



South Eastern Coalfields Limited  
(A Govt. of India Undertaking)

**COAL LIGNITE URJA VIKAS PRIVATE LIMITED**  
(JV Company of Coal India Limited and NLC India Limited)

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**Domestic Competitive Bidding (DCB)**

Tender No.: CLUVPL/ PMC/ SECL/ 01

Date & Time of Submission: 15.10.2021, 14.30Hrs

**TENDER DOCUMENT**

**FOR**

**“Setting up of 40MW (AC) Ground Mounted Grid Connected Solar PV  
Power Project for SECL at Bishrampur & Bhatgaon in Surajpur Dis-  
trict, Chhattisgarh State under EPC mode and 10 years O & M.”**

**VOLUME – IA**

**INVITATION FOR BIDS (IFB)**

**TENDER VOLUMES**

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**VOLUME-IA**

**INVITATION FOR BIDS (IFB)**

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## LIST OF ACRONYMS

APG	Advance Payment Bank Guarantee
BG	Bank Guarantee
BoS	Balance of System
C&I	Control & Instrumentation
Cl.	Clause
CIF	Cost, Insurance & Freight (Incoterms 2010)
CPG	Contract Performance Bank Guarantee
DD	Demand Draft
JDU	JOINT DEED OF UNDERTAKING
EOI	Expression of Interest
EPC	Engineering, Procurement & Construction
FOB	Free on Board (Incoterms 2010)
FTP	Foreign Trade Policy
GST	Goods and Services Tax
IFB	Invitation for Bid
IST	Indian Standard Time
INR	Indian Rupees



JV	Joint Venture
kW	Kilo Watt (Power)
LOA	Letter of Award
MW	Mega Watts (Power)
SECL	South eastern coal fields limited
NLCIL	NLC India Limited
CLUVPL	Coal lignite urja Vikas private limited
PERT	Project Evaluation and Review Technique
PSU	Public Sector Undertaking
PTO	Provisional Take Over
PAT	Performance Assessment Test
PG	Performance Guarantee
RBI	Reserve Bank of India

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**SECTION-I**  
**INVITATION FOR BIDS (IFB)**

**INSTRUCTION TO BIDDERS FOR SUBMISSION OF ONLINE BIDS  
THROUGH e-TENDER and e-REVERSE AUCTION**

Bidders are requested to read the terms & conditions of this tender before submitting their online bids. In this document the terms “bidders” and “Bidders” mean one and the same.

1.0 **Pre requisites for accessing portal <https://procure.nlcindia.in>**

**A. Software Requirements**

- Operating system: Windows 7 & above.
- Web browser: Google Chrome or Firefox or Edge or Internet Explorer 11 or above.
- Java JRE: JRE 1.8 or above.
- PDF reader: Adobe Acrobat Reader 8 or above.

**B. Digital Certificate**

Bidder should have a legally valid **CLASS III Digital Certificates (i) Digital Signature, non-repudiation certificate (used for Signing) and (ii) Key Encipherment Certificate (used for encrypting Bid Document) with Organisation name** from any of the licenced Certifying Authorities (CA) operating under the Root Certifying Authority of India (RCAI), Controller of Certifying Authorities (CCA) OF India.

Ensure that all necessary trust certificates and drivers are installed as per CA’s instruction and working properly. **For detailed guidance about browser and Java configuration the bidders are advised to go through the guide available in the NeAT portal <https://procure.nlcindia.in>.**

2.0 **Enrolment:**

Bidders interested to participate in the tender require to complete the enrollment process at NeAT <https://procure.nlcindia.in> to create their account / user id and password, if not done already.

Bidder(s) having a valid NeAT account with user id and password can only submit his/their bids online electronically. Bidders are required to make their own arrangement for bidding from a computer connected with Internet. CLUVPL shall not be responsible for making such arrangements.

3.0 **Payment of Cost of tender document**

3.1 The payment towards Cost of tender document is to be remitted in favour of Coal Lignite Urja Vikas Private Limited by NEFT/RTGS/e-payment. Payments in any other mode will not be accepted.

3.2. While making payment through NEFT / RTGS / e-payment, the Bidders are requested to furnish Tender Number and Bidder’s name in the Remarks Column.

3.3. Tender fee will be deemed to have been submitted by the bidder if and only if the same is received (credited) in the above bank account within the stipulated time. Bidder will have to fill up the details of tender cost remitted viz., UTR NO, date, scan copy, etc in the form provided under QR Forms

4.0 **Bidding Process:**

The entire bidding process is divided into Two Stages i.e. Stage-I and Stage-II. Stage-I bidding will be through e-Tender and Stage-II bidding will be through e-reverse auction.

## **Stage-I, e-Tender**

### **Preparation of Bid**

The Bidder will be able to prepare his Qualification Requirement Bid, Technical Bid, Commercial Bid and Initial Price Bid online, using the respective Forms available in the system. For Guidelines please refer to the help in the Portal.

Before submission of bid, the Bidder can edit and save his bid any number of times till closing time for submission of the bid.

After submission of bid, if the Bidder wants to edit his submitted bid then he has to first delete his submitted bid and then edit his bid and resubmit before closing time for submission of the bid. Only submitted bids will be considered for evaluation. Any saved bids that are not submitted will be deleted by the system after the due date of opening.

Bidder can attach files containing company profile details, scanned copies of dealership certificate, scanned copies of technical drawings, etc., which are required for the Tender. The documents attached should be in PDF format.

File Size: 10 MB is the maximum size of a single file that can be attached.

### **e-Bid Submission and Signing**

Submission of e-bids online is a two-step process. In the first step, the Techno Commercial bid and Initial Price Bid have to be filled and submitted. In the second step, these bids have to be digitally signed using Bidder's Digital Signature Certificate.

Bidder cannot submit any bid after the due date and time stipulated in the e-Tender.

All bids submitted by Bidder can be viewed by clicking on the link "Submitted bids" provided in the left menu of the corresponding Bidder's home page.

All notices and correspondence to the bidder(s) shall be sent by email message only during the process till finalization of tender. Hence the bidders are required to ensure that their email address provided at the time of registration is valid and updated. Non receipt of email will not entitle any bidder to lodge any claim and no complaint in this regard shall be entertained. Bidders are also requested to ensure validity of their DSC (Digital Signature Certificate).

Bidders are advised to see the website regularly to remain updated with latest information to ensure that they do not miss out any corrigendum / addendum uploaded against the said e-tender after downloading the e-tender document. The responsibility of downloading the related corrigendum, if any, will be that of the bidders.

#### **5.0 Process of e-Tender:**

5.1 This is a two stage tender. On the scheduled date and time of tender opening, Tender Opening Committee will open first the Sealed Physical Cover

Then the Part – I of those online bids will be opened. The tender shall be processed as follows:

- (i) The bidders who qualify in QR conditions alone shall be considered for further evaluation on Techno-commercial aspects.
- (ii) The bidders who get qualified on techno-commercial aspects shall alone be considered for price cover opening (Part-II).

The opening of the Part -II (Prices) of the bid will be intimated later separately to the bidders who are found to have satisfied the Qualifying Requirements and Techno-Commercial aspects.

- 5.2. For evaluation purpose, prices quoted in Schedule of Prices alone shall be taken into consideration.
- 5.3. If a bidder desires to be present at the time of Tender Opening, he shall depute his representative(s) (not more than two persons) in time with due authorization for participating in the Tender Opening.
- 5.4 **Stage – II : E-Reverse Auction :** The Reverse Auction, if required, will be conducted among the shortlisted bidders with a start price and decremental value. The Reverse auction procedure is detailed under the heading “Reverse Auction.”
- 6.0 **Bidding in e-Tender & Reverse auction:**
- a. In all cases, bidder should use their own ID and Password along with Digital Signature at the time of submission of their bid.
- b. The e-tender floor shall remain open from the pre-announced date & time and for as much duration as mentioned in the Tender.
- c. All electronic bids submitted during the e-tender and e-reverse auction process shall be legally binding on the bidder. Any bid will be considered as the valid bid offered by that bidder and acceptance of the same by the Purchaser will form a binding contract between Purchaser and the Bidder for execution of work.
- d. It is mandatory that all the bids are submitted with digital signature certificate otherwise the same will not be accepted by the system.
- e. CLUVPL reserves the right to cancel or reject or accept or withdraw or extend the e-tender in full or part as the case may be without assigning any reason thereof.
- f. The server time shall be treated as final and binding. Bids recorded in the server before the bid closing time will only be treated as valid bid. Bidders are, therefore, advised to submit their bids well before the closing time of e-tender / e-reverse auction. If any bid reaches the server after the bid closing time as per server time, the same will not be recorded and no complaint in this regard shall be entertained.
- g. Bidders are advised to exercise caution in quoting their bids in e-tender and e-reverse auction to avoid any mistake. Bids once submitted cannot be recalled.
- h. Any order resulting from this bidding process shall be governed by the terms and conditions mentioned in the tender volumes.

## Schedule Of Tender (SOT)

TENDER No.	Tender No. CLUVPL/PMC/SECL/01
MODE OF TENDER	e-Tendering System Online Bid – Part-I & Part-II and Offline Bid- Physical cover
Date of IFB available to bidders for download	From 24.09.2021 to 15.10.2021
Cost of Tender document	Rs.10,000/-(Including GST) Non Refundable in favour of Coal Lignite Urja Vikas Private Limited payable at Neyveli.
Pre Bid Meeting Date & Venue	Dt. 01.10.2021 at 11.00 hrs. (IST) through Video Conference. The points for discussion shall be furnished in advance in soft copy in pdf and editable version to the following <b>E-mail ID: <a href="mailto:cluvpl@nlcindia.in">cluvpl@nlcindia.in</a></b> Bidders who are interested to participate in the Pre bid Meeting are requested to Register their Name, Company name and address, Mobile Phone No. and e-Mail ID through e-mail to <a href="mailto:cluvpl@nlcindia.in">cluvpl@nlcindia.in</a> to enable us to send the link for participating in the Pre bid meeting.
Date of Starting of submission of Bids	Dt 05.10.2021 from 11.00 hrs. (IST)
Last date and Time of submission of Bids	Dt 15.10.2021 up to 14.30 hrs. (IST)
Date & Time of submission of Physical forms in sealed cover	Dt 15.10.2021 upto 14.30 hrs. (IST)
Date & time of opening of Tender (Part-I & Physical cover)	Dt 15.10.2021 at 15.00 hrs. (IST)
Date & time of Opening of price bid (Part-II)	To be informed later
<b>Date and time of e-Reverse Auction</b>	To be informed later

## 1.0 INVITATION FOR BID

South Eastern Coalfields Limited (SECL) entrusted the responsibility of carrying out Project Management Consultancy (PMC) works to Coal Lignite Urja Vikas Private Limited (CLUVPL - JV company of Coal India Ltd and NLC India Ltd.) for developing 40 MW Solar Projects in their lands for their captive use on open access. On behalf of South Eastern Coalfields Limited, Online Bids in English are invited by Coal Lignite Urja Vikas Private Limited for **“Setting up of 40MW (AC) Ground Mounted Grid Connected Solar PV Power Project for SECL at Bishrampur & Bhatgaon in Surajpur District, Chhattisgarh State under EPC mode and 10 years O & M ”** on Domestic Competitive Bidding Basis. Bids are invited in Two Part (Part-I and Part-II) system followed by Reverse Bidding as per the details given below:

### 1. Invitation

Online bids for Part-I: PQR and Techno-commercial Bid and Part-II: Price Bid in the manner detailed in Section-3 of Volume-IA for the scope of Setting up of 40MW (AC) Ground Mounted Grid Connected Solar PV Power Project for South Eastern Coal fields Limited (SECL) at Bishrampur & Bhatgaon in Surajpur District, Chhattisgarh State under EPC mode and 10 years O & M on Lump-sum turnkey basis which includes Site study, Site development, Design, Engineering, Manufacture, Inspection at supplier's works, Supply, Insurance, Transport, Storage, Installation, Erection, Testing and Commissioning with associated power evacuation system including grid connectivity and approval from Chhattisgarh State Electricity Authorities, Bay Extensions, external transmission lines, Metering arrangements, Performance Assessment and Operation & Maintenance for a period of 10 years including first year warranty period O & M at Bishrampur and Bhatgaon locations, Surajpur District in Chhattisgarh State. The tender is floated through Domestic Competitive bidding (DCB) route and the bid is open to bidders from within Purchaser's country only. This Tender Specification is meant for inviting bids from prospective EPC contractors for the scope of work given in the Tender Specification.

## 1.2 BRIEF SCOPE OF WORKS:

The brief scope of works consists of Site study, Site development, Design, Engineering, Manufacture, Inspection at supplier's works, Supply, Insurance, Transport, Storage, Erection, Installation, Testing, Commissioning with associated power evacuation system including grid connectivity approval from Chhattisgarh State Electricity Authorities, Bay Extensions, external transmission lines, Metering arrangements, Performance Assessment and Operation & Maintenance for a period of 10 years including first year warranty period O & M for total 40 MW (AC) capacity at Bishrampur and Bhatgaon locations, Surajpur District in Chhattisgarh State by EPC on Lumpsum turn key basis. For technical details, bidders shall refer respective technical specification.

### **1.3 OPERATION AND MAINTENANCE (O&M)**

The scope of work also includes operation and maintenance of the 40 MW solar power plants for Ten years including first year warranty period O & M and associated transmission system including bay extensions and transmission lines. The Operation and maintenance scope of contractor covers comprehensive Operation and maintenance works including spares, replacements, consumables etc., till the end of 10 years O & M contract period. In case of any delay or dispute by the contractor, the purchaser may carry out the Operation & maintenance works on necessity and back charge the Contractor during the period. The Contractor shall post sufficient staff for O & M period. In case the bidder fails to carry out any repair or replacement during the period the purchaser shall carry out such repairs or replacement at his discretion at the risk and cost of the contractor. This Scope of Work is indicative only. Detailed Scope of Work is contained in Volume-II (Technical specification).

### **2.0 PRE - QUALIFICATION REQUIREMENTS (PQR) :**

2.1 The Bidder should have executed contracts of Supply, Installation and Commissioning of Grid connected Solar PV power plant(s) of cumulative installed capacity of 20 MWp or above within the last seven years as on the original scheduled date of tender opening and out of which at least one plant should have been of 10 MWp capacity or above, which should be in successful operation for at least six months as on the original scheduled date of tender opening.

OR

The bidder should be a developer of Grid connected Solar PV Power Plant(s) of cumulative installed capacity of 20 MWp or above within the last seven years as on the original scheduled date of tender opening and out of which at least one plant should have been of 10 MWp capacity or above, which should be in successful operation for at least six months as on the original scheduled date of tender opening



2.2 Bidder who doesn't fulfil the qualifying requirements stipulated in Clause 2.1 above by himself can also participate provided he collaborates with a firm and together they fully meet the qualifying requirements stipulated in Clause 2.1 above and the Collaborator should furnish along with bid a valid collaboration agreement to execute this project as required in the relevant clauses.

OR

The Bidder can also be a leader of a consortium consisting of not more than three firms, such that together they meet the Qualifying Requirements stipulated in Clause 2.1 above and the members of the consortium should furnish back-up Bank Guarantee as required in the relevant clauses. In case of bidding by a Consortium, the consortium partners shall necessarily identify a leader of the Consortium who will furnish the Consortium Agreement and the consortium partners shall execute a Joint Deed of Undertaking in which the partners are jointly and severally liable to the Owner for successful performance of the contract.

OR

The Bidder can also be a Joint Venture Company, provided the qualifying requirement stipulated in clause 2.1 above is met by any one or more partners of the Joint Venture (JV) Company. The partner of the JV Company on the basis of whom the JV Company gets qualified shall have minimum 26% equity in the JV Company.

- 2.3. The Bidder or the lead member of Consortium or major partner of the Joint Venture Company shall have Positive Net Worth as per the latest audited financial Statements. If the Bidder participates along with the Collaborator, the bidder shall have Positive Net Worth as per the latest audited financial Statements.
- 2.4. Average Annual Turn Over of the Bidder, combined Average Annual Turn Over of the Bidder and Collaborator, combined Average Annual Turn Over of the Consortium partners and the combined Average Annual Turn Over of all the promoters of the Joint Venture Company, as the case may be, shall not be less than Rs. 48Cr. in the preceding three (3) consecutive financial years as on the original scheduled date of tender opening.

### **3.0 OTHER CONDITIONS:**

- 3.1. The Bidder or the Bidder with Collaborator or the Consortium or the Joint Venture Company as the case may be, shall attach documentary evidence to prove that the qualifying requirements mentioned in Cl. 2.1 to 2.4 above are met by him / them, along with the bid in the form of user certificate together with full contact details for verification.
- 3.2. In case of participation by the Bidder with Collaborator, the bidder shall furnish a copy of valid Collaboration Agreement along with the bid, for the services offered jointly and such agreement shall be valid till completion of all the contractual obligations. In case of participation by the Bidder as a Consortium, the bidder shall furnish a copy of valid Consortium Agreement and Joint Deed of Undertaking along with the bid, for the services offered jointly and such agreement shall be valid till completion of all the contractual obligations. In case of participation by the Bidder as a Joint Venture Company, the bidder shall furnish a copy of valid Joint Venture Agreement along with the bid, for the services offered jointly and such agreement shall be valid till completion of all the contractual obligations.
- 3.3. The successful bidder meeting the Qualifying Requirements, shall furnish a Contract Performance Guarantee (CPG) in the form of an on-demand Bank Guarantee for the faithful performance of the contract for a value of 3% of the total EPC contract price within 21 days from the date of LOA . On completion of EPC contract, 90% of the CPG will be returned to the contractor and the balance 10% will be retained throughout the O & M contract period for a period of 10 years. Further the bidder shall submit a bank guarantee for an amount equal to 10% of contract price of Operation and Maintenance portion of the entire system, before the completion of EPC contract.
- 3.4. The bidder or the bidder with collaborator or all individual firms in the Consortium or all partners in the Joint Venture Company, as the case may be, shall furnish their audited profit and loss accounts and balance sheets for the preceding three (3) financial years from the scheduled date of bid opening.
- 3.5. The bidder cannot be a collaborator /consortium Partner/ JV partner for other bidder(s) who are bidding for this tender.
- 3.6. CLUVPL reserves the right to ask the bidders to furnish the certified copies of experience certificates. For installation outside India, experience certificate is to be authenticated by the Indian Embassy in that country and within India experience certificate is to be attested by a Notary Public.

- 3.7. The purchaser also reserves the right to consider any foreign installations as experience, only if the Bidder facilitates necessary inspection of such installation by the purchaser. However, cost pertaining to the purchaser's personnel for such inspection shall be borne by the purchaser.
- 3.8. The Bidder shall submit End User Certificates of commissioning and in successful operation for the project completed which is subject to verification for qualification. Those bidders submitting End User Certificates for EPC projects with modules supplied by the developer/ project owner as free issue item to EPC contractor shall be considered to meet the Qualifying Requirements of Cl 2.1, provided the bidder issues an undertaking to engage a Solar Projects Design Consultant for this project. In case the bidder is a developer of Solar PV Power project, the bidder shall submit certificate of successful commissioning of the project issued from Government Renewable Energy Nodal Agency/ Government enterprise/ DISCOM/ Electricity Board etc. and bidder shall submit evidence of successful operation from intermediary procurer/procurer/ DISCOM/Electricity Board etc. In case the bidder furnishes the end user certificates showing the experiences of their subsidiary or group companies or companies under the same Management, a confirmation from the firm which is having the experience in this regard is to be enclosed along with end user certificate. In case of end user certificates are furnished by the Bidder from the subsidiary or group companies or companies under the same Management, in addition to End User Confirmation, CLUVPL reserves the right to inspect such installations where such certificates are obtained by the Bidder, only if the Bidder facilitates necessary inspection of such installation by CLUVPL. However, cost pertaining to the CLUVPL's personnel for such inspection shall be borne by CLUVPL.
- 3.9 CLUVPL reserves the right to inspect the plant(s) referred to by the bidders as well as the original documents submitted in support of their claim to assess its veracity.
- 3.10 The bidder shall furnish major legal cases and their statutory liabilities if any.
- 3.11 The bidder shall also possess a valid certificate of registration under GST and the same should be furnished along with tender documents. If a bidder is an unregistered /composite dealer under GST law, such bidders are not eligible to participate in this tender.
- 3.12 The bidder should have (obtained / holder of) the Permanent Account Number (PAN) under the income tax act and production of the documents relating to same are mandatory. To ensure that the bidder is not a defaulter in payment of income tax as evidenced by income tax assessment records for four consecutive years prior to bidding, it is mandatory for the bidder to provide the self attested printout of the online IT Statement indi-

cating zero tax liabilities for four consecutive years prior to bidding along with the tender documents. CLUVPL reserves the right to send the same to the income tax department for verification. (In this regard, the bidder can seek the help of the auditor in case of any doubt or otherwise.)

- 3.13 The Bidder shall not be under a declaration of ineligibility by SECL/NLCIL/CIL for Corrupt/ Fraudulent/ Collusive/ Coercive practices, as defined in tender documents (Action in case Corrupt/ Fraudulent/ Collusive/ Coercive Practices).
- 3.14 The Bidder (either individually or as a consortium or any of the participating members of the Consortium) shall not have been debarred by SECL/ CIL/NLCIL/ Ministry of New & Renewable Energy (MNRE) or any other ministries and / or any other Government Department, Agencies or CPSUs from future bidding due to “poor performance” or “corrupt and fraudulent practices” or any other reason in the past. If the tender documents were issued inadvertently/ downloaded, offers submitted by such bidders shall not be considered for opening/ evaluation/ Award and will be returned to such bidders. It is the sole responsibility of the Bidder to have informed CLUVPL about any change in status of the declaration (if any) prior to award of contract, the same has to be informed promptly to CLUVPL by the bidder. It shall be the sole responsibility of the bidder to inform CLUVPL in case the bidder is debarred from bidding by SECL/CIL/NLCIL or Public Sector Project Management Consultant. Concealment of the facts shall tantamount to misrepresentation of facts and shall lead to action against such Bidders.
- 3.15 The Bidder should not be under any liquidation court receivership or similar proceedings on the due date of submission of bid. In case there is any change in status of the declaration prior to award of contract, the same has to be promptly informed to Employer/ Owner by the bidder. It shall be the sole responsibility of the bidder to inform Employer/ Owner in case the bidder is under any liquidation court receivership or similar proceedings on due date of submission of bid and during the course of finalization of the tender. Concealment of the facts shall tantamount to misrepresentation of facts and shall lead to action against such Bidders.

#### **4.0 Public Procurement Policy (Preference to Make in India)**

The bidder shall take note of the following as per Department for Promotion of Industry and Internal Trade (formerly, Department of Industry Policy and Promotion), Ministry of Commerce and Industry, Government of India, Public Procurement (Preference to Make in India) Order 2017 – Revision; Dt: 16.09.2020 and confirm compliance to the requirements in this regard as indicated below:

#### **4.1 Definitions:**

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

ii. 'Class -I local supplier', means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content as prescribed for 'Class-I local supplier' under order dt. 16.09.2020.

iii. 'Class-II local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content as prescribed for 'Class-II local supplier' but less than that prescribed for 'Class-I local supplier' under order dt. 16.09.2020.

iv. **Minimum local content:** The 'Local Content' requirement to categorize a supplier as 'Class-I Local Supplier' is minimum 50%. For 'Class – II Local Supplier', the 'Local Content' requirement is minimum 20%. For the items, for which Nodal Ministry Department has not prescribed higher minimum local content notification under the Order, it shall be 50% and 20% for Class – I local supplier / Class – II local supplier respectively.

v. 'Non-Local Supplier' means a supplier or service provider whose goods, services or works offered for procurement has local content less than that prescribed for 'Class-II local supplier' under order dt. 16.09.2020.

vi. 'RL1/R1' means the lowest tender or lowest bid or the lowest quotation received in a tender, bidding process or other procurement solicitation as adjusted in the evaluation process as per the tender or other procurement solicitation.

vii. 'Margin of purchase preference' means the maximum extent to which the price quoted by a 'Class-I local supplier' may be above the RL1/R1 for the purpose of purchase preference.

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

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

x. 'Works' means all works as per Rule 130 of GFR-2017, and will also include 'turn-key works'.

**4.2 Eligibility Class:**

Class-I local supplier only.

**4.3 Margin of Purchase Preference:** Not Applicable

**4.4 Verification of local content:**

a. The 'Class-I local supplier' at the time of tender, bidding or solicitation shall be required to indicate percentage of local content and provide self- certification that the item offered meets the local content requirement for 'Class-I local supplier', as the case may be. They shall also give details of the location(s) at which the local value addition is made.

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

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

d. A supplier who has been debarred by any procuring entity for violation of this order shall not be eligible for preference under this Order for procurement by any other procuring entity for the duration of the debarment. The debarment for such other procuring entities shall take effect prospectively from the date on which it comes to the notice of other procurement entities.

**4.5 Reciprocity Clause:**

Entities of Countries which have been identified by the nodal Ministry / Department as not allowing Indian companies to participate in their Government procurement for any item related to that nodal Ministry shall not be allowed to participate in Government procurement in India for all items related to that nodal Ministry / Department, except for the list of items published by the Ministry / Department permitting their participation.

The term 'entity' of a country shall have the same meaning as under the FDI policy of DPIIT as amended from time to time.

**4.6 Ref: Department of Expenditure Order (Public Procurement No.: 1) Order No. 6/18/2019-PPD, Dt: 23.07.2020.**

I. Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority.

II. “Bidder” (including the term ‘tenderer’, ‘consultant’ or ‘vendor’ or ‘service provider’ in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency branch or office controlled by such person, participating in a procurement process.

III. “Bidder from a country which shares a land border with India” for the purpose of this Order means:

- a. An entity incorporated, established or registered in such a country; or
- b. A subsidiary of an entity incorporated, established or registered in such a country; or
- c. An entity substantially controlled through entities incorporated, established or registered in such a country; or
- d. An entity whose beneficial owner is situated in such a country; or
- e. An Indian (or other) agent of such an entity; or
- f. A natural person who is a citizen of such a country; or
- g. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above.

IV. The beneficial owner for the purpose of (III) above will be as under:

1. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person(s), has a controlling ownership interest or who exercises control through other means

Explanation –

- a. “Controlling ownership interest” means ownership of, or entitlement to, more than twenty-five per cent of shares or capital or profits of the company.
- b. “Control” shall include the right to appoint majority of the directors or to control the management or policy decisions, including by virtue of their shareholding or management rights or shareholders agreements or voting agreements.

2. In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership.

3. In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together; or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals.

4. Where no natural person is identified under (1) or (2) or (3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official.

5. In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

V. An Agent is a person employed to do any act for another, or to represent another in dealings with third persons.

VI. The successful bidder shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority.

#### Model Certificate

“I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that this bidder fulfils all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by Competent Authority shall be attached].

#### Model Certificate for Works involving possibility of sub-contracting

“I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority. I hereby certify that this bidder fulfils all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached].



The above said order will not apply to bidders from those countries (even if sharing a land border with India) to which, Govt. of India has extended lines of credit or in which, and the Govt. of India is engaged in development projects (Order Public Procurement No.2)

Note: The Bidders are requested to note that the bids will be evaluated taking into consideration the orders mentioned in the above Clauses (Cl.4.0 and Cl.4.6.).

#### **4.7 Certification for testing:**

Ministry of Power issued following directions vide Order 25-11/6/2018-PG, dt.02.07.2020 to protect the security, integrity and reliability of the strategically important and critical Power Supply System & Network in the country and the bidder has to comply with the same:

(1) All equipment, components, and parts imported for use in the power Supply System and Network shall be tested in the country to check for any kind of embedded malware/trojans/cyber threat and for adherence to Indian Standards.

(2) All such testings shall be done in certified laboratories that will be designated by the Ministry of Power (MoP).

(3) Any import of equipment components/parts from "prior reference" countries as specified or by persons owned by, controlled by, or subject to the jurisdiction or the directions of these "prior reference" countries will require prior permission of the Government of India.

(4) Where the equipment/ components/ parts are imported from "prior reference" countries, with special permission, the protocol for testing in certified and designated laboratories shall be approved by the Ministry of Power (MoP). This order shall apply to any item imported for end use or to be used as a component, or as a part in manufacturing, assembling of any equipment or to be used in power supply system or any activity directly or indirectly related to power supply system.

#### **5.0 Land for solar projects :**

The lands required for setting up of solar power projects at Bhisrampur and Bhatgaon are under the possession of SECL and the lands will be handed over to the successful Bidder as is where is basis and the contractor shall mobilise and carry out the site activities from the date of LoA.

#### **6.0 Time Schedule:**

The time schedule for commissioning of the solar power projects shall be 9 months from the date of LOA.

Provisional Takeover and Commercial Operation Declaration: 12 months from the date of LOA.

O&M: For 10 years including first year warranty period O&M from the date of commercial operation declaration.

**7.0 Bid Security declaration :**

Bidders has to submit the Bid Security Declaration As per Annexure-A

**8.0 Bid Submission and opening conditions.**

8.1 All bids, including all attachments/enclosures shall be prepared in English Language only and submit the same. The bidder shall submit the offer for full scope of work indicated in the Tender Specification.

Online bids are to be submitted for Part - I & Part – II.

Offline bids - Physical Cover to be submitted in person/by post on or before the schedule date of Bids Submission.

8.2 The Offers/Bids are to be submitted as follows:

Part I	PART – I (through online) Covering Letter, Bid form (Part-I) (As per Annexure - B), Power of Attorney, Proof for remittance of Cost of tender document, Bid security declaration, Integrity Pact, PQR documents, Collaboration agreement (as applicable)/ Consortium Agreement(as applicable)/ Joint Undertaking Deed(JDU) as applicable, Techno- Commercial details and all other details as given in this volume and as per the requirements of online submission.
Part II	Part-II (through online) (i) Duly filled in Form of bid as per Annexure – C of Invitation for Bid (IFB). (ii) Price Bid with completely filled in Schedule of Prices (Schedule – F1) of Volume – IA.

Physical Cover	Bidders are requested to furnish the following documents in Original in a sealed Physical cover within the last date of receipt of Bids:
	<ol style="list-style-type: none"> <li>1. Bid Security declaration</li> <li>2. Power of Attorney / Authorization with the seal of the company in favour of the person signing the Bid.</li> <li>3. Collaboration agreement (as applicable)/ Consortium Agreement (as applicable)/ JOINT DEED OF UNDERTAKING (JDU) as applicable,</li> <li>4. Integrity Pact.</li> <li>5. Duly filled up Checklist as in Specimen Format. .</li> </ol>

Bidders are requested to submit their Physical Cover within the stipulated time to the Office of the CEO/CLUVPL, PBD Division, Block-1, NLC India Limited, Nevely-607801, Tamil Nadu, India.

8.3 **Part-I and Physical cover** shall be opened on the scheduled date of tender opening. The offers/bids of the bidders is considered as responsive bid who satisfy the conditions of i) Class-I local supplier declaration ii) payment of cost of tender documents iii. Bid declaration and Integrity Pact and those offers/bids shall be considered for further evaluation on PQR aspects. If required, bidders will be called for techno-commercial discussions. After PQR and techno-commercial shortlisting, Part-II cover will be opened in online and proceeded with e-Reverse auction.

#### 9.0 **Special Note and Information Regarding the Tender:**

I. The complete Bidding Documents are available at portal <https://procure.nlcindia.in>, Central Public Procurement portal (CPPP) of GoI at [www.eprocure.gov.in](http://www.eprocure.gov.in). However, for the purpose of participation, the official copy of the bidding documents shall only be downloaded from e-tendering portal at <https://procure.nlcindia.in> (herein after referred to as the portal) , as per the provisions available therein. Accordingly, the online bid also has be uploaded by the respective bidders at <https://procure.nlcindia.in> only & no other mode of participation is permitted for this tender document other than this Portal.

II. Interested bidders have to necessarily register themselves on the portal to participate in the bidding under this invitation for bids. It shall be the sole responsibility of the interested bidders to get themselves registered at the aforesaid portal for which they are required to contact the executives mentioned in “Contact as” of the portal to complete the registration formalities. The address of CLUVPL is mentioned on the Schedule of Tender. All required documents and formalities for registering on portal are mentioned in the subsequent bidding documents. They may obtain further information regarding this IFB from the office of

CEO/CLUVPL at the address given on the Schedule of Tender from 10:00 hours to 17:00 hours on all working days till the last date of the Bid Submission. For proper uploading of the bids on the portal, it shall be the sole responsibility of the bidders to apprise themselves adequately regarding all the relevant procedures and provisions as detailed in the portal. The CLUVPL in no case shall be responsible for any issues related to timely or properly uploading/ submission of the bid in accordance with the relevant provisions of tender volume.

III. While submitting/ uploading the bids, the system through portal asks to key in the pass-phrase for encryption of the documents. The pass-phrase is required by CLUVPL for opening the bids (Separate for both First Envelopes as well as Second Envelopes). The same may be submitted on the portal as per the provisions existing for submission of the pass phrase and as per the details given in IFB. In the event, CLUVPL is unable to open the Bids with the given pass-phrase provided by the bidders, CLUVPL on its discretion may give an option through the portal, to the bidder to open its bid as per provisions available on the portal. However, CLUVPL shall not be responsible if bid could not be opened within reasonable time for whatsoever reason. In such a case, the bid shall be sent unopened to 'Archive' on the portal and shall not be considered at all any further.

IV. A Single Stage Two Envelope Bidding Procedure followed by e-Reverse Auction will be adopted and will be processed as detailed in the Bidding Documents. Bidding will be conducted through the competitive bidding procedures as per the provisions of IFB and the contract shall be executed as per the provisions of the Contract. It shall be noted that the respective rights of the Employer and the Bidder/ Contractor shall be governed by this Bidding Documents and Contract signed between the Owner and the Contractor for the package.

V. Bidders should submit their bid proposal online complete in all aspect on or before last date and time of Bid Submission as mentioned on Portal and as indicated in the Schedule Of Tender.

VI. Bidder shall submit bid proposal along with non-refundable Tender Processing Fees, Bid-Guarantee complete in all respect as per the Schedule Of Tender. Techno-Commercial bids will be opened as per the Schedule Of Tender in offline/ online presence of authorised representatives of bidders who wish to be present offline/ online. Bid proposals received without the prescribed Cost of Tender Document and Tender Processing Fees will be rejected. In the event of any date indicated is a declared Holiday, the next working day shall become operative for the respective purpose mentioned herein.

VII. Tender documents which include Eligibility Criteria, Technical Specifications, various Conditions of Contract, Formats etc. can be downloaded from Portal at <https://procure.nlcindia.in>. It is mandatory to download official copy of Tender Document from Portal to participate in the Tender. Any amendment(s)/ corrigendum(s)/ clarification(s) with respect to this Tender shall be uploaded on the portal. The Bidder should regularly check for any Amendment(s)/ Corrigendum(s)/ Clarification(s) on the above mentioned site.

VIII. The Bidder selected shall be responsible for the performance of the following scope of work (more detailed in this tender document):

- (i) Design, Engineering, Supply, Construction, Erection, Installation, Testing & Commissioning of 40 MW Solar PV Power Project at Bishrampur and Bhatgaon areas of Chhattisgarh, India.
- (ii) Comprehensive operation & maintenance of the Solar PV Power Plants for 10 (Ten) years as mentioned in detailed scope of work, after successful commissioning and performance demonstration, as detailed in technical specification, including supply and storage of all mandatory spare parts, consumables, repairs/ replacement of any defective equipment, etc.

The above scope of work is indicative and the detailed scope of work is given in the Scope of Work and Technical Specification (Volume-II) of the Tender Documents.

IX. The detailed Qualifying Requirements (QR) are given in the section-I, Instructions to Bidders (IFB)

X. The CLUVPL shall conduct e-Reverse Auction (e-RA), as per provisions of Instructions to Bidders (IFB) of Tender documents.

XI. CLUVPL reserves the right to cancel/ withdraw this invitation for bids without assigning any reason and shall bear no liability whatsoever consequent upon such a decision.

The Cost of tender document may be remitted through RTGS / NEFT mode or e- payment and the UTR No. may be indicated in the tender document. The Bank commission charges will be to the account of the bidder.

Name of Beneficiary	Coal Lignite Urja Vikas Private Limited
CLUVPL's Account No.	00000039899678393
Branch	Museum Road,Block-2, Neyveli -607801
Beneficiary Bank,	State Bank of India
IFSC Code	SBIN0000958
Swift Code for online transfer	SBININBB457

The bidder is to note that the Banks commission charges will be to the account of the bidder and the net amount transferred to CLUVPL's account shall be equal to the cost of the tender document. The qualification of bidder is subject to receipt of cost of the tender document stipulated in the tender. No other mode of payment will be accepted.

- (1) All other terms and conditions along with the technical details, time schedule, bid security declaration, validity of bids and instructions to bidders, etc., are contained in the tender documents.
- (2) Bids submitted by fax or E-mail shall be rejected.
- (3) Bids submitted after expiry of the time specified for receiving the Bid shall be rejected
- (4) CLUVPL reserves the right to reject any bid or all bids received at its discretion without assigning any reasons whatsoever.
- (5) CLUVPL takes no responsibility for delay, loss or non-receipt of Tender/bid documents or any letter sent by post either way.
- (6) Offer is to be made in Indian rupees and payment for entire scope will be made in Indian Rupees only.
- (7) The Tender documents are meant for the exclusive purpose of bidding against the subject package and shall not be transferred, reproduced or otherwise used for purposes other than for which these are specifically issued.
- (8) In case of extension of Bid submission date, the pre-qualification requirements met by the Bidder as on the original Scheduled date of tender opening, shall alone be taken into account.
- (9) Performance certificate issued by consultants will not be considered.
- (10) Bids not meeting the requirement as stated above shall be liable for rejection.
- (11) CLUVPL reserves its right to allow purchase preference to Central Public Sector Undertakings, as notified by the Government of India from time to time.
- (12) Any firm which is placed under Suspension/Banning by SECL/CIL/NLCIL will not be

allowed to participate in any tender issued on or after the date of suspension/banning order and also if that firm has already participated in any tender, which is under process, their bid will not be considered for further processing.

- (13) Bidders are advised to quote the most competitive price in the initial bid as well as in the Reverse Auction (RA), wherever applicable, since there will not be post tendering negotiations with the L1 bidder under any circumstances.

CEO /CLUVPL

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## SECTION – 2

### GENERAL PROJECT INFORMATION

#### 2.0 GENERAL PROJECT INFORMATION

##### 2.1 Introduction

The Solar Power Project sites are located at Bishrampur and Bhatgaon, Surajpur district, Chhattisgarh state. In Bishrampur, the solar power projects are to be installed at Goraknathpur (10MW) and in Shivnandanpur (10MW). In Bhatgaon, the solar power projects are to be installed in Bhatgaon-I (10MW) and in Bhatgaon-II (10MW). Infrastructure such as access road, railway connection etc are available nearby the project site locations.

##### 2.2 Project & Site Information

1	Owner / Purchaser	South Eastern Coal fields Limited( SECL), Bilaspur, Chhattisgarh
1A	Tender floating Authority on Behalf of SECL	Coal Lignite Urja Vikas Private Limited, Delhi (CLUVPL)- JV company of Coal India Limited and NLC India Limited.
2	Project Management Consultant	
3	Project Title	Setting up of 40MW (AC) Ground Mounted Grid Connected Solar PV Power Project for SECL at Bishrampur & Bhatgaon in Surajpur District, Chhattisgarh State under EPC mode.
4	Location	Approximately 300 kms from Raipur (C.G)



5	Latitude	<p><b><u>Bhatgaon solar sites.</u></b>  Bhatgaon-1: 23°22'38.5"N  Bhatgaon-2: 23°22'38.5"N</p> <p><b><u>Bishrampur solar sites.</u></b>  Goraknathpur: 23°12'05.0"N  Shivnandanpur: 23°11'38.8"N</p>
6	Longitude	<p><b><u>Bhatgaon solar sites.</u></b>  Bhatgaon-1: 83°00'09.5"E  Bhatgaon-2: 83°00'09.5"E</p> <p><b><u>Bishrampur solar sites.</u></b>  Goraknathpur: 82° 57' 31.3" E  Shivnandanpur: 82° 57' 41.1" E</p>
7	Elevation above MSL	Approximately (+) 457m[ both Bishrampur & Bhatgaon]
8	Nearest Railway Station	Bishrampur
9	Nearest Sea Port	Vishakhapatnam
10	Nearest Airport	Raipur
11	Road Access/Approach to Site	The approach road is approximately less than 1 km from solar sites.
12	Site Meteorological Data	
13	Max ambient temperature	40° C
14	Min Ambient Temperature	17° C

15	Wet bulb temp	29 ° C
16	Max. Relative Humidity	90%
17	Min. Relative Humidity	17%
18	Rainfall	About 1265.7 mm annually (average)
19	Wind direction	South West to North East direction
20	Wind Speed	0.6 m/s at Bishrampur and 0.7 m/s at Bhatgaon
21	Seismicity	As per IS: 1893 (Zone-II) Importance factor: 1.75.

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**SECTION – 3**  
**INSTRUCTIONS TO BIDDERS**

### **3.1 Introduction**

Coal Lignite Urja Vikas Private Limited herein afterwards referred as CLUVPL invites bids on behalf of South Eastern Coal Fields Limited herein afterwards referred as SECL or Purchaser, Bilaspur for Setting up of 40MW (AC) Ground Mounted Grid Connected Solar PV Power Project for SECL at Bishrampur & Bhatgaon in Surajpur District, Chhattisgarh State under EPC mode. The bidders shall submit their offers for complete scope of work indicated in the tender volumes.

### **3.2 SITE VISIT**

- 3.2.1 The Bidder is advised to visit and examine the site of works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the Bid and entering into a Contract for the required job. The costs of visiting the site shall be borne by the Bidder.
- 3.2.2 The Bidder or any of its personnel or agents shall be granted permission by the SECL/CLUVPL to enter upon its premises and land/Area for the purpose of such visits, but only upon the express conditions that the Bidder, its personnel and agents will release and indemnify the SECL/CLUVPL and its personnel, agents from and against all liabilities in respect thereof, and will be responsible for death or injury, loss or damage to property, and any other loss, damage, costs, and expenses incurred as a result of inspection.
- 3.2.3 The Bidder shall not be entitled to hold any claim against SECL/CLUVPL for non-compliance due to lack of any kind of pre-requisite information as it is the sole responsibility of the Bidder to obtain all the necessary information with regard to site, surrounding, working conditions, weather etc. on its own before submission of the bid.

### **3.3 SECL's Consultant :**

SECL appointed CLUVPL as Project Management Consultant for setting up of 40MW(AC) Ground Mounted Grid Connected Solar PV Power Project at Bishrampur & Bhatgaon in Surajpur District, Chhattisgarh State. CLUVPL acts as owner engineer on behalf of SECL and hence CLUVPL owns all responsibilities of this project tendering and project implementation and monitoring O & M activities for 10 years.

### **3.4 Language of the Bid :**

The Bid, prepared by the Bidder and all correspondence and documents relating to the Bid, exchanged by the Bidder and the CLUVPL and Purchaser shall be written in the English language. Any printed literature/material furnished by the Bidder in any other language shall be accompanied by an authentic English translation of all pertinent points. For purposes of interpretation of Bid, the English translation shall govern.

### **3.5 Brief Scope of Work :**

The scope of the work shall be on the basis of single Bidder responsibility, covering the complete scope of work specified under these specifications and documents. It shall include the following: The brief scope of works consists of Site study, Site development, Design, Engineering, Manufacture, Inspection at supplier's works, Supply, Insurance, Transport, Storage, Erection, Installation, Testing, approval from Chhattisgarh State Electricity Authorities, Bay Extensions, external transmission lines, Metering arrangements and Commissioning with associated power evacuation system including grid connectivity, Performance Assessment and Operation & Maintenance for a period of 10 years including first year warranty period O & M for total 40 MW (AC) capacity at Bishrampur and Bhatgaon locations, Surajpur district in Chhattisgarh state by EPC on Lump sum turn key basis. For technical details, respective technical specification shall be referred. The scope includes:

- i) Detailed design of the systems/equipment covering all Mechanical, Electrical, Control & Instrumentation, Civil and Structural works.
- ii) Complete manufacture, supply, shop inspection and testing.
- iii) Providing engineering drawings, data, operational & maintenance manuals, etc., for CLUVPL approval.
- iv) Packing, forwarding and transportation including insurance from the manufacturer's works to plant sites at Bishrampur and Bhatgaon and transportation from storage yard to erection site.
- v) Receipt, storage, preservation and conservation of system/equipment at site including construction of storage facility viz. covered, semi-covered, air-conditioned, open yard at the solar sites including storage-cum-erection and all other specified & statutorily required insurance.
- vi) Pre-assembly, if any, erection, Installation, testing, commissioning, completion of plant and equipment/ system, performance assessment test and handing over of all the plant and equipment/ system covered under this specification.
- vii) Carry out all related civil and structural works at site including construction of foundations, buildings, structures etc. including supply of cement and steel and all other required materials.
- viii) Maintaining mandatory spares

Bids not covering the entire scope mentioned in the tender specifications will be treated as incomplete and hence are liable for rejection.

### **3.6 Time Schedule:**

The contractor shall complete Site study, Site development, Design, Engineering, Manufacture, Inspection at supplier's works, Supply, Insurance, Transport, Storage, Installation, Erection, Testing, approval from Chhattisgarh State Electricity Authorities, Bay Extensions at SECL SS, external transmission lines and its augmentations, Metering arrangements and Commissioning with associated power evacuation system including grid connectivity within 9 months from the date of LOA.

### **3.7 Tender Specifications**

The scope of contract, bidding procedures and contract terms are prescribed in the Tender Specifications. The Tender Specifications comprise, interalia, the following volumes:

Volume – IA : Commercial – Invitation for Bid

Volume – IB : Commercial – Draft Contract

Volume – II : Technical Specification

The Bidder is expected to examine all instructions, forms, terms and specifications in the Tender Specifications including clarifications/corrigendum/amendments for completeness and obtain clarifications, if any, from Purchaser/Consultant.

### **3.8 Bid Submission and Opening:**

Refer Section-1 , Schedule of Tender

#### **3.8.1 Cost of tender document:**

The payment towards cost of tender document is to be remitted in favour of CLUVPL by NEFT/RTGS or e-payment to CLUVPL's bank account as per following details.

Name of Beneficiary	Coal Lignite Urja Vikas Private Limited.
CLUVPL's Account No.	00000039899678393
Branch	Museum Road, Block -2, Neyveli -607801 (IFSC Code No. SBIN0000958)
Beneficiary Bank,	State Bank of India
IFSC Code	SBIN0000958
Swift Code for online transfer	SBININBB457

Cost of tender document will be deemed to have been submitted by the bidder if and only if the same is received (credited) in the above bank account within the stipulated time. Cash payments will not be accepted. Cost of tender document is non-refundable.

### 3.8.2 Registration:

The process involves Bidder registration with portal <https://procure.nlcindia.in>. Only after successful registration, the Bidder(s) can submit his/their bids electronically. Bidders are required to make their own arrangement for bidding from a computer connected with Internet. CLUVPL shall not be responsible for making such arrangements.

Interested bidders are required to pay the Cost of tender document and register in the URL and click on "New Bidder" and fill up the registration form with their details like Bidders address, user ID and Password, Cost of tender document details etc., and attach a scanned copy of details with UTR No., Remitted Bank, Amount, Date etc., and submit. Kindly note that Bidder name will be captured from Digital Signing Certificate (DSC). Bidders are advised to keep note of the same. It may be noted that no separate user id and password will be provided by CLUVPL. Acceptance or Rejection of Registration request for the Tender will be intimated by a separate e-mail message.

After the Cost of tender document payment and successful registration, the bidder can login with their user ID, password & DSC and participate in the e-Tender.

3.8.3 All Bids, including all attachments/enclosures shall be prepared in the English language only, by typing or printing and shall be submitted in three parts. The bidder shall submit the offer for full scope of work indicated in the Tender Specification.

(1) (a) Part-I & Part-II in online and

(b) The bidder shall also furnish (i) Bid security declaration (ii) Power of Attorney / Authorisation with the seal of the company in favour of the person signing the Bid (iii) Deed of Joint Undertaking as applicable , (iv) Integrity Pact & (v) Duly filled up Checklist as in Specimen Format in physical form in a separate sealed cover.

Physical cover shall be super scribed as under:

Name of the Bidder :

Tender No : \_\_\_\_\_ Part No : \_\_\_\_\_

Last date & time of receiving Bids :

Bid opening date and time (Part-I) :

Bid for : Setting up of 40MW (AC) Ground Mounted Grid Connected Solar PV Power Project for SECL at Bishrampur & Bhatgaon in Surajpur District, Chhattisgarh State under EPC mode and 10 years O & M.

Submitted to :

**Office of the Chief Executive Officer  
CLUVPL  
Projects & Business Development  
NLC India Limited, Corporate Office, Block – 1,  
Neyveli – 607 801, Cuddalore (Dt), Tamil Nadu  
Phone No: 04142- 212379 Fax- 04142-252645**

(2) Bid submitted in any other office of CLUVPL/SECL/CIL/NLCIL will be liable for rejection.

(3) The Bidder's Bid and the documents attached thereto shall be considered as forming part of the Contract documents.

(4) Bids submitted by Tele fax, E-mail etc. will not be accepted.

(5) For submission for bid documents, refer Sec.1 of this volume

(6) CLUVPL will receive Bids in respect of all the equipment/systems to be supplied and erected for the above power plant as set forth in the accompanying specifications. All bids shall be prepared and submitted in accordance with the Tender Specification.

(7) Failure to furnish all information required in the Tender Specifications or submission of a Bid not substantially responsive to the Tender Specifications in every respect



or bids received in incomplete shape shall be liable for rejection. A bid shall be determined as substantially responsive in every respect, if it conforms to all the terms, conditions and specifications of the Tender Specifications without material deviations, objections, conditionality or reservations.

(8) A material deviation, objection, conditionality or reservation is one:

(a) That affects in any substantial way the scope, quality or performance of the contract;

(b) That limits in any substantial way, inconsistent with the Tender Specifications, the CLUVPL's rights or the successful Bidder's obligations under the contract.

(9) Deviation(s) to vital clauses listed under the Tender Specifications shall be considered to be material deviation(s).

3.8.4 All bids shall be prepared and submitted in accordance with the Tender Specification.

### **3.9 Part-I Pre Qualifying Requirements, Technical & Commercial Aspects (without prices)**

3.9.1 Bid security declaration as per annexure-A.

3.9.2 Qualifying Requirements (QR) of the Bidders (Technical & Financial criteria): Bidder to refer Clause: 2.0 of Section 1 of this Volume IA.

3.9.3 Make in India and other Govt. policies/ guidelines: Refer 4.0 Public Procurement Policy (Preference to Make in India)

3.9.4 Integrity Pact Programme

a) SECL is committed to have most ethical business dealing with the vendors, Bidders and Contractors of goods and services and deal with them in a transparent manner with Equity and Fairness.

b) SECL being a signatory in implementing the Integrity Pact Programme with Transparency International India, all the bidders / contractors required to sign the 'Integrity Pact' during the submission of the Techno- Commercial bids / offers (as per Annexure -D of this Volume)

### **3.9.5 Technical & Commercial Bid (Part-I)**

This part shall, inter-alia, include the following shall be submitted online (Scan copy):

- i) Bid security declaration as per annexure-A
- ii) Duly filled in "Form of Bid" (As per Annexure-B of this Volume IA).
- iii) Power of Attorney/Authorization with the seal of the company in favour of the person signing the Bid.
- iv) Proof for remittance of Cost of Tender Document
- v) Minimum Local Content Certificates from the bidder & auditor, if applicable.
- vi) JOINT DEED OF UNDERTAKING (JDU) as per Annexure-G.
- vii) Copy of existing valid Collaboration Agreement as on the Original Scheduled date of Bid opening.
- viii) Point-wise confirmation of acceptance of points as per respective Clauses, Certification and undertaking in this regard.
- ix) Overall time schedule as per Schedule – F2
- x) Deviations to the Draft Contract, if any, as per Schedule – F3.
- xi) Deviations to Technical Specifications, if any, as per Schedule – F4.
- xii) Requirements of the Contractor at site, as per Schedule – F5.
- xiii) Resource deployment schedule as per Schedule – F6.
- xiv) Schedule of weights and dimensions as per Schedule – F7.
- xv) Checklist for Bid submission as per Schedule – F8.
- xvi) Details of Sub-Contractors/Sub-Suppliers/Sub-Vendors, if any.
- xvii) Quality Assurance Programme
- xviii) Technical Details to be furnished with the Bid as called for in the Technical Specification. Bidder shall furnish the above separately in the same order as in the relevant section of Technical Specification Volume(s).
- xix) Bar chart/PERT Network schedule to achieve the time schedule, as per clause 3.6 of this Volume-IA and details as called for in Section-4 of Volume-IB (Draft Contract).
- xx) All other details as called for in Schedule F1 to F7 to this Volume-IA and Annexure- I to XII of Volume-IB (Draft Contract).

- xxi) Integrity Pact Programme as per Annexure-D of this Volume IA.
- xxii) Contracts in hand / pending jobs and their status along with value.
- xxiii) Major Legal cases and their statutory liabilities.
- xxiv) Recent orders completed with value.
- xxv) Any other information the Bidder wishes to furnish.

### **3.10. Price Bid (Part-II)**

(1) The Bidders are requested to quote for EPC Price and 10 years O & M price (including all taxes and duties) only in the format as per Schedule F1 (Table 1) in online. Price given in Part-II should cover the entire scope of work as given in Part-I of the offer and should be as per Schedule of Price enclosed. The evaluation will be based on the total price quoted (including all taxes and duties) for EPC and 10 years O & M. The price for 10 years O & M (including taxes and duties) shall be minimum 10 % of the total price quoted by the bidder (including taxes and duties).

(2) The Price Bid shall contain the following:

- (a) Duly filled in Form of bid as per Annexure – C of Invitation for Bid (IFB).
- (b) Completely filled in Schedule of Prices (Schedule – F1, Table 1) of Volume – IA.

3.10.2 The Price Bid shall contain the following:

(1) The Bidder shall quote his price against each item of the schedules as indicated in the enclosed formats. The Bidder shall quote the prices only once after considering all the pros and cons, risks and contingencies. Rebate percentage etc., if any, should be spelt out by the Bidder in the first bid itself. Offers contained in supplemental / additional covers shall be summarily rejected.

(2) The Bid shall be made in Indian Rupees only and all payments for the entire scope will be made in Indian Rupees only.

### **3.11 General**

- i) Bidders shall submit bids as per clause “Bid submission and opening” detailed in Section-3, Cl. 3.8 of this Volume-IA. Unsolicited Bids shall not be taken into cognizance and CLUVPL shall not bear any responsibility or liability in this regard.
- ii) This is a two part tender. On the date and time of opening, Part– I will be opened in online and Physical cover will also be opened. Opening of the Part – II (Price bid) will be intimated separately to those Bidders whose Part-I Bid would be determined to be substantially responsive in all respects. Part– II (Price bid) of the bidders who are shortlisted will be opened in online after intimation to the shortlisted bidders.
- iii) If the Bidder desires to be present at the time of opening of Part-I of bids, they shall depute their representatives (not more than two persons) in time with due authorization for participating in the Bid opening.
- iv) Purchaser/CLUVPL takes no responsibility for delays, loss or non-receipt of Bid documents or any letters sent by post/courier either way and also reserve the right to reject any Bid in part or full without assigning any reasons thereof.
- v) Notwithstanding any information and data, which may be contained in these Tender Specifications, the Bidder has to make independent inquiries and generally obtain his own information on all matters that may in any way affect prices, risks and obligations of the bidder under the Contract.

### **3.12 Signature of Bids**

- i) The Bid must contain the name and place of business of the person or persons making the Bid and each page of the Bid must be signed and stamped by the Bidder with his usual signature. The names of all persons signing should also be typed or printed below the signature.
- ii) Bids by a Corporation / Company must be signed with the legal name of the Corporation / Company by the President, Managing Director or by the Secretary or such other person or persons authorized to Bid on behalf of such Corporation / Company in the matter with the official seal of the company.
- iii) Bid by a partnership must be furnished with full names of all partners be signed with the partnership name, followed by the signature(s) and designation(s) of the authorized partner(s) or other authorized representative(s).
- iv) Satisfactory evidences of authority of a person signing on behalf of the Bidder shall be furnished with the Bid.
- v) The Bidder’s name stated on the Bid shall be the exact legal name of the Bidder.

vi) Corrections in the Bid documents if any shall be countersigned by the person signing the Bid.

vii) Printed literature, if enclosed need not be signed.

viii) Bids not conforming to the above requirements are liable to be treated as non-responsive.

### **3.13 Clarifications/Corrigendum/ Amendment of Tender Specifications**

i) At any time prior to the deadline for submission of Bids, CLUVPL may, for any reason, whether at his own initiative or in response to clarification(s) requested by a prospective Bidder, modify the Tender Specifications by amendment.

ii) Clarifications/Corrigendum/Amendment shall be construed to be an integral part of the Tender Specifications, which will be notified online, in writing or by e-mail / fax to all the bidders who have received the tender specification. The bidders are required to acknowledge receipt of any such amendment to the Tender specification.

### **3.14 Modification of Bids**

Intentionally deleted.

### **3.15 Information to be furnished with the Bid**

i) The Bid (Part-I) must clearly indicate the name of the manufacturer, the type or model of each principal item of equipment proposed to be supplied and erected. The Bid should also contain drawings and descriptive materials indicating general dimensions, material from which the parts are manufactured, principles of operation and the extent of pre-assembly involved, major erection equipment required to be deployed, method of erection and the proposed erection Organisation structure.

ii) The above information shall be provided by the Bidder in the form of separate sheets, drawings, catalogues, etc.

iii) Any Bid not containing sufficient descriptive material to describe accurately the system / equipment proposed may be treated as incomplete and hence liable to be rejected. Such descriptive materials and drawings submitted by the Bidder will be retained by the Purchaser. Any major departure from these 'drawings and descriptive material submitted will not be permitted during the execution of the Contract' without specific written permission of the Purchaser.

iv) Oral statements made by the Bidder at any time regarding quality, quantity or arrangement of the equipment or any other matter will not be considered.

v) Standard catalogue pages and other documents of the Bidder may be used in the Bid to provide additional information and data as deemed necessary by the Bidder.

vi) The Bidder shall submit editable soft copy of pre bid queries in addition to the signed & scanned copies submitted mail/online. However, scanned copy submitted online alone will be considered.

### **3.16 Policy for Bids under Consideration**

Bids shall be deemed to be under consideration immediately after they are opened. While the Bids are under consideration, Bidder's and/or their representatives or other interested parties are advised to refrain from contacting by any means, CLUVPL and/or his employees/ representatives on matters related to the Bids under consideration. CLUVPL if necessary will obtain clarifications on the Bids by requesting for such information from any or all the Bidders, in writing as may be necessary.

### **3.17 Validity of Bid**

- i) The Bid shall be kept valid for acceptance for 240 days from the date of opening of the Bid.
- ii) The Bidder will not be permitted to change the substance of the Bid suo-moto, after Bid has been opened.
- iii) Unilateral revision or withdrawal of offer by the Bidder within the subsistence of the validity period of offer shall not be permitted. Violation of this condition shall result in rejection of the Bid without notice and the Bidder shall be banned either permanently or for a fixed period, at the discretion of Purchaser from participating in any of the Purchaser's tenders.
- iv) If the bidder is extending the validity of the bid based on the request from CLUVPL, he should correspondingly extend the validity of all the Bid documents submitted.

### **3.18 Understanding & Clarification on Documents & Specifications**

- i) The Bidder is required to carefully examine the specifications and documents and fully informs himself as to all the conditions and matters which may in any way affect the 'Works' or the cost thereof. Bidders are free to visit site if required by them. However, the Bidders' visit to site shall be at their cost and risk, without any liability on part of CLUVPL / SECL.
- ii) Bidders may seek clarifications to the prescribed clauses and / or different part of the Tender Specifications. Such a request for clarifications, if any, should reach CLUVPL at least three days before the date stipulated for pre-bid meeting. CLUVPL then will issue interpretations and clarifications as it may think fit in during the pre-bid meeting. After receipt of such clarifications, the Bidder may submit its Bid but within the time and date as specified in the Invitation for Bid or as amended by the Purchaser. All such clarifications and the relevant exchange of correspondence between the parties shall be construed to form part of the tender specifications.
- iii) Pre-Bid Conference will be organized through Video Conference (VC) and outcome of the pre-bid conference is binding on all the Bidders. Outcome of the Pre-Bid Conference will be intimated by the Purchaser to all the Bidders.

iv) A copy of such clarifications shall be uploaded with the Bid (Part-I). In case any queries remain un-replied, it shall be construed that in respect of those queries, the respective stipulations of the Tender Specifications shall continue to apply and/or no new stipulations are made with respect to those queries.

v) No extension of time for submission of Bid will be granted on account of Bidders' request for interpretation/clarifications.



### **3.19 Latest Hour for Receipt of Bids**

Bids must reach the designated Office not later than 14:30 Hrs, Indian Standard Time (IST) on the date fixed for receipt of the Bid as indicated in the Invitation for Bid. Bids delivered / received after the time and date fixed for the receipt of the bids shall be rejected.

### **3.20 Single Bidder Responsibility**

The scope of supply and services shall be under single Bidder responsibility.

### **3.21 No Claim for Compensation for Submission of Bid**

i) The submission of any Bid connected with these documents and specifications shall constitute an agreement that the Bidder shall have no cause of action or claim against the Purchaser for rejection of his Bid.

ii) Regardless of the conduct or outcome of the bidding process, Bidder shall not be entitled to claim any costs, charges and expenses incidental to or incurred by him through or in connection with his submission of Bid or its consideration by the Purchaser, even though the Purchaser may elect to modify/withdraw the Invitation for Bid or does not accept the Bid(s).

### **3.22 CLUVPL's Right to Accept Bid**

i) CLUVPL shall always be at liberty to reject or accept any bid or bids at his sole discretion and any such action will not be called into question and the Bidder shall have no claim in that regard against the Purchaser.

ii) The CLUVPL does not pledge himself to accept the lowest of Bid.

### **3.23 Deputation of Representatives for Discussion**

After opening of the Bid, if CLUVPL desires to have techno-commercial discussion on the Bid, the Bidder shall be in a position to depute his competent representatives of various disciplines at short notice with full authority for finalising technical parameters as well as Commercial Terms and Conditions of the Tender.

### **3.24 Price Basis**

Bidder to refer Section-3 (Contract Price) of Volume-IB (Draft Contract).

### 3.25 Evaluation of Bid

The Bids received will be evaluated by CLUVPL to ascertain the lowest evaluated substantially responsive Bid vis-à-vis the Tender Specifications. The Bidder has to satisfy himself that full information is furnished as required in the specifications. Lack of particulars or incomplete information furnished will run the risk of rejection of the Bid.

The following major procedures would be followed for evaluation of Bids.

- i) The eligible Bidders who qualify in PQR conditions alone shall be considered for further evaluation on Techno-commercial aspects.
- ii) All the Bidders would be brought on par with reference to technical specification, Draft Contract, Instructions to Bidders and subsequent techno-commercial discussions/clarifications.
- iii) The Bidders who qualify on techno-commercial aspects alone will be considered for price cover opening (Part-II).
- iv) For evaluation and comparison of price Bid, the total price per MW will be considered as furnished by the bidder in Table-1 as per Schedule F1.
- v) Arithmetical errors correction: Not Applicable.
- vi) All the Sl. Nos. and columns in the 'Schedules of Prices' shall be quoted. If no prices are envisaged for any of the entries, 'Numeric Zero (0)' shall be mentioned. In this context "Zero (0)" mentioned against any item shall construe that the Bidder shall not charge any amount separately for that item from SECL but cover it in the scope of work. If the Bidders have not quoted for Taxes & Duties, it is construed that the Taxes & Duties will be borne by the Bidder.
- vii) The Bidders will be ranked starting from the lowest total quoted price (R1) for the entire scope of the Contract and increasing in the ascending order (R1, R2, R3,....., H1).
- viii) From the ranking, the Highest Quoted Bidder (H1) shall be eliminated, subject to ensuring minimum four (4) bidders participation in the reverse auction i.e. H1 will be eliminated if 5 or more bidders participated. In case, participation is less than or equal to Four (4), all the bidders will be qualified and short listed for the reverse auction. In case more than one bidder turn out to be H1 bidders (with the same quoted price, all H1 bidders will be eliminated subject to ensuring 4 (four) bidders participation in the reverse auction. Due to such elimination of H1 bidders, if the available eligible bidders get reduced to less than four, all will be included for Reverse Auction without elimination.

ix) All the short listed bidders for Reverse Auction will be intimated about their eligibility for participation in Reverse Auction. Terms and conditions of Reverse Bidding / Auction shall be as detailed in Cl. 3.39 below.

x) The date and time of Reverse Bidding / Auction will be intimated. At the end of Reverse Auction, the price ranking status of bidders will be ranked as RL1, RL2, RL3..., starting from the lowest offered price in the ascending order. In case of non-participation of bidders in the RA/ no reduction of Price in the RA, then the quoted prices of all the bidders will be considered for ranking. RL1/R1 bidder will be considered for order placement.

xi) The successful bidder should submit break up of prices as per Schedule F1 Table-1 Price Schedule as per their schedule wise revised contract price matching the total price /MW quoted by them in the Reverse Auction following the ratio quoted in the original price bid.

### **3.26 Local Conditions**

i) The Bidder shall inspect the site and shall satisfy himself of the site conditions and shall apprise himself of the procedure for engagement of agencies/labor and shall collect any other information, which may be required before submitting the Bid.

ii) Wages not less than Minimum wages for Contract labor shall be paid as applicable in this region from time to time. Claims and objections due to ignorance of site conditions will not be considered after submission of Bid.

(a) The Bidder is required to carefully examine the Technical & General Specification, Terms and Conditions of Draft Contract, drawings and other details relating to work given in the Tender Specification and fully acquaint himself as to all conditions and matters which may in any way affect the work or the cost thereof. The Bidder shall be deemed to have on his own and independently obtained all necessary information for the purpose of preparing the Bid and his Bid as accepted shall be deemed to have taken into account all contingencies as may arise due to such information or lack of the same.

(b) The Bidder shall be deemed to have exhaustively examined the Tender Specifications including the Draft Contract, to have obtained all information and clarifications on all matters whatsoever that might affect the carrying out of the work and to have satisfied himself as to the adequacy of his Bid. He is deemed to have known the scope, nature and magnitude of the work and the requirements of materials and labor involved etc. and as to all work he has to complete in accordance with the Contract for the adequacy of his Bid. Whatever be the defects, omissions or errors that may be found in the tender/ Bid Documents after submission of Bid, it shall be to the account of the Bidder.

(c) The Bidder shall be deemed to have visited and carefully examined the site and surroundings, to have satisfied himself about the nature and details of all existing structures, if any, and also as to the nature and conditions of the railways, roads, bridges and culverts, means of transport and communications, whether by land, water or air and as

to possible interruptions thereto and the access to and from the site, to have made independent enquiries, examined and satisfied himself as to the sources for obtaining earth, gravel, sand, stones, bricks and all other construction materials, the site for disposal of surplus earth and debris, the available accommodation, underground existing services, sub-soil water conditions, storms, prevailing winds, climatic conditions and all other similar matters which may affect the work.

(d) The Bidder shall be deemed to have acquainted himself with the Indian Income tax Act, 1961, Indian Companies Act, 1956, Indian Customs Act, 1962, Indian Central Excise Act, Indian Electricity Act, Interstate Migrant Workmen Act 1979, Factories Act, GST act/rules, Pollution Control Regulations and other related Acts & Laws prevalent in the State of Chhattisgarh and in India and as amended from time to time. The Purchaser shall not entertain any request for clarifications from the Bidders regarding such local conditions.

(e) Any neglect or omission or failure on the part of the bidder in obtaining necessary and reliable information as stated above or on any other matter affecting the Bidder shall not relieve him from any risk or liabilities or the entire responsibility for completion of the work in accordance with the Tender Specifications.

### **3.27 Deviations**

i) Normally, deviations are not permitted in commercial terms & conditions and technical specification. Nevertheless, if the Bidder takes any deviation, it shall be clearly indicated in the deviation schedule (Schedule – F3 and Schedule- F4 with a soft copy. Deviation listed elsewhere in the Bid shall be summarily rejected and ignored. Separate printed standard terms and conditions of the Bidder shall not be taken into cognizance and shall be totally rejected.

ii) No alterations or disfigurement, other than filling in particulars wherever called for in the formats of the Tender Specifications shall be made in the Bid. Any changes/modifications made by the Bidder in Bid documents itself shall not be taken into consideration.

iii) If at any later date, it is found that documents, information, averments and data submitted by the bidder in the Bid, based on which the Bidder has been considered eligible or successful or has been awarded the Contract is incorrect or false to the extent that had the correct or true information been made available to CLUVPL at time of tender evaluation, the Bid would have been declared ineligible or unsuccessful, the Bidder shall be forthwith disqualified or, as the case may be, the Contract awarded based on such incorrect or false information shall be cancelled and the CPG /Back up Guarantee for compliance to JDU / any other Guarantees deposited shall be appropriated by the Purchaser towards Purchaser's cost, loss and damage to Purchaser.

### **3.28 Suspension/Banning**

The Bidder will be disqualified for this tender and also would be banned for (2) Two years for the following acts:-

- a) Formation of Cartel with other Contractors with a view to artificially hike the prices.
- b) Wilful suppression of facts or furnishing of wrong information or manipulated/forged documents or using other illegal/unfair means.
- c) If the bidder withdraws/ modifies/ impairs/ derogates his offer on his own after tenders are opened or fails to accept the LOA/fails to submit CPG.

Purchaser would also be at liberty to inform the matter to other PSUs of the Government of India / Statutory Bodies.

Any firm which is placed under Suspension/Banning by CLUVPL will not be allowed to participate in any tender issued on or after the date of suspension/banning order and also if that firm has already participated in any tender, which is under process their bid will not be considered for further processing.”

### **3.29 Signing of Contract**

- i) The enclosed Draft Contract of Volume-IB shall form the basis of the Contract to be entered into with the successful Bidder. The Bidder shall carefully go through the terms and conditions given in the draft contract and his offer (Bid) should be in line with the terms and conditions specified therein.
- ii) Contract will be signed and executed by and between the Purchaser and the successful Bidder, at the earliest but not later than fifteen (15) days from the Purchaser's Letter of Award, which shall be valid till completion of all the obligations on the part of the Contractor under this Contract. The successful bidder shall present himself for signing of the Contract with proper power of attorney and other requisite materials.

The Purchaser shall prepare two (2) originals of Contract as described for signing the Contract. One (1) original will be given to the Contractor for his record and other original will be retained by the Purchaser. Within one (1) month after signing the Contract, the Contractor shall make and submit 15 (fifteen) photo-copies of the Contract documents complete with all enclosures, neatly bound, to the Purchaser, along with a scanned copy in Pen drive of entire document free of charge.

### **3.30 Agency Commission**

No Agency commission shall be payable under the Contract.

### **3.31 Priority of Documents**

Subject to the conditions enumerated in the Draft Contract, the tender will be governed by “Technical Specification and Conditions of Contract” as detailed in the document. The Technical Conditions of Contract shall prevail over the other conditions elsewhere specified in the Tender Specification in case they differ from other conditions to the extent they differ from other conditions.

### **3.32 CONTRACT PERFORMANCE BANK GUARANTEE (CPG) & BACK UP GUARANTEE FOR COMPLIANCE TO JDU**

#### **3.32.1 CONTRACT PERFORMANCE BANK GUARANTEE (CPG) –**

i. The successful bidder to whom the work is awarded shall be required to furnish CPG as prescribed in Section-10 of Volume-IB ( Commercial draft contract) as follows in the form of on demand Bank guarantee for faithful performance of the Contract.

ii. CPG shall be 3% of the EPC contract price for supply and services towards faithful performance of contract. This BG shall be valid till expiry of 90 days beyond the date of completion of scope of EPC contract. In case of any extension of EPC contract period, the CPG shall be extended accordingly and SECL reserves right to encash the CPG in case of non-fulfilment of contractual obligations during the above period.

#### **3.32.2 Backup bank guarantee for Compliance to Joint Undertaking Deed (JDU)**

In case the successful bidder having qualified through Consortium route, in addition to the CPG furnished by the Contractor, a Back up bank guarantee for faithful performance/ Compliance to JDU shall be furnished by the executants of JDU other than the Contractor for a value equal to one percent (1%) of the value of EPC Contract price within 30 days from the date of Letter of Award as per format in Vol-IB.

### **3.33 Contract Quality Assurance**

i) The Bidder shall include in his Bid a detailed Quality Assurance Programme containing the overall quality, management and procedures which he proposes to follow in the performance of the ‘Works’ during various phases.

ii) After Letter of Award (LOA) the detailed Quality Assurance Programme to be followed for the execution of the ‘Contract’ will be mutually discussed and agreed to and such agreed Programme shall form a part of the ‘Contract’.

### **3.34 Codes & Standards**

Specifications give reference to Indian or Internationally accepted Standards. However, equipment or materials meeting other recognized National or International Standards, which ensure an equal or superior quality than Standards specified, will also be accepted. For details of codes and standards refer Technical specification.

### **3.34(A) Regarding ALMM**

The provisions as contained in the O.M. dated 10.03.2021 issued by MNRE on the subject “Approved Models and Manufacturers of Solar Photovoltaic Modules (requirement of compulsory registration) order, 2019- implementation-reg.” and its subsequent amendments and clarifications, shall be applicable for this tender. The cells and modules used in the project under this tender shall be sourced only from the models and manufacturers included in the list-I (Solar PV modules) of ALMM order, annexure-I of the O.M issued by MNRE on 10th March, 2021 which will be updated by MNRE from time to time. The modules to be procured for this project, shall be from the list-I of the ALMM order applicable on the date of invoicing of such modules. Bidders shall also provide a disclosure regarding that they are aware of binding provisions of the ALMM order and the list(s) there under, while quoting for the tender.

### **3.35 Drawing List**

Successful bidder on issue of Letter of Award (LOA) shall submit the list of engineering drawings to be submitted by him for the complete package to the Purchaser/ Consultant for review, approval and information clearly indicating date of submission within the time schedule furnished in the Bar Chart/PERT Network indicated in Section-4 of Volume-IB. On receipt of list of drawings, Purchaser/Consultant shall review and finalize the drawing list for easy monitoring of status of the drawings.

### **3.36 Standardisation & Variety Reduction**

i) With a view to standardize maintenance procedures, reduce spares inventory and achieve interchangeability, the Purchaser/Consultant desires to have, as far as practicable, dimensionally and otherwise identical components and parts of equipment which are common within the package.

ii) This will apply to items like Solar PV modules, SMBs, Power Conditioning Units, Switchgears, relays, protection and metering panels, SCADA panels, controls and instrumentation panels etc. In respect of bought out items, the Contractor shall therefore arrange to Standardize and offer specifically identified Manufacturer’s equipment in consultation, at the appropriate time with the CLUVPL.

iii) It shall be responsibility of the Bidder to interact with the CLUVPL well in advance and in any case ahead of supply schedule so as to obtain whatever details of specifications / parameters of components, as are necessary in this regard. The successful bidder shall not be entitled to any increase in the Contract Price or to any extension of time, on account of this clause, nor shall the warranty period / conditions be altered as a result. No request for extension of time or increase in price on this account shall be entertained by the Purchaser.

### **3.37 Vital Clauses**

The following clauses in the “Instructions to Bidders” and “Draft Contract” are vital. While submitting the duly filled up, signed & stamped “Deviation Schedule to Draft Contract (Except Section-8)” under Schedule-F3, Bidder is advised not to take deviations to these clauses. If deviations are taken from the stipulations of these clauses, such Bids would be liable for rejection:

- i) Scope of Work
- ii) Time Schedule
- iii) Price Basis
- iv) Contract Performance Guarantee (CPG)
- v) JOINT DEED OF UNDERTAKING (JDU)
- vi) Backup Contract Performance Guarantee for compliance to JDU
- vii) Warranty
- viii) (a) Price Reduction (b) Compensation for shortfall in net energy export
- ix) Force Majeure
- x) Arbitration
- xi) Taxes & Duties
- xii) Bid security declaration
- xiii) Patents, Indemnity
- xiv) Validity of Bids
- xv) Governing Laws
- xvi) Termination

### **3.38 Pre-Bid meeting:**

Pre-bid meeting will be held on the date and time indicated in the Tender Documents through video conference. The points for discussion / clarification shall be furnished at least five days in advance of Scheduled Date of Pre-bid meeting, both in hard and editable soft copy (like word document) to the CEO/CLUVPL, Corporate Office, NLC India Limited, Neyveli- 607 801 and also to the following E-mail ID: cluvpl@nlcindia.in

### **3.39 TERMS AND CONDITIONS OF REVERSE AUCTION.**



1. Schedule for Reverse Bidding: After Price e-Bids are opened online, e-Reverse Auction will be conducted on the same day and time of start of Reverse Auction will be intimated to all the eligible bidders. Scheduled duration of Reverse Auction shall be normally 2 (Two) hours. All electronic bids submitted during the e-reverse auction process shall be legally binding on the bidder.
2. Auction extension time: If a valid bid is placed within Ten (10) minutes of End Time of the Reverse auction (RA), then RA duration shall get automatically extended for another Ten (10) minutes from the existing end time. It may be noted that the auto-extension will take place only if a valid bid comes in those last Ten (10) minutes. If a bid does not get accepted as the lowest bid, the auto-extension will not take place even if that bid might have come in the last Ten (10) minutes. The above process will continue till no bid is received in last Ten (10) minutes which shall mark the completion of Reverse Auction. However, bidders are advised not to wait till the last moment to enter their bid to avoid complications related to internet connectivity, their network problems, system crash down, power failure etc.
3. Procedure of Reverse Auctioning:

Reverse Auction will be conducted based on Lowest bid price per MW emerged as per Clause 3.25 of Section - 3 of this Volume (Invitation for Bid).

The 'Opening Price' i.e. Start Price for RA (Reverse Auction) shall be the lowest quoted bid price per MW (R1 price).

Bid Decrement shall be Rs.50,000/- and its multiples.

"RL1" Bid is the last offered rate i.e. further no bidder responds within the time limit.

After completion of the online Reverse Auction, the Closing Price per MW (i.e. RL1 price) shall be available for further processing.

After reverse auction, the price break up for all components shall be arrived at the same ratio as quoted in their initial price bid such that the total price shall be equal to the lowest quoted Bid Price per MW during reverse auction multiplied by 40.

4. CLUVPL shall conduct the Online Reverse Auction and the terms and conditions shall be as below:

i) Once CLUVPL decides to conduct reverse auction for a tender, an e-mail containing the terms and conditions, date and time of reverse auction (RA), the start price and the decrement amount will be sent to all the eligible bidders to their Email ID registered in the site (<https://procure.nlcindia.in>). The same will also be available in the home page of web site after logging in under Reverse auction menu. It shall be the sole responsibility of the bidders to view such emails and participate in the Reverse Auction. CLUVPL shall not be responsible for any failure on the part of the bidders to notice the emails.

ii) In case of any change in the bidders Email ID, it is the responsibility of the bidder to update his Email ID then and there (available under "Update Profile" menu using secure login). CLUVPL does not hold any responsibility for the lapses on the bidder's side in this regard.

- iii) The bidders are also requested to login to <https://procure.nlcindia.in> regularly and view the details of Reverse Auction (RA).
- iv) Bidders are advised to exercise caution in quoting their bids in e-reverse auction to avoid any mistake. Bids once submitted can't be recalled.
- v) The duration indicated in the auction screen, will be the minimum duration for the Reverse Auction process.
- vi) If a bid is received in the last 10 minutes of closing of the auction, the auction gets extended automatically for 10 minutes (rounding off to the nearest minute) from the time of last bid. If no bid is received in the last 10 minutes the auction will get closed. However, bidders are advised not to wait till the last minute or last few seconds to enter their bid to avoid complications related with internet connectivity, network problems, system crash down, power failure, etc.
- vii) During the course of Reverse Auction if any problem arises in Server that interrupts the participation of the bidder in RA and resulting in closure of RA, CLUVPL reserves the right to re-conduct RA with the last bid price offered in the RA. The rescheduled date and time of RA will be intimated to the qualified bidders by e-mail / SMS.
- viii) RA screens are activated 10 minutes before the start of the auction.
- ix) In all cases, bidder should use their own ID and Password along with Digital Signature at the time of submission of their bid.
- x) During the entire e-reverse auction process, the bidders will remain completely anonymous to one another and also to everybody else.
- xi) The e-reverse auction floor shall remain open from the pre-announced date & time and for as much duration as mentioned above.
- xii) All electronic bids submitted during the e-reverse auction process shall be legally binding on the bidder. Any bid will be considered as the valid bid offered by that bidder and acceptance of the same by the CLUVPL will form a binding contract between CLUVPL and the Bidder for execution of work.
- xiii) It is mandatory that all the bids are submitted with digital signature certificate otherwise the same will not be accepted by the system.
- xiv) The Start Price and the minimum Bid decrement value shall be displayed to the Bidders at the start of the Reverse Auction. The bidder can bid lower than the current bid amount however such bid should be single or multiple of decrement value.
- xv) Bidders shall be required to start bidding from this Start price, reducing their price by minimum one decrement value or multiple of decrement value by clicking the calculator button under the column 'Action'.

- xvi) A single Bid cannot have more than 5 times the decrement value from the current lowest bid. In case the bidder wants to give more than 5 times the decrement value, he can give multiple bids.
- xvii) Bids once opened cannot be revoked / withdrawn by the bidder and the bidder shall be bound to accept the price indicated in the auction as per their final bid price. Should the bidder fail to accept the prices quoted and in conformity with the terms and conditions of enquiry, their offer will be rejected without any notice besides banning/suspension of the firm for a fixed period from participating in any of the SECL/CLUVPL/NLCIL/CIL and its subsidiaries tenders.
- xviii) CLUVPL reserves the right to reschedule or cancel the Reverse auction Process / Tender at any time without any notice or assigning any reason thereof.
- xix) The time of Server, hosting the reverse auction will be the basis for all time related activities i.e., start of auction, closing of auction, acceptance of bid, etc. The server time shall be treated as final and binding. Bids recorded in the server before the bid closing time will only be treated as valid bid. Bidders are, therefore, advised to submit their bids well before the closing time of e-reverse auction. If any bid reaches the server after the bid closing time as per server time, the same will not be recorded and no complaint in this regard shall be entertained.
- xx) CLUVPL is not liable for any interruption or delay in accessing website irrespective of the cause and for any system problems or inability to use the system by the Bidders. Bidders are requested to make all the necessary arrangements / alternatives whatever required so that they are able to circumvent such situation and be able to participate in the reverse auction successfully.
- xxi) The Bidder shall not involve himself or any of his representatives in Price manipulation of any kind directly or indirectly by communicating with other suppliers / bidders.
- xxii) The Bidder shall not divulge either his Bids or any other exclusive details of CLUVPL to any other party.
- xxiii) The prevailing / current lowest bid will be displayed on the bidding screen during the course of e-reverse auction and all subsequent bids shall have to be quoted lower than the prevailing / current lowest bid.
- xxiv) At the end of Reverse Auction, the lowest closing bid will be considered for further processing.
- xxv) The lowest bidder's price shall be final.
- xxvi) Any order resulting from this bidding process shall be governed by the terms and conditions mentioned in the NIB.
- xxvii) CLUVPL's decision on award of the order shall be final and binding on all the bidders.

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**VOLUME – I A**  
**INVITATION FOR BID**  
**ANNEXURES**

**ANNEXURE - A**

**BID SECURITY DECLARATION**

(On Letter Head of Bidder)

I / We,....., Proprietor/Partner/Legal Attorney/Director/Accredited Representative of M/S. ....and submitting Bid for the work.....  
.....against NIT

No.....Dated.....solemnly declares that:

i) If, I/We withdraw or modify my/our Bids during the period of validity,

OR

ii) If, I/We am/are awarded the contract and fail to sign the contract within the stipulated time as per bid document,

OR

iii) If, I/We, fail to submit Performance Security before deadline,

OR

iv) Any other default as defined in the Tender documents

Then, I/We will be banned for 02 (two) years from being eligible to submit Bids in SECL/NLCIL/CLUVPL/CIL and its subsidiaries.

Signature of the Bidder

or

his Authorized representative

(In case of Consortium/Collaboration / JV, signature of all partners of Consortium/Collaboration / JV)

Date.....

\*\*\*\*\*

**ANNEXURE –B**  
**FORM OF BID**

( Techno commercial Bid)

To be submitted by the Bidder in Part-I

Tender No:.....

Dated.....

Bid No.:.....

From:

To:

The Chief Executive Officer

CLUVPL

Projects & Business Development

NLC India Limited, Corporate Office, Block – 1,

Neyveli – 607 801, Cuddalore (Dt), Tamil Nadu

Phone No: 04142- 212379 Fax- 04142-252645

Sub : \_\_\_\_\_ (Name of Package) for 40 MW SPV Project, Bishrampur & Bhatgaon, Surajpur dist, Chhattisgarh of M/s SECL at Bilaspur, Chhattisgarh, India.

Tender No.: \_\_\_\_\_

Dear Sirs,

1. Having carefully examined the Tender Documents attached to your Invitation to Bid No \_\_\_\_\_ dated \_\_\_\_\_, and its Amendments / Errata / Corrigendum / clarifications issued till the date of tender opening, We agree to complete the ‘works’ in conformity with all the terms and conditions stated in Tender Documents and its Amendments / Errata / Corrigendum / Clarifications issued till the date of tender opening and as per time schedule given in Tender Documents. The plant, equipment and systems offered are of the best and latest technology and of international standards.

2. I/We declare and certify that I/We fully satisfy the Qualifying Requirements and the documentary proof as called for, have been annexed.

3. We undertake, in case our Bid is accepted, to commence the work from the date of Letter of Award and to complete and deliver the whole of the work and responsibilities comprised in the Contract as per Time Schedule given in Tender Documents.

4. We are submitting the Bid Security Declaration as per the format as instructed by you. This Bid Security Declaration shall be governed as per the stipulations provided in the "Instructions to Bidders".
5. We agree to abide by and keep our Bid valid initially for a period of 240 (Two Hundred Forty) days from the date of opening of bid (Part-I) by CLUVPL and it shall remain binding on us and may be accepted at any time before the expiry of that period.
6. Should our Bid be accepted, we hereby agree to abide by and fulfill all terms and conditions of Tender Documents as accepted by us and in default thereof, to forfeit and pay to SECL or SECL's successors, assignees or authorized nominees such sums of money as are stipulated in conditions contained in Tender Documents and agree to furnish Bank Guarantee for Contract Performance as per the proforma prescribed for the sum equal to 3% of the "EPC Contract Price", for the entire scope of work within 21 days from the date of Letter of Award. We also agree to furnish Backup BG from Consortium member for a sum equal to 1% of the EPC Contract Price for the Consortium member (s) within 21 days from the date of Letter of Award.
7. We understand that CLUVPL is not bound to accept the lowest or any Bids received and SECL has the right to reject any Bid, without assigning any reason whatsoever.
8. This Bid together with written acceptance thereof, shall constitute a binding Contract between SECL and ourselves till a formal Contract is executed.
9. We have noted the contents of clause 4.7 of Section-3 of Volume-IA in line with DIPP order and its subsequent Amendments and confirm compliance to the requirements.

Signed this \_\_\_\_\_ day of \_\_\_\_\_

Signature:

Name :

Designation :

Company:

Company Seal:

Date :

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**ANNEXURE - C**

**FORM OF BID**

To be submitted by the Bidder in

Part-II – [Price Bid]

Tender No. :

Bid No :

From:

dated:

To

:

The Chief Executive Officer

CLUVPL

Projects & Business Development

NLC India Limited, Corporate Office, Block – 1,

Neyveli – 607 801, Cuddalore (Dt), Tamil Nadu

Phone No: 04142- 212379 Fax- 04142-252645

Dear Sirs,

1. I/We, the undersigned have carefully examined and understood the Tender Documents including the Amendments/Errata/Corrigendum/Clarifications issued till the date of Tender Opening. I/We hereby agree to carry out the entire works as described in the specifications in conformity with the specifications and Tender Documents, as per prices quoted by us in the Schedule of Prices (Schedule F1 – Tables 1) enclosed herewith.

2. In the event of our offer being accepted, we agree to furnish a Bank Guarantee for Contract Performance as per the Contract Performance Guarantee (CPG) in the form of an on-demand Bank Guarantee for the faithful performance of the contract for a value of 3% of the total EPC contract price within 21 days from the date of LOA . On completion of EPC contract, 90% of the CPG will be returned to the contractor and the balance 10% will be retained throughout the O & M contract period for a period of 10 years.Further the bidder shall submit a bank guarantee for an amount equal to 10% of contract price of Operation and Maintenance portion of the entire system, before the completion of EPC contract.

3. Signed this \_\_\_\_\_ day of \_\_\_\_\_ 202\_\_\_\_\_

Signature :



Name :

Designation :

Company :

Company Seal

Date :

\*\*\*\*\*

## ANNEXURE – D

### INTEGRITY PACT PROGRAMME

1. SECL is committed to have most ethical business dealing with the Vendors, Bidders and Contractors of goods and services and deal with them in a transparent manner with equity and fairness.
2. In order to achieve these goals, SECL is implementing the Integrity Pact Programme in co-operation with Central Vigilance Commission (CVC) and renowned International Non-Governmental Organization, Transparency International India (TII).
3. The Integrity Pact Programme will cover Tenders / Contracts valued at Rs. 1 (one) Crore or above.
4. The Integrity Pact Programme covers the following aspects.
  - i). Commitments and Obligations of SECL (Principal).
  - ii). Commitments and Obligations of Vendors / Bidders / Contractors (Counterparties).
  - iii). Violations and Consequences.
  - iv). Independent External Monitors.
5. As per the Integrity Pact Programme, an “Integrity Pact”, which envisages an agreement between the prospective Vendors, Bidders & Contractors and SECL, committing the persons / officials of both parties, not to exercise any influence on any aspect of the contract. Only those Vendors / Bidders / Contractors, who have entered into such an “Integrity Pact” with SECL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.
6. Hence the bidder shall submit the Integrity Pact agreement duly filled and signed in his offer enclosed in Part-I cover.
7. The format of “Integrity Pact”, which should form a part of the tender of value more than Rs. 1 Crore is enclosed as Appendix – I.
8. The details of the Independent External Monitors of SECL are given below:

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**APPENDIX - I**  
**INTEGRITY PACT**

**General**

This pre-bid pre-contract Agreement (hereinafter called the Integrity Pact) is made on.....day of the month of .....20..., between, on one hand, **South Eastern Coalfields Limited**, acting through Shri ....., Designation of the officer, (hereinafter called the “BUYER / Principal”, which expression shall mean and include, unless the context otherwise requires, his successors in office and assigns) of the First Part and M/s. ....represented by Shri....., Chief Executive Officer (hereinafter called the “BIDDER/Seller/Contractor” which expression shall mean and include, unless the context otherwise requires, his successors and permitted assigns) of the Second Part.

WHEREAS the BUYER proposes to procure, contract .....(Name of the Stores/Equipment/Item) and the BIDDER/Seller is willing to offer/has offered the stores and

WHEREAS the BIDDER is a private company/public company/Government undertaking/partnership/registered export agency, constituted in accordance with the relevant law in the matter and the BUYER is a Central Public Sector Unit.

NOW, THEREFORE,

To avoid all forms of corruption by following a system that is fair, transparent and free from any influence/prejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to :-

Enabling the BUYER to obtain the desired said stores/equipment at a competitive price in conformity with the defined specifications by avoiding the high cost and the distortionary impact of corruption on public procurement, and

Enabling BIDDERS to abstain from bribing or indulging in any corrupt practice in order to secure the contract by providing assurance to them that their competitors will also abstain from bribing and other corrupt practices and the BUYER will commit to prevent corruption, in any form, by its officials by following transparent procedures.

The parties hereto hereby agree to enter into this Integrity Pact and agree as follows:

**Section 1 – Commitments of the Principal**

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

- a. No employee of the Principal, personally or through family members, will in connection with the tender for , or the execution of a contract, demand ; take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
- b. The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.
- c. Principal will exclude from the process all known prejudiced persons.

(2) If the Principal obtains information on the conduct of any of its employees which is a criminal offence under the IPC/ PC Act, or if there be a substantive suspicion in this regard, the Principal will inform the Chief Vigilance Officer and in addition can initiate disciplinary actions.

## Section 2 - Commitments of the Bidder(s)/ Contractor(s)

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

a. The Bidder(s) / Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material or other benefit which he/ she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

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

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

d. The Bidder(s) / Contractor(s) of foreign origin shall disclose the name and address of the Agents/ representatives in India , if any, Similarly the Bidder(s) /Contractor(s) of Indian Nationality shall furnish the name and address of the foreign principals, if any. Further details as mentioned in the "Guidelines on Indian Agents of Foreign Suppliers" shall be disclosed by the Bidder(s) / Contractor(s).Further, as mentioned in the Guidelines all the payments made to the Indian agent/ representative have to be in Indian Rupees only. *The guidelines and terms and conditions for Indian agents of Foreign supplier shall be as per the provisions of this document.*

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

f. Bidder(s) / Contractor(s) who have signed the Integrity Pact shall not approach the Courts while representing the matter to IEMs and shall wait for their decision in the matter.

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

## Section 3 - Disqualification from tender process and exclusion from future contracts

If the Bidder, before contract award, has committed a transgression through a violation of Section 2 or in any other form such as to put his reliability or credibility as Bidder into question, the Principal is entitled to disqualify the Bidder from the tender process or to terminate the contract, if already signed, for such reason.

(1) If the Bidder / Contractor / Supplier has committed a transgression through a violation of Section 2

such as to put his reliability or credibility into question, the Principal is also entitled to exclude the Bidder / Contractor / Supplier from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of the transgression. The severity will be determined by the circumstances of the case. In particular the number of transgressions, the position of the transgressors within the company hierarchy of the Bidder and the amount of the damage. The exclusion will be imposed for a minimum of 6 months and maximum of 3 years.

(2) A transgression is considered to have occurred if the Principal, after due consideration of available facts and evidences within his / her knowledge concludes that there is a reasonable ground to suspect violation of any commitment listed under Section 2 i.e “ Commitments of Bidder(s) / Contractor(s).

(3) The Bidder accepts and undertakes to respect and uphold the Principal’s absolute right to resort to and impose such exclusion and further accepts and undertakes not to challenge or question such exclusion on any ground, including the lack of any hearing before the decision to resort to such exclusion is taken. This undertaking is given freely and after obtaining independent legal advice.

(4) If the Bidder / Contractor / Supplier can prove that he has restored / recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal may revoke the exclusion prematurely.”

#### Section 4 - Compensation for Damages

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

(2) If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to Section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages of the Contract value or the amount equivalent to Performance Bank Guarantee.

#### Section 5 - Previous transgression

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

(2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or action can be taken as per the procedure mentioned in "Guidelines on Banning of business dealings".

#### Section 6 - Equal treatment of all Bidders / Contractors / Subcontractors

(1) In case of Sub-contracting, the Principal Contractor shall take the responsibility of the adoption of Integrity Pact by the Sub-contractor.

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

(3) The Principal will disqualify from the tender process all bidders who do not sign this Pact or violate its provisions.

#### Section 7 - Criminal charges against violating Bidder(s) / Contractor(s) / Subcontractor(s)

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

#### Section 8 - Independent External Monitor

(1) The Principal appoints competent and credible Independent External Monitor for this Pact after approval by Central Vigilance Commission. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

(2) The Monitor is not subject to instructions by the representatives of the parties and performs his/ her functions neutrally and independently. The Monitor would have access to all Contract documents, whenever required. It will be obligatory for him / her to treat the information and documents of the Bidders/Contractors as confidential.

He/ she reports to the Chairman, Coal India Limited / CMD, Subsidiary Companies

(3) The Bidder(s) / Contractor(s) accepts that the Monitor has the right to access without restriction to all Project documentation of the Principal including that provided by the Contractor. The Contractor will also grant the Monitor, upon his/ her request and demonstration of a valid interest, unrestricted and unconditional access to their project documentation. The same is applicable to Sub-contractors.

(4) The Monitor is under contractual obligation to treat the information and documents of the Bidder(s) / Contractor(s) / Sub-contractor(s) with confidentiality. The Monitor has also signed declarations on 'Non-Disclosure of Confidential Information ' and of 'Absence of Conflict of Interest'. In case of any conflict of interest arising at a later date, the IEM shall inform Chairman, Coal India Limited / CMD, Subsidiary Companies and recuse himself / herself from that case.

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

(6) As soon as the Monitor notices, or believes to notice, a violation of this agreement, he/ she will so inform the Management of the Principal and request the Management to discontinue or take corrective action, or to take other relevant action. The monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.

(7) The Monitor will submit a written report to the Chairman, Coal India Limited / CMD, Subsidiary Companies within 8 to 10 weeks from the date of reference or intimation to him by the Principal and, should the occasion arise, submit proposals for correcting problematic situations.

(8) If the Monitor has reported to the Chairman, Coal India Limited / CMD, Subsidiary Companies, a substantiated suspicion of an offence under relevant IPC/ PC Act, and the Chairman, Coal India Limited / CMD, Subsidiary Companies has not, within the reasonable time taken visible action to proceed against such offence or reported it to the Chief Vigilance Officer, the Monitor may also transmit this information directly to the Central Vigilance Commissioner.

(9) The word 'Monitor' would include both singular and plural.

#### Section 9 - Pact Duration

This Pact begins when both parties have legally signed it. It expires for the Contractor 12 months after

the last payment under the contract, and for all other Bidders 6 months after the contract has been awarded. Any violation of the same would entail disqualification of the bidders and exclusion from future business dealings.

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

#### Section 10 - Other provisions

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

(2) If the Contractor is a partnership or a Joint Venture/consortium, collaboration this agreement must be signed by all partners or JV/consortium members.

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

(4) Issues like Warranty / Guarantee etc. shall be outside the purview of IEMs.

(5) In the event of any contradiction between the Integrity Pact and its Annexure, the Clause in the Integrity Pact will prevail.

#### Section 11- Facilitation of Investigation

In case of any allegation of violation of any provisions of this Pact or payment of commission, the BUYER or its agencies shall be entitled to examine all the documents including the Books of Accounts of the BIDDER and the BIDDER shall provide necessary information and documents in English and shall extend all possible help for the purpose of such examination.

#### Section 12- Law and Place of Jurisdiction

This Pact is subject to Indian Law. The place of performance and jurisdiction is the seat of the BUYER.

#### Section 13 - Other Legal Actions.

The actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the extant law in force relating to any civil or criminal proceedings.

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

(Office Seal)

(Office Seal)

Place -----

Date -----

Witness 1:

(Name & Address)

Witness 2:

(Name & Address)

## **Guidelines for Indian Agents for Foreign supplier with regard to Integrity Pact**

1. Authorized Indian Agent of a foreign manufacturer or indigenous manufacturer is also eligible to quote on behalf of its principal against the tender, in case manufacturer as a matter of corporate policy does not quote directly. However, in such case, authorized Indian Agent shall have to upload scanned copy of tender specific Manufacturer's Authorization signed and stamped by the manufacturer to quote against the CIL Tender, indicating the Tender Reference No. and date along with the offer. The authorized Indian Agent is to upload scanned copies of details in respect of its organization along with the copies of document like certificate of incorporation/ registration, etc. along with the offer. The firm (Indian Agent) should be in existence for 3 years on the date of tender opening, irrespective of date of appointment as Indian Agent.

In case an Indian Agent is participating in a tender on behalf of one manufacturer, it is not allowed to participate / quote on behalf of another manufacturer in this tender or in a parallel tender for the same item. Further, in a tender, either manufacturer can quote or its authorised Indian Agent can quote but both are not allowed to participate / quote in the same tender. Also one manufacturer can authorize only one agent to quote in the same tender. All the bids, not quoted as per the above guidelines, will be rejected.

2. The Foreign manufacturer must indicate the name & address of its agent in India. It should also indicate the commission payable to them and the specific services rendered by them. The Indian Agency commission will be payable only on FOB prices of goods and it should be quoted as a percentage of the FOB price. In case, the foreign manufacturer does not have any Indian Agent, it should be clearly mentioned in the bid. In terms of Integrity Pact, the bidder has also to disclose all payments to agents, brokers or any other intermediaries. The amount of agency commission payable to Indian Agent should not exceed 5% or what is specified in agency agreement, whichever is lower.
3. In addition to above A certificate that no commission is payable by the principal supplier to any agent, broker or any other intermediary against this contract other than percentage as indicated in BOQ (not exceeding 5% of FOB ) of FOB value of the contract to Indian Agent. This certificate forms a part of letter of credit.
4. The payment of Indian Agency Commission, if any, involved, may be considered in case of necessity, subject to compliance of the Government of India guidelines issued from time to time. The name of the Indian Agent with their full address and the quantum of Agency-commission, if any, payable shall have to be mentioned in the offer by the foreign manufacturer.

The following documents shall be submitted by the bidder in case of contract with foreign principals involving Indian Agents:

- i. Foreign principal's pro-forma invoice or any other authentic document indicating the commission payable to the Indian Agent, nature of after sales service to be rendered by the Indian Agent and the precise relationship between the Principal and their mutual interest.
- ii. Copy of the agency agreement if any with the foreign principal stating the precise relationship between them and their mutual interest in the business.

However, if all the details given in para – (i) are complied with, the requirement of submission of document mentioned at Para – (ii) may be waived.

Agency commission, if any, shall be paid in equivalent Indian Rupees

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**ANNEXURE – G**

**(JOINT DEED OF UNDERTAKING)**

FORMAT OF JOINT DEED OF UNDERTAKING (JDU) / JOINT DEED OF UNDERTAKING (JDU) TO BE SUBMITTED BY THE COLLABORATOR/ CONSORTIUM PARTNER /JV PARTNER (as applicable) ALONG WITH THE CONTRACTOR

This Deed of undertaking executed this ..... day of ..... by ..... a Company incorporated under ..... and having its Registered Office at ..... herein after called ..... or 'Collaborator/Consortium Partner/ JV Partner' which expression shall include its successors, executors and permitted assigns and (Bidder's Name) ..... a Company incorporated under the Companies Act 1956 having its registered office at ..... hereinafter called ..... (Bidder's Name) or 'Contractor' which expression shall include its successors, executors and permitted assigns in favour of South Eastern Coal Fields Limited, a company incorporated under the Companies Act 1956 having its Registered Office at Bilaspur (hereinafter called the 'PURCHASER'), which expression shall include its successors, executors and assigns.

Whereas the Purchaser is desirous of getting work of the design, manufacture, supply, transport and insurance, Port handling, Customs clearance, forwarding, storage, erection, testing and commissioning of ..... (herein after called as equipment) at ..... done as per its specification No ..... dated ..... whereas ..... (Bidder's Name) submitted its technical proposal vide its Letter No. .... dated ..... based on the association of

M/s ..... (Collaborator/Consortium Partner /JV Partner) and whereas it is a condition for the award of contract to ..... (Bidder's Name) that ..... (Bidder's Name) and its Collaborator / Consortium Partner /JV Partner M/s ..... would be jointly and severally bound and shall be responsible to the Purchaser for the successful performance of the equipment fully meeting the parameters guaranteed as per the Purchaser's specifications in terms of the Contract. Now, therefore, this Undertaking witnesseth as under:

1. That in consideration of the award of Contract by the Purchaser (herein after referred to as the 'Contract') we, the Collaborator/ Consortium Partner /JV Partner and Contractor do hereby declare and guarantee that we shall be jointly and severally bound unto to the SECL (Purchaser) for the successful performance of equipment fully meeting the guaranteed parameters as per the contract and further shall be fully responsible for the correctness of design, manufacture, supply, transport, insurance, erection supervision, testing and commissioning of the equipment in accordance with the Contract specifications. Further, we, the Collaborator/ Consortium Partner /JV Partner and the Contractor hold ourselves jointly responsible for the timely execution of all activities in accordance with the contract.

2. Without prejudice to the generality of the undertaking in para - 1 above, the methods of achieving the objectives set forth above shall be as follows:

a. The Collaborator/ /Consortium Partner /JV Partner' shall be responsible for the preparation of all design, design calculation and manufacturing drawings for the equipment and shall provide all additional necessary technical assistance to ..... (Bidder's Name) for the portion of the work to be performed by ..... (Bidder's Name) in India. Further the Collaborator/ /Consortium Partner /JV Partner shall extend their quality surveillance to ..... (Bidder's Name) during manufacture at Contractor's work and/or at the Purchaser's project site. Without prejudice to the overall responsibility of the Collaborator/ /Consortium Partner /JV Partner as to the successful commissioning and performance of the equipment, the Collaborator /Consortium Partner /JV Partner shall in addition depute his technical experts from time to time to the Contractor's works/ Purchaser and the Contractor in accordance with the stipulation in the Contract.

b. The Collaborator/Consortium Partner /JV Partner will be fully responsible for the quality of manufacture and the timely delivery of all the major equipments/ main assembly / components manufactured at his works or at his Contractor's work for incorporation in the equipment as per the Contract Schedule.

c. The Contractor shall be responsible to manufacture that portion of the equipment to be manufactured at his works or at the sub-Contractor's works as per the Collaborator's /Consortium Partner's /JV Partner's design and the Collaborator's / Consortium Partner's /JV Partner's quality acceptance level. Further the Contractor shall supervise the erection, commissioning and carry out the Take Over Test and Long Term Performance Test of the equipment as per the contract in accordance with the Collaborator's advice, procedure and guidance.

3. In the event of any breach in the performance of the obligations set forth above, we the Collaborator/ Consortium Partner /JV Partner and the Contractor, shall jointly and severally pay the loss or damage to the Purchaser on his demand. Further, we the Collaborator/ Consortium Partner /JV Partner and the Contractor, jointly and severally undertake to agree to the Price Reduction in accordance with the provisions of the Contract, in the event of any delay in supply or in completion of functional test including weighing of the equipment or in commissioning of the equipment without any demur, reservations, protest and recourse. Further, any extension of time, relaxation or indulgence issued by the Purchaser to the Contractor/ Collaborator/ Consortium Partner /JV Partner shall not prejudice the rights of the Purchaser under this undertaking against the Collaborator/ Consortium Partner /JV Partner or the Contractor.

4. We, the Collaborator/ Consortium Partner /JV Partner and the Contractor agree that this undertaking shall be irrevocable and further agree that this undertaking shall continue to be enforceable till the end of warranty period under the Contract. We further agree that this undertaking shall be without prejudice to the various liabilities of the Contractor including his Contract Performance Guarantee as well as his other obligations in terms of the Contract.

5. The Performance, rights and responsibility of the party shall be in accordance with the Contract and further the liability of the Contractor and Collaborator/ /Consortium Partner /JV Partner under this Undertaking shall not in any case exceed the limits as stipulated in the Contract.

6. As a security, the Collaborator/ Consortium Partner /JV Partner, apart from the Contractor's Performance Guarantee, shall furnish a Performance Guarantee from his Bank, in the form acceptable to the Purchaser, in favour of the Purchaser, prior to signing of the Contract. The value of the Guarantee shall be 1% value of the EPC contract price and it shall be guaranteed towards the faithful performance/compliance of this Deed of Undertaking in accordance with the terms and conditions specified herein. The Guarantee shall be irrevocable and valid for the entire period of the contract , namely till the end of the warranty period of the contract plus three months. The guarantee amount shall be payable to the Purchaser on demand without any condition whatsoever.

In witness whereof the Collaborator/Consortium Partner /JV Partner and the Contractor have, through their authorised representatives, executed this Undertaking and affixed common seals of their respective companies, on the day, month and year first above mentioned.

..... (Signature)	For Collaborator/Consortium Partner /JV Partner
..... (Name in Block Letters)	Name
..... (Official address)	Designation
..... (Signature)	Seal of the company.
..... (Name in Block Letters)	
..... (Official address)	For Contractor. Name: Designation: Seal of the Company.

Notes:

- i) Power of Attorney of each of the person signing the Deed of Joint Undertaking and Board resolution in regard of POA of Authorised signatory, shall be furnished along with this Deed of Joint Undertaking.
- ii) \* Bidder to strike out, whichever is not applicable.

\*\*\*\*\*

**ANNEXURE – H**

**Letter of Undertaking by Collaborator/Consortium as applicable.**

**to be attached**

\*\*\*\*\*

**VOLUME – I A**  
**INVITATION FOR BID**  
**SCHEDULES**

## PRICE SCHEDULE

### 1.0 PREAMBLE

- 1.1 This section covers the price schedule to be filled up by the BIDDER for the entire scope of work.
- 1.2 For the award of contract, the Price Break up of the schedules originally furnished by the successful bidder shall be revised in the same proportion matching with the lowest offered price in the reverse auction. .
- 1.3 The BIDDER shall carefully scrutinize the specification and drawings and include price for all items of work in the price schedule. This is a turn key lump sum contract and over and above the prices quoted, no extra claim will be admissible. All piping, cabling, earthing, roads and pathways, with in the terminal points are deemed to have been included within the quoted price.

#### 1.4 Special Notice:

- i) The BIDDER shall note that the list of items indicated in the price schedule are not necessarily exhaustive and the price quoted shall be inclusive of all necessary equipment, accessories, gauges, instruments, etc., labour, duly supplied, constructed, installed, tested, commissioned and handed over to the Purchaser in perfect working conditions.
- ii) It is the responsibility of the successful BIDDER to arrange for and obtain necessary/ approval from the concerned appropriate authority for the complete installation included in the scope of supply, construction, installation and commissioning. The installation will be deemed to have been completed only when all such approval is obtained and handed over to SECL/CLUVPL.
- iii) The Prices for supply items shall be quoted as delivered at site including packing & forwarding, loading and freight up to door delivery at site. The services provided at site shall be on works contract basis. The Price shall be inclusive of all applicable Taxes & Duties including Customs Duty if any.
- iv) The prices shall be firm throughout the contract period in force.
- v) While quoting for taxes and duties, the bidders shall consider all prevailing laws and concession available and quote accordingly. Where any concessional taxes have been considered the same shall be considered in the bid. The rate of taxes and duties adopted shall be indicated in Schedule - 1 of prices.

Signature:

Name:

Designation:

Company:

Date:

## SCHEDULE-F1

**Table-1**

Sl. No	Details	In Rupees
<b>1.0</b>	<b>PRICE SCHEDULE-1</b>	
1A	Lumpsum and firm price for setting up of total 40 MW solar PV projects at Bishrampur (2x 10MW) and Bhatgaon (2 x 10MW) locations as per the scope of work including approvals, connectivity, developing infrastructure for power evacuation from solar project sites to the designated SECL 33KV SS at both locations on turnkey basis.	
1B	Taxes and Duties for sl. No. 1A	
1C	TOTAL EPC price (1A+1B )	
<b>2.0</b>	<b>PRICE SCHEDULE-2</b>	
2A	Lumpsum and firm price for Comprehensive Operation and Maintenance of Solar PV Power Plants and power evacuation facilities for 10 years including first year warranty period O & M.	
2B	Taxes and Duties for Sl. No. 2A	
2C	Total O & M price (2A+2B)	
3A	<b>Total Price (1C +2C) for 40 MW</b>	
3B	<b>Total Price/MW (3A/40)</b>	

- Note:**
1. For evaluation and comparison of price bids, the total price /MW i.e., Sl. No. 3B furnished by the bidder as above in Table-1 as per Schedule F1 will be considered.
  2. The total O & M price (2A+2B) shall be minimum 10 % of the total price (1C+2C) for 40 MW and if the bids are submitted less than 10 % of the total price (1C+2C), those bids are liable for rejection.
  - 3) The successful bidder should submit break up of prices as per Schedule F1 Table-1 Price Schedule as per their schedule wise revised contract price matching the total price /MW quoted by them in the Reverse Auction following the ratio quoted in the original price bid.



Table 1 A - Break up for Rates and Classification of Taxes and duties:

The bidder shall furnish the details of the prevailing rates and classification of taxes and duties components applicable and considered in accordance with the above Price Schedules.

Sl. No.	Components	Classification adopted	Rate

## SCHEDULE –F2

### OVER ALL TIME SCHEDULE

(Bidder to fill-in and submit with its Bid)

Sl. No.	Description of Time schedule	Number of Months /years from date of LoA
1.	Issue of LOA - Zero Date	D
2.	Site study / assessment, power evacuation and connectivity approvals, Supply, Erection, Testing & Commissioning	
3	Completion of site development works.	
4	Approval of all major drawings	
5	Completion of supplies	
6	Completion of Erection and Interconnection of all equipment and systems	
7	Power evacuation completion, Testing and trial power exports	
8	Commissioning	D + 9 months
10	Provisional takeover and Commercial operation Declaration	D+12 months
11	Warranty Period & first Year O & M	D + 24 months

12	Performance Guarantee Test (duration of PG Test is within the warranty period)	3 Months
13	2nd year O & M to 10th Year O & M	9 Years

Signature :

Name :

Designation :

Company :

Company Seal :

Date :

Note:

1. Time Schedule indicated above shall not exceed the time period indicated in Section-4 of Volume-IB of the specification
2. This time schedule shall be in line with the L-1 PERT Network schedule.

\*\*\*\*\*

**SCHEDULE –F3 (Not Applicable)**  
**DEVIATION SCHEDULE TO DRAFT CONTRACT**

**SCHEDULE –F4 (Not applicable)**

**DEVIATION SCHEDULE TO TECHNICAL SPECIFICATION**

## SCHEDULE –F5

### REQUIREMENTS OF THE CONTRACTOR AT SITE

(Bidder to fill-in and return with its Bid)

The Bidder shall state his requirements against each of the following and the total requirement shall be within the area allocated as per specifications :

A.	Requirements:			
1	Land for Project, Site fabrication work, Stores, Site Office etc. - Area Requirement			Sq.m
1.1	Land for Labour colony			Sq.m
1.2	Land for other construction activities at site if any			Sq.m
2	Construction Power Requirement (in kVA)		kVA for	Months
3	Construction Water Requirement (in m/day)		m/day for	Months

Signature :

Name :

Designation :

Company :

Company Seal

Date :

## SCHEDULE-F6

### CONTRACTOR'S RESOURCE DEPLOYMENT SCHEDULE

#### A) Construction Equipment

The Bidder shall indicate the schedule of construction equipment, proposed to be deployed at the site for executing the works as per the pro-forma below:

S. No.	Type of Resource	Months						
		1	2	3				
1	Erection Equipment	1	2	3				
1.1	Cranes with different Capacities							
1.2	Others (Bidder shall indicate) as applicable for the works							

#### B) Resource Deployment Schedule

The Bidder shall indicate the schedule of manpower resources proposed to be deployed at the site for executing the works as per the pro-forma below:

S. No.	Type of Resource	Months						
		1	2	3				
2	<b>Human Resources</b>	1	2	3				
2.1	<b>Engineering Category</b>							
2.1.1	Project Engineers							

2.1.2	Mechanical Engineers	-	-						
2.1.3	Electrical Engineers								
2.1.4	Civil Engineers	-	-						
2.1.5	C&I Engineers								
2.1.6	Commissioning Engineers	-	-						
2.1.7	Structural Engineers	-	-						
2.1.8	Others (bidder shall indicate) as applicable for the work								
2.2	<b>Supervisory Category</b>	-	-						
2.2.1	Const. Manager								
2.2.2	Electrical Supervisors								
2.2.3	Mechanical Supervisors								
2.2.4	C&I Supervisors								
2.2.5	Civil Supervisors								



S. No.	Type of Resource	Months						
2.2.6	Purchase Officer (s)							
2.2.7	Finance/Site Office							
2.2.8	Inspection/Quality Control							
2.2.9	Others (Bidder shall indicate) as applicable for the work							
2.3	Labour Category							
2.3.1	Welder							
2.3.2	Fitter							
2.3.3	Rigger							
2.3.4	Un-skilled labour							
2.3.5	Others (Bidder shall indicate) as applicable for the work							

**Note :**

1. The above charts are only indicative and bidder shall indicate list of human resources, list of erection equipments as applicable to the project and the mobilization period for the same.

**2. Organization and Manpower Deployment.**

The Bidder shall also submit the following:

a) Number of engineers/specialists, with details, proposed to be deployed at the Bidder's Head Office, for design & engineering and for equipment procurement & follow up, including bio-data of key personnel.

b) Site Organization chart with details and Bio-data of the site-in-charge and other key personnel.

c) Details of the safety organization, proposed to be deployed at site.

3. Bidder shall indicate the details of initial mobilization at site. It is the responsibility of the successful bidder to mobilize any additional resources, if the progress is tardy or is to make up/catch-up the delay already occurred, in order to match the completion schedule.

4. Bidder shall add suitable number of rows in this schedule to indicate number of personnel and indicate details.

Signature

Name :

Designation :

Company :

Company Seal

Date :

**SCHEDULE – F7**

**SCHEDULE OF WEIGHTS & DIMENSIONS**

The Bidder shall state, hereunder, the weights & dimensions of various packages, for shipment, comprising the complete scope of supply:

<b>Sl. No</b>	<b>Package Description</b>	<b>Dimensions, L x B x H (metres)</b>	<b>Weight (Tonnes)</b>

Signature :

Name :

Designation :

Company :

Company Seal

Date :

## SCHEDULE –F8

### CHECKLIST FOR BID SUBMISSION

#### A) TECHNO-COMMERCIAL PART (PART-I):

Name of Work :

Tender no. :

Bidder is requested to fill this check list and ensure that all details / documents have been furnished as called for in the Tender Specification along with duly filled in, signed & stamped Checklist with each copy of the “Un-priced Part” of its Bid.

Sl. No	Description	Bidder Response
1)	Covering Letter	-
2)	Duly filled in ‘Form of the Bid’ (As per Annexure-B of IFB)	-
3)	Power of Attorney / authorization with the seal of the company in favour of the person signing the Bid.	-
4)	Remittance Proof for Cost of Tender Document	-
5)	Bid Security Declaration as per Annexure –A of IFB.	-
6)	Joint Undertaking (JDU) as per Annexure – G of IFB	-

7)	Copy of existing valid Collaboration Agreement as on the Original Scheduled date of Bid opening (if applicable).	
8)	Letter of Undertaking by holding Company as per Annexure - H of IFB (if applicable).	
9)	Documentary Evidence for meeting P.Q.R.	
10)	Overall time schedule as per Schedule – F2	
11)	Deviations to the Draft Contract, if any, as per Schedule – F3.	
12)	Deviation to Technical Specifications if any as per Schedule – F4( Not applicable)	
13)	Requirements of the Contractor at site as per Schedule-F5	
14)	Resource deployment schedule as per Schedule-F6	
15)	Schedule of weights and dimensions as per Schedule – F7	

16)	Details of sub-contractors /sub-suppliers/sub-vendors, if any	
17)	Quality Assurance Programme	
18)	Technical Details to be furnished with the Bid as called for in Technical specification. Bidder shall furnish the above separately in the same order as in the relevant	
19)	Bar chart/PERT Network schedule to achieve the time schedule, as per Clause 3.6 of this Volume IA and details as called for in Section - 4 of Volume-IB (Draft Contract).	
20)	All other details as called for in Schedule F1 to F8 to this Volume IA and Annexure- I to XII of Volume-IB (Draft Contract).	
21)	Integrity Pact Programme (as per Appendix-I) of Annexure-D of this Volume.	
22)	Any other information the bidder wishes to furnish.	

Signature :

Name :

Designation :

Company :

Company Seal

Date :

**B) PRICE BID (PART-II):**

<b>Sl. No</b>	<b>Description</b>	<b>Bidder response</b>
1).	Duly filled Form of Bid (As per Annexure- C of IFB)	
2).	Completely filled in Schedule of Prices (Schedule-F1, Table 1) of Volume-IA	

Signature :

Name :

Designation :

Company :

Company Seal:

Date :

\*\*\*\*\*

**COAL LIGNITE URJA VIKAS PRIVATE LIMITED  
(JV Company of Coal India Limited and NLC India Limited)**

REGD. OFFICE: 4<sup>th</sup> Floor, Core-I & II, CIL, Scope Minar,  
Laxmi Nagar District Centre, Laxmi Nagar,  
New Delhi – 110 092

Office of the Chief Executive Officer  
CLUVPL

Address: Projects & Business Development  
NLC India Limited, Corporate Office, Block – 1,  
Neyveli – 607 801, Cuddalore (Dt), Tamil Nadu  
Phone No: 04142- 212379 Fax- 04142-252645

Email: cluvpl@nclindia.in

Domestic Competitive Bidding (DCB)

Tender No.: CLUVPL/ PMC/ SECL/ 01.

TENDER SPECIFICATION

FOR

**Setting up of 40MW (AC) Ground Mounted Grid Connected Solar PV Power  
Project for SECL at Bishrampur & Bhatgaon in Surajpur District, Chhattisgarh  
State under EPC mode.**

**VOLUME – IB**

**COMMERCIAL - DRAFT CONTRACT**



**TENDER SPECIFICATION ALL VOLUMES**

**MASTER INDEX**

Sl. No	Volumes	Description
1	IA	Commercial – Invitation for Bid
2	IB	Commercial – Draft Contract
3	II	Technical Specification

## COMMERCIAL CONDITIONS

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Annexure- XXIII	Letter of Undertaking	See Note*

Note\*: Annexure I to XII shall be prepared after mutual agreement with the successful Bidder based on offer and agreement arrived at during techno commercial discussion and shall form part of the contract. LOA to the successful Contractor, integrity pact and Joint Deed of undertaking (JDU), Letter of Undertaking to be furnished in the bid by the successful Contractor shall be attached as Annexure XX to XXIII in the agreement.

#### **LIST OF ACRONYMS**

APG	:	Advance Payment Bank Guarantee
BG	:	Bank Guarantee
BoS	:	Balance of System
C&I	::	Control & Instrumentation
Cl.	:	Clause
CIF	:	Cost, Insurance & Freight (Incoterms 2010)
CPG	:	Contract Performance Bank Guarantee
DD	:	Demand Draft
JDU	:	Joint Deed of undertaking
EPC	:	Engineering, Procurement & Construction
FOB	:	Free on Board (Incoterms 2010)
FTP	:	Foreign Trade Policy

GST	:	Goods & Service Tax
IFB	:	Invitation for Bid
IST	:	Indian Standard Time
INR	:	Indian Rupees
JV	:	Joint Venture
kW	:	Kilo Watt (Power)
LD	:	Liquidated Damages
LOA	:	Letter of Award
MCC	:	Motor Control Centre
MW	:	Mega Watts (Power)
SECL	:	South Eastern Coalfields Limited
CLUVPL	:	Coal Lignite Urja Vikas Pvt. Ltd.
PAC	:	Provisional Acceptance Certificate
PERT	:	Project Evaluation and Review Technique
PTO	:	Provisional Take Over
PSU	:	Public Sector Undertaking
PG	:	Performance Guarantee
RBI	:	Reserve Bank of India

**CONTRACT AGREEMENT**

( This shall be executed on Non-JUDICIAL stamp paper of value not less than Rs.20/-)

This contract No..... made  
this ..... day of .....

between

**South Eastern Coalfields Limited( SECL)**, incorporated under the Companies Act, 1956 and having its registered office at SEEPAT ROAD,BILASPUR,DISTT.-BILASPUR (C.G)-495006, INDIA hereinafter referred to as the “**PURCHASER**” (which expression shall unless repugnant to the context or the meaning thereof, be deemed to include its successors and permitted assignees), of the ONE PART,

AND

M/s. ....( Contractor’s name) a Company incorporated under the Laws of \_\_\_\_\_ and having its registered office at ..... hereinafter referred to as the “**CONTRACTOR**” (which expression shall, unless repugnant to the context or meaning thereof, be deemed to include its successors and permitted assignees) of the SECOND PART,

WHEREAS, on behalf of the Purchaser, **Coal Lignite Urja Vikas Private Limited (CLUVPL )** invited the CONTRACTOR to submit tender for Setting up of 40MW (AC) Ground Mounted Grid Connected Solar PV Power Project at Bishrampur & Bhatgaon in Surajpur District, Chhattisgarh State under EPC mode, the scope of work which includes Site study, Site development, Design, Engineering, Manufacture, Inspection at supplier’s works, Supply, Insurance, Transport, Storage, Installation, Erection, Testing, approval from Chhattisgarh State Electricity Authorities, Bay Extensions, external transmission lines, Metering arrangements and Commissioning with associated power evacuation system including grid connectivity. Performance Guarantee and Operation & Maintenance for a period of 10 years including first year warranty period O & M for total 40 MW (AC) capacity at Bishrampur and Bhatgaon locations on Lump-sum turnkey basis.

The scope is indicative only and detailed scope of work is contained in the tender specification.

AND

WHEREAS, the CONTRACTOR submitted tender to the Purchaser for execution of the work in accordance with the tender documents including technical specifications, and schedule of items.

AND

WHEREAS, the Purchaser has accepted the tender submitted by the CONTRACTOR for the construction and completion of the scope of work.

NOW IT IS HEREBY AGREED AND DECLARED BY AND BETWEEN THE PARTIES AS FOLLOWS:

*Article – 1: Contract Price.*

In consideration of the promises and the payments to be made by the Purchaser to the Contractor, the Contractor hereby covenants with the Purchaser to perform the work as detailed in Section – 2 “Scope of work” and Technical specifications to this contract subject to and on the terms and conditions contained herein.

As consideration for this Contract, the Purchaser shall pay to the “Contractor” as specified in Section–3 a sum of INR \_\_\_\_\_ (Rupees \_\_\_\_\_ only) including all taxes and duties.

It is clearly understood between the parties that the Contractor shall be solely responsible for the completion of the scope of work.

*Article – 2: Sub Contractor.*

The Contractor should not sub-contract the whole of the work on back to back basis.

If the Contractor wishes to appoint Sub–Contractor during execution of the contract, the Contractor shall take prior written approval of the Purchaser spelling out the scope of the work proposed to be entrusted to the said Sub-Contractor together with the relevant experience and other details of such proposed Sub-Contractor(s).

Notwithstanding the approval accorded by the Purchaser to the appointment of Sub-Contractor(s), the Contractor shall be solely responsible for the completion of the works as per specifications and within the time schedule agreed in this Contract. Approval of any Sub-Contractor by the Purchaser shall not relieve the Contractor from any of his liabilities or obligations under the Contract and he shall be responsible for the acts, defaults and neglects of any Sub-Contractor(s) as fully as if they were the acts, defaults or neglects of the Contractor.

*Article – 3: Contractor’s Guarantee*

This Contract shall come into effect from the date of letter of Award.

Notwithstanding the dispatch of plant and equipment including technological & building steel structure, tools & tackles, consumables, mandatory spares, instruments, oils and lubricants etc. required for operation & maintenance of the Package directly by the Contractor’s sub-contractor to the Purchaser site, the Contractor shall remain wholly liable to perform, fulfill and discharge all the obligations and responsibilities under this Contract and the responsibilities of the Contractor shall in no way be reduced or diminished for any reason whatsoever.

*Article -4: Overall Responsibility*

Notwithstanding the fact that the Purchaser has made separate arrangement for making direct payment in favour of Sub-Contractors within the provisions of the Contract, the Contractor

shall remain liable to perform, fulfill and discharge all the obligations and responsibilities under this Contract for the design, manufacture, transportation and delivery of materials, civil foundation and other work, storage, erection, Installation, testing, commissioning, performance guarantee, commercial operation and regular & reliable working of the plant in all respects.

#### Article -5: Effective Date of Contract and Time schedule

This Contract shall come into effect from \_\_/\_\_/2021 the date of Letter of Award.

The contractor shall carry out Site study, Site development, Design, Engineering, Manufacture, Inspection at supplier's works, Supply, Insurance, Transport, Storage, Installation, Erection, Testing, approval from Chhattisgarh State Electricity Authorities, Bay Extensions, external transmission lines, Metering arrangements and Commissioning with associated power evacuation system including grid connectivity within 9 months from the date of LOA.

Performance Guarantee and Operation & Maintenance for a period of 10 years including first year warranty period O & M for total 40 MW (AC) capacity at Bishrampur and Bhatgaon locations on Lump-sum turnkey basis.

#### Article -6A: Price reduction (PR) for delay in time schedule

Price reduction under this Contract shall be reckoned and determined in accordance with Cl. 4.7.1 of Section – 4 (Time Schedule).

#### Article -6B: Penalty for non-fulfilment of PG

Penalty under this Contract for non-fulfilment of PG values shall be reckoned and determined in accordance with Section-9 (Performance requirement and Guarantee).

#### Article -7: Terms of Payment

The terms of payment shall be as provided in Section-6 of this contract.

#### Article -8: Taxes & Duties

The Contract price is inclusive of Taxes and duties to the extent of break-up shown in Section -3 and subject to the provisions of Section-5.

#### *Article – 9: Sections*

The following Sections Appended to this Contract shall be deemed to form and be read and construed as part of this Contract:-



- Section – 1: Definitions
- Section – 2: Scope of Supply & Services
- Section – 3: Contract Price
- Section – 4: Time Schedule
- Section – 5: Taxes & Duties
- Section – 6: Terms of Payment
- Section – 7: Facilities to be provided by the Owner
- Section – 8: Contract Technical Specifications
- Section– 9: Performance requirement and Guarantee
- Section –10: General Terms & Conditions of the Contract
- Section - 11: Quality Assurance

***Article – 10: Annexures***

In addition to the aforesaid, the following documents shall be deemed to form and be read and construed as a part of this Contract:-

ANNEXURES	DESCRIPTION
Annexure-I	List of imported plant and equipment, technological and structures, etc.
Annexure-II	List of indigenous plant and equipment, technological and building structures, etc.
Annexure-III	List of imported equipment to be brought directly to site.
Annexure-IV	List of imported equipment / components required at Indian contractor's works in India

Annexure-V	List of Sub- contractor's /Sub-Suppliers /Sub-Vendors
Annexure-VI	List of mandatory Spares
Annexure-VII	List of Tools & Tackles
Annexure-VIII	List of Initial fill, Oil and Lubricants including flushing oil and consumables
Annexure-IX	Training program for the purchaser's personnel - Not applicable

Annexure-X	Requirements of contractor at site
Annexure-XI	Resource deployment schedule
Annexure-XII	Schedule of Supervisory personnel
Annexure- XIII A	Pro-forma for Contract Performance Bank Guarantee
Annexure- XIII B	Pro-forma for Backup Bank Guarantee for faithful compliance to JDU
Annexure- XIV	Pro-forma for Advance Payment Bank Guarantee- Not applicable
Annexure- XV	Pro-forma for Custody-cum-Indemnity Bond
Annexure- XVI	Pro-forma for Retention Money Bank Guarantee - Not applicable
Annexure- XVII	Pro-forma for release of Liquidated Damages Bank Guarantee -

	Not applicable
Annexure- XVIII	Safety Code for Contractors
Annexure- XIX	General Conditions for Erection and Civil Works
Annexure-XX	Letter of Award
Annexure-XXI	Integrity Pact
Annexure-XXII	Deed of joint Undertaking
Annexure- XXIII	Letter of Undertaking

*Article – 11: Interpretation*

All the words and expression used in this contract shall, unless repugnant to the context, have the same meaning as are respectively assigned to them in Schedule-1. All headings and marginal notes to the Articles, Schedules, Annexure, Technical Specifications or to any other part of the Contract are solely for the purpose of giving a concise indication and not a summary of a contents thereof and they shall never be deemed to be part thereof or be used in the interpretation or construction thereof.

Article -12: Agreement

This “Contract”, together with the Sections and Annexure referred to herein, constitute the agreement and understanding between the ‘Purchaser’ and the ‘Contractor’. The Contract shall also include Letter of Award (LOA), all correspondence exchanged, Minutes of Meetings and Techno-Commercial Discussions, Contractor’s Techno Commercial offer, Price offer, Tender Specification, Notice Inviting Bid (NIB).

The several Sections listed in Article-09 herein above and the Annexure listed in Article- 10 and forming an integral part of this Contract, are to be taken as mutually explanatory to one another. However, in case of conflict between the Sections and the Annexure the provisions contained in the Sections shall prevail. In case of any conflict/contradiction between the Articles of this contract and Sections appended here in, provisions in the Articles shall prevail.

No modifications or amendment of this Contract including Sections and Annexure hereto shall be valid unless the same is agreed to in writing by the parties hereto and issued as an amendment to the Contract.

#### Article -13: Order of Precedence

The order of precedence shall be

1. Any mutual agreement made after Signing of this Contract.
2. Contract
3. Letter of Award (LOA)
4. All correspondence exchanged prior to Letter of Award
5. Minutes of Meetings and Techno-Commercial Discussions
6. Contractor's Techno-Commercial Offer and Price offer
7. Tender Specification
8. Invitation for Bid

#### Article – 14: Jurisdiction

The Contract shall be governed in accordance with the Law of India. The civil court having original jurisdiction over **Bilaspur** shall have exclusive jurisdiction to try any matter arising out of this contract.

#### Article -15: Legal Entity

It is understood that the Contract is being signed by SOUTH EASTERN COAL FIELDS LIMITED solely on its own behalf and not on behalf of any other person or entity. In particular, it is to note and understand that the Government of India is not a party to this contract or the associated tendering process and has no liabilities, obligations or rights hereunder. It is to note and understand that SOUTH EASTERN COAL FIELDS LIMITED is an independent legal entity with power and authority to enter into contracts solely on its own behalf under the applicable Laws of India and general principles of Contract Law. It is to note and understand that SOUTH EASTERN COAL FIELDS LIMITED is not an agent, representative or delegate of the Government of India. It is to be further noted and understood that the Government of India is not and shall not be liable for any acts, omissions, commissions, breaches or other wrongs arising out of the execution of the Contract or associated tendering process. Accordingly, the Contractor shall have no rights, whatsoever, against the Government of India as to any manner, claims, cause of action or thing whatsoever arising of or under this Contract or associated tendering process.

#### Article – 16: Counter Parts

This Contract is executed in the English language in two originals; each party receiving one duly signed copy. Both these copies shall be authentic. The Contractor shall submit 25 (Twenty Five) photocopies of the entire Contract documents (free of charges) within 30 (thirty) days after signing of this Contract, to the Purchaser, for its use.

IN WITNESS WHEREOF THE parties hereto by representatives duly authorised have executed the Contact on the day, month and the year first above written.

Name

Name

Designation

Designation

For and on behalf of  
(Contractor)

For and on behalf of

SOUTH EASTERN COAL FIELDS LIMITED

BILASPUR- 495006

(Seal of the Office)

(Seal of the Office)

In the presence of

In the presence of

1.

1.

2.

2.

\*\*\*\*\*

## SECTION-1

### 1.0. DEFINITIONS

- 1.1 The following words and expressions are used in this Contract (as herein defined and in the Invitation For Bid) shall have the meanings hereof assigned to them, except where the context requires otherwise.
- 1.2 **Acceptance** shall mean the manifestations by the owner of his assent to the mutually agreed terms of the offer by the Contractor.
- 1.3 **Agreement** shall mean mutual understanding between the parties which creates obligations between each other.
- 1.4 **APPLICABLE LAW** means any statute, law, regulation, ordinance, notification, rule, regulation, Judgement, order, decree, bye-law, approval, directive, guideline, policy, requirement or other governmental restriction or any similar form of decision of, or determination by, or any interpretation or administration having the force of law in the Republic of India and the State Government, by any Government Authority or instrumentality thereof, whether in effect as of the date of this Contract or thereafter.
- 1.5 **Base Date** shall mean the first working day of the calendar month, one month prior to the original scheduled date of Bid Opening (Cover - I).
- 1.6 **Bid** shall mean a valid offer made against this tender enquiry, indicating terms, conditions and prices.
- 1.7 **BIDDER** means Bidding Company submitting the Bid. Any reference to the Bidder includes Bidding Company including its successors, executors and permitted assigns as the context may require.
- 1.8 **Billing Breakup** shall mean the item, description and Quantities arrived at after detailed design and engineering are prepared. It generally occurs in lump sum Price contracts, where rates are fixed up for such items, based on the Break-up prices indicated in the offer.
- 1.9 **Contractor / Tenderer / EPC** shall mean a person/party/ firm/ company /consortium who submits an offer/ bid against a tender enquiry.
- 1.10 **Codes and Standards** shall mean such codes and Standards as prescribed in ISS/ DIN/ BSS as applicable to the equipment, components, plant, machinery, consumables. ASM Test Codes –AIEE Codes – Indian Electricity Act, etc.
- 1.11 **Commercial use'** shall mean that use of the equipment for works, which the 'Contract' contemplates.

- 1.12 **Commissioning** shall mean subjecting the solar power plant connected to the SECL SS and exporting power from the solar power plant within 09 months from the date of LOA.
- 1.13 **Compensation** shall mean anything as an equivalent as to make assessment for loss or damage.
- a. The consideration for services rendered by contract agreed or implied.
  - b. Remuneration for injury suffered, especially when it has resulted in measurable loss or in expenditure Money paid for damage caused by any wrong or breach of contract, to the person defrauded or injured.
- 1.14 **Completion of erection** shall be defined as to be completion of erection of all the materials and items of the equipment covered under the scope of Contract, successful completion of functional tests.
- 1.15 **Completion of Handing Over** shall mean that completion of scope of work as indicated in the technical specifications and conditions of contract.
- 1.16 **Completion Time** shall mean the period stated in the contract for the completion of Works upto and including successful completion upto provisional takeover and shall be reckoned from the date of Letter of Award.
- 1.17 **Condition** shall mean the conditions agreed between the parties and stipulated in the Contract agreement.
- 1.18 **Consequential damages** means the damages, claimed in a tort or breach of contract which do not normally follow from the tort or breach.
- 1.19 **Consultants** shall mean the consultant appointed by the CLUVPL for the PMC activities for the project or their duly authorised representative.
- 1.20 **Contractor** shall mean the successful Bidder whose bid has been accepted by the Purchaser and on whom the `Contract' or `Purchase order' is placed by the Purchaser and shall include his heirs, legal representatives, successors and permitted assignees.
- 1.21 **CONTRACTOR'S REPRESENTATIVE** means any person nominated by the Contractor and approved by the Employer to perform the duties delegated by the Contractor.
- 1.22 **Contract** shall mean and include this contract between the owner and Contractor for the execution of the works as per agreed terms, conditions, specifications prices and enforceable as per law.
- 1.23 **Contract period** shall mean the period / time schedule agreed in the contract during which period the Contracted work shall be performed / executed, inclusive of any period covered by extension(s), duly issued.
- 1.24 **Contract Price** in relation to particular contract shall mean the total consideration to be paid by the Purchaser to the Contractor. It includes all taxes and duties.

- 1.25 **Contractor's works or Manufacturer's works** shall mean and include the land and other places which are used by the Contractor/Sub-Contractor for the manufacture of equipment.
- 1.26 **CONTRACTOR'S EQUIPMENT** means all plant, facilities, equipment, machinery, tools, apparatus, appliances or things of every kind required in or for installation, completion and maintenance of Facilities that are to be provided by the Contractor, but does not include Plant and Equipment, or other things intended to form or forming part of the Facilities.
- 1.27 **CONTRACT DOCUMENTS** mean collectively the Tender Documents, Designs, Drawings, Specification, Schedule of Quantities and Rates, Notification of Award/ Letter of Intent/ Letter of Acceptance and agreed variations if any, and such other documents constituting the Tender and acceptance thereof.
- 1.28 **Day** shall mean the period between midnight to next midnight.
- 1.29 **Delivery** shall mean delivery of only such equipment, materials and supplies specified in the Contract and manufactured and/or supplied by the Contractor in accordance with the sequence of delivery schedule of the Contract and in case of construction and erection work, delivery shall mean the approval of the owner to the said construction and erection work.
- 1.30 **Dimensions** shall mean length, area, volume etc. all expressed in metric system.
- 1.31 **Drawing** shall mean such drawings provided along with bid documents / furnished during the progress of work by the Contractor and approved by the PURCHASER.
- 1.32 **Date of Contract** shall mean the calendar date on which Purchaser and the Contractor have signed the 'Contract'.
- 1.33 **Design Charges** shall mean the charges payable for design and engineering of the equipment.
- 1.34 **ENGINEER-IN-CHARGE (EIC)** shall mean the person designated from time to time by CLUVPL and shall include those who are expressly authorized by him to act for and on his behalf for operation of this Contract.
- 1.35 **Effective date of Contract** shall mean the date of Letter of Award.
- 1.36 The term '**Equipment Portion**' of the Contract Price shall mean the Ex-works. Price of the equipment components and goods including charges for design, manufacture, shop- testing, packing and forwarding and loading into containers / carriers.
- 1.37 **Erection** shall mean the putting up of structures and/or installation of plant and equipment under the Contract by the Contractor and/or under the supervision of the



Contractor and will include any service which the Contractor is required to perform at the site with his own and/or other staff and/or labour and/or Sub-Contractor for the due fulfilment of the Contract.

- 1.38 The term '**Erection Portion**' of the '**Contract Price**' shall mean the value of field activities of the 'Works' including unloading, handling, storage till erection, erection, commissioning and testing including supervision to be performed at "site" by the Contractor.
- 1.39 '**FACILITIES**' mean the Plant and Equipment to be supplied and installed, as well as all the installation services including all infrastructure as mentioned in scope of works to be carried out by the Contractor under the Contract.
- 1.40 '**Final Take Over**' will occur when the following are achieved.
- a) All supplies and services completed as per contract.
  - b) Final balance documentation, if any, incorporating latest modifications in as built drawings has been submitted by the Contractor in requisite copies.
  - c) The Contractor has rectified in a definite manner all objections/observations/defects mentioned in the 'Provisional acceptance certificate.
  - d) Completion of Performance Guarantee (PG) Test for the plant and acceptance of Performance Guarantee Test Report submitted.
  - e) Completion of Ten years O & M including 1st year Guarantee/warranty period O & M.
  - f) Taking over of the site after issue of completion certificate by the Purchaser.
- 1.41 '**Functional tests**' shall mean all activities undertaken after completion of erection and shall include mechanical and electrical check outs, safety checks, calibration of instruments and protection devices and such other tests carried out to ensure functional reliability of various sub-supporting systems.
- 1.42 '**Warranty period**' shall mean the period of 12 (twelve) months from the date of provisional take over.
- 1.43 '**GOODS & SERVICE TAX (GST)**' means taxes or cess levied under the Central Goods and Services Tax Act, Integrated Goods and Services Tax Act, Goods and Services Tax (Compensation to States) Act and various State/Union Territory Goods and Services Tax Laws and applicable cesses, if any under the laws in force (hereinafter referred to as relevant GST Laws) w.e.f. 01.07.2017, which shall be fully complied with by Bidders.

- 1.44 Words 'imparting' person shall include firms, Companies, Corporation, associations or body of individuals whether incorporated or not. Words imparting masculine gender or singular number shall also include the feminine gender and plural number and vice-versa where the context so required or permits.
- 1.45 '**Inspector**'/ '**Inspecting Engineer**' shall mean any person or persons, or any firm nominated by or on behalf of the Purchaser /CLUVPL or his duly authorised agent or to inspect equipment, supplies, materials or any type of work under the contract.
- 1.46 '**Instructions**' shall mean any drawings and/or instructions, oral and/or in writing details, direction and explanations issued by the or the CLUVPL from time to time during the 'Contract Period'.
- 1.47 '**Installation**' shall mean especially the whole of a system of machine, apparatus, and accessories, when set up and arranged for practical working by the Contractor and/or under the supervision of the Contractor and will include any service which the Contractor is required to perform at the site with his own and/or other staff and/or labour and/or Sub-Contractor for the due fulfilment of the Contract.
- 1.48 '**IEC**' means specifications of International Electro-Technical Commission.
- 1.49 '**Letter of Award (LOA)**' shall mean the official communication issued by SECL notifying legally to the Contractor that his bid has been accepted on mutually agreed terms, conditions and prices.
- 1.50 '**Liquidated damages**', not as a Penalty, is agreed upon between parties in the Contract towards time delay. Liquidated damages can also be prefixed towards shortfall in performance parameters agreed in a Contract.
- 1.51 **LANGUAGE FOR DRAWINGS AND INSTRUCTION** All the drawings, titles, notes, instruction, dimensions, etc. shall be in English Language only.
- 1.52 '**Manufacturer**' shall mean a person firm/company who manufactures and/or produces Plant, Equipment, Component Spare Parts etc.,
- 1.53 '**Mobilisation**' shall mean establishment as per contract of sufficiently adequate infrastructure by the Contractor at site inclusive of construction equipment, aides, tools & tackles, setting up site offices with facilities such as power, water, communication etc. establishing man power organisation consisting of Resident Engineers, Supervisory personnel and an adequate strength of skilled, semi-skilled and unskilled workers, who, with the so established infrastructure shall be in a position to commence execution of work at site(s), in accordance with the agreed time schedule of completion of works. 'Mobilisation' shall be considered to have been achieved if the Contractor is

able to establish infrastructure as indicated above to begin work at site in accordance with agreed schedule of work to the satisfaction of the CLUVPL.

- 1.54 **Month** shall mean English Calendar month.
- 1.55 **MWp** means Mega-Watt Peak.
- 1.56 **MWh** means Mega-Watt Hour.
- 1.57 **kWh** shall mean Kilo-Watt-hour.
- 1.58 **NOTICE IN WRITING OR WRITTEN NOTICE** shall mean a notice in written, typed or printed characters sent (unless delivered personally or otherwise proved to have been received by the addressee) by Email/registered post to the latest known private or business address or registered office of the addressee and shall be deemed to have been received in the ordinary course of post it would have been delivered.
- 1.59 **Notice** shall mean any written Notice issued by CLUVPL/Bidder/contractor.
- 1.60 **O & M** means comprehensive Operation & Maintenance of Commissioned Project/ Work/ Facilities under the contract.
- 1.61 **Particulars** shall mean the following:
- a) Specification
  - b) Drawing
  - c) Sealed pattern denoting a pattern sealed and signed by the Inspector.
  - d) Proprietary make denoting the product of an individual firm.
  - e) Any other details governing the construction, manufacture, supply and / or erection as per the Contract.
- 1.62 **Performance Guarantee Test** shall mean such tests as are prescribed in the Specification to be done by the Contractor.
- 1.63 **Plant, Equipment, Stores, Item or Material** shall mean and include plant, equipment, material, machinery or any part thereof to be provided for and the erection work to be done by the Contractor under the Contract.
- 1.64 **Price** shall mean the price agreed in the contract between the parties towards the scope of work.
- 1.65 **Project** shall mean the project specified in the tender documents and specification.

- 1.66 **Purchaser/Owner** shall mean and include SOUTH EASTERN COAL FIELDS LIMITED (SECL) and its different functionaries entrusted with the responsibilities in relation to this contract in respect of the area of responsibilities of such functionaries.
- 1.67 **Provisional Take Over** shall mean acceptance of prima facie and in principle subject to completion of all the scope of works related to each solar power project and entire capacity of each solar power project is exporting power to grid. This is not a complete acceptance of work entitling the Contractor to get full payment or to assume that all the obligations and terms and conditions of the contract have been fulfilled to the satisfaction of the CLUVPL.
- 1.68 **Price Reduction** shall mean the EPC Contract price by way of reduction in price for delay and not as LD in the case of Contractor fails to adhere to the time schedule specified for commissioning of Solar power Projects.
- 1.69 **PLANT AND EQUIPMENT** means permanent plant, equipment, machinery, apparatus, articles and things of all kinds to be provided and incorporated in the Facilities by the Contractor under the Contract (including the spare parts, consumables, refills etc., to be supplied by the Contractor) but does not include Contractor's Equipment.
- 1.70 **Specification** shall mean the Technical – Commercial specification including modification set in the tender / contract documents.
- 1.71 **Sub-Contractor** means a Contractor selected with the approval of the owner to carry out certain part of the scope of work.
- 1.72 **Sublet** shall mean to let out the work to another.
- 1.73 **Sub-supplier** means the supplier selected with the approval of the owner to supply certain items included in the Scope of Work.
- 1.74 **Supervision** shall mean the successive control and directions given by the Contractor in relation to Contract work during execution of the Contractor's and/or his sub-Contractor's work.
- 1.75 **Successful Bidder/Tenderer** shall mean the Contractor whose bid is considered for acceptance.
- 1.76 **Supply** shall mean the goods to be supplied by the Contractor under the 'Contract'.
- 1.77 **Tender** shall mean the Contractor's offer with his terms, conditions, Specifications and prices to perform the scope of work
- 1.78 **Test** shall mean such test / tests stipulated or considered necessary by the Inspecting Officers.

- 1.79 **Time** shall be reckoned by months, weeks, days and hours, month being equivalent to the Calendar month according to the Gregorian Calendar. The day or days unless herein otherwise expressly defined shall mean Calendar day or days of 24 hours each.
- 1.80 **Time of completion** shall mean the time / period stated / agreed for completing the scope of work specified in the contract.
- 1.81 The term '**Transport Portion**' of the Contract Price shall mean charges on all the mode of transport envisaged under Contractor's scope including inter-carting storage at any intermediate point.
- 1.82 **Warranty** shall mean Contractor's assurance to the PURCHASER that the goods or property is or shall be as represented and if not it will be repaired and reconditioned or replaced by the Contractor at his cost or expenses.
- 1.83 **Weight** shall mean the calculation of a load. It is to be stated in ton (1 ton = 1000 kilogram) and / or kilogram (1 Kilogram = 1000 gram).
- 1.84 **Works** shall mean plant, non-plant, buildings, Structures, Foundations and all plants, Equipment, Components to be provided and other construction/ erection services that the contract requires the Contractor to provide.
- 1.85 Words **importing persons** shall include firms, Companies, Corporation, Words importing masculine gender or singular number shall also include the feminine gender and plural number and vice-versa where the context so requires or permits.
- 1.86 **Terms and expressions** not herein defined shall have the same meaning as are assigned to them in the Indian Sales of Goods Act (1930), failing that in the Indian Contract Act (1872) and failing that in the General Clauses Act (1897) and such others as mentioned from time to time.
- 1.87 **Writing** shall include any manuscript, typewritten or printed statement, under or over signature and/or seal as the case may be.
- 1.88 **WEEK** means a period of any consecutive seven days.

## **SECTION- 2**

### **SCOPE OF SUPPLY AND SERVICES**

#### **2.0 SCOPE OF WORKS & BATTERY LIMITS**

##### **2.1 SCOPE OF WORKS**

The scope of work includes Site study, Site development, Design, Engineering, Manufacture, Inspection at supplier's works, Supply, Insurance, Transport, Storage, Erection, Testing, approval from Chhattisgarh State Electricity Authorities, Bay Extensions, external transmission lines, Metering arrangements and Commissioning with associated power evacuation system including connectivity with SECL SS. Performance Guarantee test and Operation & Maintenance for a period of 10 years including first year warranty period O & M for total 40 MW (AC) capacity at Bishrampur and Bhatgaon locations on Lump-sum turnkey basis.

For detailed scope of works: Refer Technical Volume-II.

##### **2.2. Scope of Supply for Plant & Equipment**

The scope of supplies and services of the Contractor for Plant and Equipment is detailed in Technical Specification-II and the relevant Annexure, General Terms and Conditions of Contract in SECTION-10 of this Volume IB.

##### **2.3 Scope of Services**

###### **I. Technical Services**

The Contractor shall be responsible for the following services including those Services stipulated elsewhere in the Tender Specification:

- a) Detailed design and engineering
  - b) Technical services relating to planning, procurement, manufacturing, inspection, expediting, packing, shipping, storing, etc.
  - c) Project management activities and complete feedback of data and information to CLUVPL regarding Contractor's scope of supply and services.
  - d) Time bound project co-ordination relating to transportation, insurance, claim settlement, inspection, construction planning and scheduling, erection planning, field construction engineering, testing, start up, trial run, commissioning and Performance Guarantee Tests. The Contractor shall bring his own or Sub-Contractor(s) Specialists for the performance of the above mentioned works.
  - e) Total day to day supervision of construction including erection and specialised services, if any.
  - f) Technical consultation/liaison/guidance relating to detail design and plant engineering by its sub-Contractors.
  - g) Quality control and adherence to the time schedule control of site work and

other works.

- h) Testing, Grid Connectivity, commissioning and Demonstration of Performance Assessment Tests by deputing experts/specialists.
- i) Clearance and approvals for installations including power evacuation system from the statutory and other concerned authorities on behalf of CLUVPL. The Contractor shall also assist in preparing application forms, providing necessary drawings, documents, test certificates etc., including necessary co-ordination with statutory and other concerned authorities.
- j) Submission of complete as built drawings/documents, O&M Manuals etc., as instructed by CLUVPL.

The Contractor shall be responsible for supply of all the drawings and technical documents & information in respect of the plant & equipment. The Contractor shall deliver the drawings, technical documents and information to CLUVPL and their authorised agency.

## **II. Contractor's Supervision:**

The Contractor shall give or provide all necessary supervision during the implementation of the projects and the Construction Manager or its deputy shall be constantly on the Site to provide full-time supervision of the implementation of the projects. The Contractor shall provide and employ only technical personnel who are skilled and experienced in their respective fields and supervisory staff who are competent to adequately supervise the work at hand.

## **2.4 Construction, Erection & Installation Works**

1. The Contractor shall mobilise all necessary construction and erection tools & tackles, small hand tools, instruments, all commissioning instruments, bolts, nuts, washers, jigs and fixtures, winches, alignment tools etc. and the material handling equipments such as cranes, hoists etc., welding equipment and accessories, measuring instruments, temporary supports and staging, consumables (e.g. welding gas, electrodes etc), erection packs etc for erection of steel structures, and other equipment which may be required for carrying out the construction and erection work efficiently within the time schedule provided herein in the Contract. The Contractor shall ensure that proper documentation is followed at entry gate of PURCHASER's premises for such items which shall be carried back by Contractor after completion of work.

2. The Contractor shall carry out any and all such works, as may be required, to build the project complete in all aspects as per the Contract Specification.

3. The Contractor shall make all necessary arrangements to deliver the equipment at the project site by wagons/trucks/trailers, build his own stores (covered, uncovered, air-conditioned, if necessary) for the proper storage of equipment, maintain the stores and all related documents and records, transport the equipment to site for erection purpose. Necessary security arrangements also shall be made by the Contractor. Area required for construction of stores and construction site office, labour colony, etc. shall be made available by the Contractor.

4. The Contractor shall be responsible for proper and neat storage and also undertake conservation of all consignments including damaged boxes. During storage of equipment, the

Contractor shall take into account deterioration and carry out the re-conservation of the complete equipment/parts/supplies as may be necessary as per the storage instructions of the Manufacturer of equipment/components. The Contractor shall also supply the consumables required for such re-conservation work and repair/replace parts required thereof for the proper functioning of the equipment after erection and commissioning.

5. The Contractor shall unpack and do visual checking against physical damages to the equipment/cases, clean equipment before start of erection. Damage/ shortage, if any, will be reported to the CLUVPL and shall be rectified/replaced expeditiously, so as not to upset the erection and commissioning schedule. Delay on account of settlement of insurance claims by the Contractor shall not be considered as an excuse for delay in completion of erection and commissioning.

6. The Contractor shall mobilize all necessary erection equipments including material handling equipment such as cranes and hoists, compressors and other equipment and instruments and consumables, all commissioning equipment and instruments, welding equipment, winches, alignment tools, precision levels, theodolite, etc. which may be required for carrying out the erection and commissioning work efficiently. All instruments shall be properly calibrated before use. Unless otherwise specified, the above erection equipment/ materials shall be the property of the Contractor. However, CLUVPL's prior permission shall be required for removal of these erection equipment/ materials from the site. The Contractor shall ensure that proper documentation is followed at entry gate for such items which shall be carried back by Contractor after completion of work.

7. The Contractor shall mobilise all temporary ladders, scaffolding materials, platforms, supports and other necessary facilities required for handling, erection, testing and visual inspection of supplies at the point of installation and shall also provide necessary packing plates, wedges, shims, leveling screws etc. required for erection of equipment and structures.

8. The Contractor shall mobilise erection consumables like oxygen gas, acetylene gas, argon gas, welding rods, filler wire, solder lugs, oil, grease, kerosene, cotton waste, etc. required for erection of equipment and steel structures and required items for commissioning activities.

9. The Contractor shall erect and maintain his own site offices and stores, as required for the work and arrange for proper house-keeping and up-keep of the area.

10. The Contractor shall provide sufficient fencing/barricade, notice boards, signage and lighting to protect and warn others as may be considered necessary by the CLUVPL. All materials used for providing these facilities shall be the property of the Contractor.

11. The Contractor shall mobilise adequate material handling equipment such as mobile cranes, forklifts, trailers, dozers, winches etc in addition to other erection tools & consumables keeping in view the erection schedule. The Contractor shall provide within two weeks from the date of Letter of Award, his scheme for mobilisation with Bar Chart indicating clearly the resources, manpower and machinery proposed to be deployed to ensure timely completion of work and quality of workmanship.

12. Underground/Over Ground services, if any to be diverted / protected shall be the responsibility of the Contractor and shall be informed to the CLUVPL. Approval from authorities required for such works shall be obtained by the Contractor. The compensation / statutory payments if any for such works shall be borne by the Contractor.



13. The Contractor shall organise the work in such a manner that work being carried out simultaneously at site is not impeded and the workmen not endangered and shall arrange all temporary access as required for the erection work.

14. The Contractor shall carry out base/primer and final painting of all Plant & Equipment, Structures, Pipelines, etc. supplied. The painting including its process shall be carried out as specified in the detailed technical specification. Where not specified, the same shall be as per the standard codes & practices normally applicable and adopted internationally for the type of Plant & Equipment offered.

15. Grouting of the equipment and steel structures on the foundations with approved non-shrink-grouting compound shall be the responsibility of the Contractor. The grouting materials shall be supplied by the Contractor.

16. All safety, health and pollution control measures as required to be adopted as per the statutory regulations and the safety codes for projects issued along with the tender or otherwise required or implied by local statutory regulations or practices shall be strictly followed by the Contractor during the entire duration of execution of the Contract. The Contractor shall set up a suitable safety organization of its own at site, in this regard.

17. The Contractor shall not dispose of, transport or withdraw any tools, tackles, equipment, and material provided by him for the "contract" without taking prior written approval from the CLUVPL.

18. The Contractor shall be responsible for all damages, losses etc. due to fire or otherwise, if it is due to his negligence, improper installation, operation and/or maintenance of his part of installations.

## **2.5 Demonstration of Performance Guarantee test.**

Refer Technical Specification-II

## **2.6 Water for Construction and for O & M**

1. The Contractor shall make their own necessary arrangements for water supply for construction, operations and maintenance of the Solar Power Plant. However, charges if any claimed by any competent authorities in future for usage of underground water or for bore-well, the same shall be payable by the Contractor without any extra cost to the PURCHASER.
2. The scope includes arrangement of Construction Water and for O & M at each location of project site by the Contractor.
3. All payments towards arrangement and supply of water shall be borne by the Contractor. The Contractor shall make his own arrangements to lay and maintain further necessary distribution lines at his own cost. The Contractor shall arrange for storage sumps, pumps and distribution piping to various locations within the solar power plant. The Contractor shall be responsible to store water in sufficient quantity to meet its requirements in well built covered/protected water storage tanks / sumps.
4. The Contractor shall ensure that there is no wastage of water. The Contractor shall also be responsible for maintaining the taps, pipe lines etc. in proper condition. The Contractor shall obtain prior approval of the PURCHASER of his distribution scheme before laying the pipelines. Non-availability of water in the project site shall not be excuse for delay in completion of Project. The Contractor may at his own cost arrange

suitable backup water supply.

## **2.7 Construction Power**

1. In respect of power supply required during construction period, the Contractor has to apply to local power distribution authorities / SECL in the prescribed application form at its own cost and the Contractor shall also be responsible for all including timely payments etc.
2. The Scope includes arrangement of construction power for the purpose of the construction and erection for each location of project site /sites. All payments towards availing power supply and usage charges and deposits shall be borne by the Contractor. The Contractor shall make his own arrangements for further distribution. The Contractor shall make his own arrangements to lay and maintain necessary supply lines for temporary power. All temporary wiring must comply with local regulations and relevant Indian Electrical Act and will be subject to the SECL's/CLUVPL's inspection and approval before connection to supply and later. Non-availability of power shall not be an excuse for delay in completion of erection construction. Contractor may at his own cost arrange suitable back-up power.
3. The Contractor will supply and install all distribution cables, wires and switches etc. of rated capacity for the commencement of work from the source of power at his own cost. He will employ Electricians having valid Electrical License for carrying out the installations as well as for the maintenance works.
4. The Contractor will facilitate the SECL /CLUVPL or his authorised representative for inspecting his temporary electrical installation as and when required. The Contractor will immediately attend to the defects so pointed out during this inspection including replacement of faulty cables, switches etc.
5. The SECL/CLUVPL is not liable for any loss or damage to the Contractor's equipment as a result of variation in voltage or frequency or interruption in power supply or other loss to the Contractor arising there from.
6. The Contractor will have to provide and install his own lights and power meters which will be governed as per Central/ State /UT Government Electricity Rules.
7. In case of damage of any of the Employer's/ Owner's equipment on account of fault, intentional or unintentional on the part of the Contractor, the Employer/ Owner reserves the right to recover the cost of such damage from the Contractor's bill.

## **2.8 Codes and Standards**

All works to be executed and/or engineering services and technical services to be rendered under this Contract, shall be completed in the manner set out in this Contract and in accordance with the specified codes, Standards and best trade/ engineering practices. Wherever the codes are not mentioned or in case of code discrepancies, relevant Indian Standards / International Standards approved by SECL/CLUVPL shall be followed.

## **2.9 Total Responsibility**

The Contractor shall be solely responsible for the entire supplies, engineering services and technical services, irrespective of whether supplies and services have been made/

rendered by him directly or by his Sub-Contractor of this contract.

### Spares

The Contractor shall maintain Spares and consumables which are necessary or useful for satisfactory and trouble-free operation and maintenance of the plant till the end of the Ten years O & M period without any extra cost to SECL.

## **2.10 General**

Minimum wages for contract labour shall be paid as applicable in that region from time to time as per statutory norms. Claims and objections due to ignorance of site conditions will not be considered after submission of Bid.

- (a) The Contractor is required to carefully examine the Technical & General Specification, Terms and Conditions of Draft Contract, drawings and other details relating to work as given in the Tender Document and fully acquaint himself as to all conditions and matters which may in any way affect the work or the cost thereof. The Contractor shall be deemed to have on his own and independently obtained all necessary information for the purpose of preparing the Bid and his bid as accepted shall be deemed to have taken into account all contingencies as may arise due to such information or lack of the same.
- (b) The Contractor shall be deemed to have exhaustively examined the Tender documents including the Draft Contract, to have obtained all information and clarifications on all matters whatsoever that might affect the carrying out of the work and to have satisfied himself as to the adequacy of his Bid. He is deemed to have known the scope, nature and magnitude of the work and the requirements of materials and labour involved etc. and as to all work he has to complete in accordance with the Contract whatever be the defects, omissions or errors that may be found in the Tender/Bid Documents.
- (c) The Contractor shall be deemed to have acquainted himself with the Indian Income Tax Act, 1961, Indian Companies Act, 1956, Indian Customs Act, 1962, Indian Electrical Act, CERC regulations, CEA rules, State Electricity rules and regulations & State Renewable Energy rules and regulations of State Government, MNRE guidelines, Factories Act, Pollution Control Regulation and other related Acts & Laws prevalent in India and as amended from time to time. The PURCHASER shall not entertain any request for clarifications from the Contractors regarding such local conditions.
- (d) Any neglect or omission or failure on the part of the Contractor in obtaining necessary and reliable information on any other matter affecting the Contractor shall not relieve him from any risks or liabilities or the entire responsibility of completion of the work in accordance with the Contract.

## **2.11 Surplus materials and scrap**

- a) Surplus materials / defective materials available after commissioning of the project shall be taken back free of cost by the Contractor with prior approval of the CLUVPL. The cost of removal shall be borne by the Contractor.
- b) Contractor shall take back all crates, packing cases, all packing materials including steel packing materials and other scrap materials then and there to keep the site free from scraps.

c) No imported material shall be allowed to be taken out other than imported tools and tackles and instruments brought by the Contractor on drawback basis, provided he has carried out necessary documentation at the time of bringing such items inside the Plant.

d) Replacements/ Disposal of materials during construction as well as O&M during warrantee period shall be carried out by the contractor with utmost care without affecting the environment and all the scrap shall be taken out by the contractor and shall be disposed as per the standard practice and prevailing norms.

e) Necessary permission from concerned authorities shall be obtained for disposal of any item within the Solar site area.

## **2.12. Clearances & Approvals Required From The State Government And**

### **Other Local Bodies:**

a. All approvals, permits and clearances required for setting up of the Project including those required from State/Central Government and local bodies shall be in the scope of the Contractor.

b. The Contractor shall obtain requisite approvals from the Electricity authority / appropriate authority as applicable, to connect the Power Project with the Interconnection Facilities at the Delivery Point.

c. The Contractor shall apply for all necessary approvals, permits and clearances within the stipulated period according to the requirement from the issuance of LOA, which shall be complete in all respects, incorporating the clarifications/changes as required by the concerned authorities. In case of any of the clearances as indicated above being not applicable for the said Project, The Contractor shall submit an undertaking in this regard, and it shall be deemed that The Contractor has to obtain all the necessary clearances for establishing and operating the Project. Any consequences contrary to the above shall be the responsibility of the Contractor. The clearances, as applicable for the Project, shall be required to be submitted to SECL/CLUVPL prior to commissioning of the Project.

## **2.13. Contractor's Subordinate Staff and their Conduct**

i) The Contractor, on or after award of the Work shall name and depute a qualified Engineer having sufficient experience in carrying out work of similar nature, to whom the equipment, materials, if any, shall be issued and instructions for works given. The Contractor shall also provide sufficient and qualified staff to superintend the execution of the Work, competent sub-agents, foremen and leading hands including those specially qualified by previous experience to supervise the types of works contained in the Contract in such manner as will ensure work of the best quality, expeditious working. Whenever in the opinion of the Engineer-in-Charge/Project Manager additional properly qualified supervisory staff is considered necessary, they shall be employed by the Contractor without additional charge on ac-

counts thereof. The Contractor shall ensure that Sub-Contractors, if any, shall provide competent and efficient supervision, over the work entrusted to them.

- ii) If and whenever any of the Contractor's or Sub-Contractor's agents, sub-agents, assistants, foremen, or other employees be guilty of any misconduct or be incompetent or insufficiently qualified or negligent in the performance of their duties, it is undesirable for administrative or any other reason for such person or persons to be employed in the works, the Contractor, shall at once remove such person or persons from employment thereon. Any person or persons so removed from the works shall not again be employed in connection with the Works. Any person so removed from the Work shall be immediately replaced at the expense of the Contractor by a qualified and competent substitute. Should the Contractor be requested to repatriate any person removed from the works he shall do so and shall bear all costs in connection herewith.
- iii) The Contractor shall be responsible for the proper behavior of all the staff, foremen, workmen, and others, and shall exercise a proper degree of control over them and in particular and without prejudice to the said generality, the Contractor shall be bound to prohibit and prevent any employees from trespassing or acting in any way detrimental or prejudicial to the interest of the community or of the properties or occupiers of land and properties in the neighborhood and in the event of such employee so trespassing, the Contractor shall be responsible therefore and relieve the Owner of all consequent claims or actions for damages or injury or any other grounds whatsoever. The Contractor shall be liable for any liability to Owner on account of deployment of Contractor's staff etc. or incidental or arising out of the execution of Contract. The Contractor shall be liable for all acts or omissions on the part of his staff, Foremen and Workmen and others in his employment, including misfeasance or negligence of whatever kind in the course of their work or during their employment, which are connected directly or indirectly with the Contract.
- iv) If and when required by the Purchaser and Contractor's personnel entering upon the Purchaser's premises shall be properly identified by badges or gate passes which must be worn at all times on Purchaser's premises. Contractor may be required to obtain daily entry passes for his Staff/ Employees to work within operating areas. These being safety requirements, no relaxations on this account shall be given to Contractor.
- v) Contractor shall at all times provide CLUVPL access to site and office during construction/ O&M periods and also provide them with any data/ information sought for.

## SECTION-3

### **3.0 CONTRACT PRICE**

- i) The total price in respect of the scope of supplies and services for the entire works covered by and in accordance with all terms, conditions, stipulations, specifications, requirements and other conditions of the Contract and incorporated in the Price Schedule, shall be treated as the Contract Price.
- ii) The Contract Price shall be deemed inter-alia to include and cover the cost of deployment of construction equipment, temporary works, establishment of labor camp, all materials and supplies, labor, insurance, stores, appliances, security arrangements, safety and firefighting arrangements (including those required during dismantling, construction, storage and erection) to be supplied/used by the Contractor and all such other materials and services and actions that may be necessary or derived or statutorily required in connection with the execution of the works as per the Contract or any portion thereof complete in every respect and maintained as detailed in the contract documents or as may be required in terms of the Contract.
- iii) The Contract Price shall be deemed to include and cover the cost of all royalty and fees for all articles, and processes, protected by letters, patent or otherwise incorporated in or used in connection with the work, also all royalties except expressly stated in the contract, rents and other payments in connection with obtaining all materials for the work and the Contractor shall indemnify and keep indemnified the PURCHASER, which indemnity, the Contractor hereby gives against all actions, proceedings, claims, damages, costs and expenses arising from the incorporation in or use of work of any such articles, processes or supplies.
- iv). Single contract or separate contracts for supplies, services, during warranty period etc., may be entered with suitable interlinking clauses in the EPC contract. However the separate contracts shall have necessary provisions to take care of single bidder responsibility, price reduction, purchaser's right to recover dues including price reduction from payment due under any of the contracts, warranty and performance Guarantee etc.,  
In view of the above, any liabilities arising out of such contracts shall be borne by the bidders/contractors.  
However separate contract will be entered in to for 10 years solar O & M.
- iv) All the payments for supplies shall be payable in Indian Rupees only.
- v) The contract price shall be firm till completion of the contract period.

### **3.1 Contract Price Break-up**

- i) The Contract Price indicated in the Price Schedule shall be for the scope of work and services detailed under section-2 & Section-8 scope covered and technical specification and for all the contractual obligations of the Contractor if any, under the Contract.

(After the issue of Letter of Award (LOA), the agreed contract price will be detailed here while signing the Contract with the successful Bidder).

- ii) The Contractor shall furnish the detailed billing break-up for each item for the approval of CLUVPL, which after the approval only, will be the basis for submission of invoices for progress of payments.

### **3.2 Price Basis**

- i) In respect of equipment and steel structures and other supplies supplied by the Contractor from Indian sources, the prices mentioned here in above are for delivery on Ex-works basis, suitably and securely packed for handling and movement by road and rail.
- ii) The Contract price stated above shall include supply of mandatory spares, Tools & Tackles, instruments, appliances for erection, operation and maintenance, consumables till the completion of Contract.
- iii) The Contract price shall include the cost of all foundation bolts, anchoring parts, floor plates, hand railings, cross overs, safety guards etc.
- iv) The Contract price shall also include cost of painting, packing, forwarding, loading, freight, insurance, unloading, handling, clearing, port charges, storing, conservation and re-conservation, fees and all expenses in connection with the execution of the Contract.
- v) All the equipment should be covered by the Insurance Policy till the completion of Contract including O& M for 10 Years.
- vi) The Contract price indicated in the price schedule shall be inclusive of all taxes and duties as indicated in Section-5 hereto.

### **3.3 Firm Price**

3.3.1 The prices for all imported supplies including Design & Engineering fees, spares, tools & tackles, freight, insurance, training charges and services including Design & Engineering fees shall be firm and shall not be subject to any escalation whatsoever.

3.3.2 The prices for supply of all Indian spares, inland transport and insurance shall be firm and shall not be subject to any escalation whatsoever.

### **3.4 Price Variation for Indigenous Equipment Supplies & Services:**

Not Applicable.

### **3.5 Adjustment of Price:**

Not Applicable

### **3.6 Taxes and Duties**

The contract price as indicated above shall be inclusive of all taxes & duties as indicated in Section-5 hereto.

Contract price shall be the price, as admitted in accordance with the provisions of Section-3 of this Volume of the specification.

**SECTION-4**  
**TIME SCHEDULE**

**4.0 TIME SCHEDULE**

**4.1 TIME SCHEDULE - Firm and Binding**

The basic considerations and the essence of the 'Contract' shall be the strict adherence to the time schedule for performing the works in the contract. The time and the date of completion of the project activities as stipulated in the Time Schedule of Tender specification and accepted by the PURCHASER shall be deemed to be the essence of the Contract. The Contractor shall so organise his resources and perform this work as to complete it not later than the date agreed to. The time to complete the Works contracted for shall be reckoned from the date of issue of the "Letter of Award" to the Contractor. The Lands required for setting up of solar project are under the possession of SECL and the Lands are deemed to be handed over as is where is basis to be contracted.

**4.1.1 Time schedule for Commissioning:**

The Contractor shall complete Site study, Site development, Design, Engineering, Manufacture, Inspection at supplier's works, Supply, Insurance, Transport, Storage, Installation, Erection, Testing, approval from Chhattisgarh State Electricity Authorities, Bay Extensions, external transmission lines and its augmentation, Metering arrangements and Commissioning with associated power evacuation system including connectivity within 9 months from the date of LOA.

**4.2 TIME SCHEDULE FOR SUBMISSION OF PROJECT DATA, DRAWINGS AND DOCUMENTS**

**4.2.1** The Contractor shall submit the various drawings and documents listed and as specified in Technical Specification. Hard copies shall be submitted for CLUVPL approval as specified in Section-2 of the Technical specification. Additional copies, if any, required by CLUVPL shall be furnished by the Contractor, without any extra cost. The Contractor shall supply all drawings/documents and the drawings/documents supplied will be the property of PURCHASER. In addition to hard copies, soft copy of all drawing/ documents shall be submitted by the Contractor through CLUVPL mail, details of which will be furnished after issue of LOA.

Within 15 days from the date of issue of Letter of Award, the Contractor shall submit for approval to the CLUVPL the list of all drawings and documents by title, using the approved numbering system and indicating the schedule of submission of drawings in conformity with the time schedule. This list of submission and approval shall be updated and submitted by the Contractor at the end of every month.

**4.2.2** All the drawings and documents shall be prepared in accordance with contractual requirements and also as per the best engineering practices. Contractor shall submit all drawings and documents in hard copy form only for approval purpose. Approval in respect of drawings shall be accorded by the CLUVPL within two weeks of receipt of



the same. In case drawing is not complete and/or is not approved, the comments shall be furnished to the Contractor within two weeks of receipt of drawing in hard copy. Any submission with gross omissions and/or errors will not be considered as a valid submission. If any document/drawing were commented by CLUVPL, the Contractor has to incorporate the comments and resubmit the document within one week for approval by the CLUVPL. This review and / or approval of the drawings by CLUVPL will not relieve the Contractor of any of his responsibilities under this contract.

4.2.3 The sequence of submission of feed back data, delivery of structurals, mechanical equipment and electrical equipment, instrumentation, submission of erection instruction and erection drawings and other supplies and services by the Contractor shall be as per the L1 PERT network schedule.

### 4.3 PERT NETWORK

4.3.1 Level-I PERT network of the project (submitted along with the bid) shall be resubmitted by the Contractor for CLUVPL approval and finalised within one month from the date of Letter of Award. The approved L- 1 PERT will be annexed to at the end of this Section in the contract document.

4.3.2 Detailed Level-2 PERT network of all systems/sub systems/ discipline/ equipment etc. incorporating activity-wise quantity shall be submitted and finalised within one month from the date of Letter of Award. These-detailed networks shall be prepared based on the milestones reflected in Level-I network, which shall be the basis for performance of the Contract. The list of activities that shall appear in the PERT Network is as follows:

<b>PROJECT TIME SCHEDULE</b>		
<b>Sl. No.</b>	<b>Description</b>	<b>Periods from date of LoA</b>
<b>1.</b>	<b>Issue of LOA - Zero Date</b>	<b>D</b>
<b>2.</b>	<b>Site study and site development, power evacuation and connectivity approvals, Supply, Erection, Testing &amp; Commissioning</b>	<b>D+9 Months</b>

<b>3</b>	<b>Provisional takeover of all the Projects</b>	<b>D+12 Months</b>
<b>4.</b>	<b>First Year warranty period O &amp; M ( From the date of Provisional Take Over of all the projects )</b>	<b>D + 24 Months</b>
<b>6.</b>	<b>2nd year O &amp; M to 10th Year O &amp; M Contract period</b>	<b>09 Years</b>

- 4.3.3 The Contractor shall submit detailed construction resource planning along with Level-2 networks.
- 4.3.4 The Contractor shall submit estimates of quantities/volume of work sub-system wise, discipline wise, list and weights of equipment (mechanical/electrical/instrumentation) etc during execution stage as per requirement.
- 4.3.5 All PERT network shall be furnished in MS Projects both in Hard copies and Soft copies.
- 4.3.6 The bio-data of key personnel shall be submitted within one month of the date of issue of Letter of Award (LOA) and for others two months before their deputation.
- 4.3.7 Drawings of equipments shall be supplied at least one month before the shipment of the equipment.
- 4.3.8 All “as built drawings” shall be submitted by the Contractor before Final Take Over.
- 4.3.9 Erection Instructions for the Plant and Equipment shall be submitted by the Contractor at least one month before the shipment of the respective Plant & Equipment.
- 4.3.10 The delivery of equipment shall be deemed to be completed when all equipment and drawings/documentations have been supplied by the Contractor. Mandatory spares shall be delivered along with the last consignment of the respective equipment. The Mandatory spares shall be maintained at stores after Provisional Takeover.
- 4.3.11 Erection of the system / equipment shall be deemed to be completed when all equipment for the normal functioning of the plant / system are erected at site.
- 4.3.12 Demonstration of performance guarantee tests shall be deemed to have completed when the Contractor has demonstrated and has achieved performance values as per Technical Specification ( Volume-II) and Section-9 of Volume-IB
- 4.3.13 The Contractor shall render timely and adequate technical services through his Specialists to ensure completion of civil work, erection, commissioning and demonstra-

tion of performance guarantee tests as per relevant Clauses of Section -10 of Volume-IB

4.3.14 The Contractor shall prepare and submit in a time bound manner necessary drawings of proper standard with best engineering practices. The Contractor shall be responsible for obtaining timely approval of the drawings from CLUVPL to ensure completion of work within the time schedule. Any delay due to incomplete submission and consequent delay in approval shall be to the account of the Contractor. The Contractor shall not claim any time extension on this ground.

4.3.15 The Contractor shall ensure to send all letters with authentication through FAX/E-mail and a confirmation copy of the same through courier/Speed Post. All drawings and documents shall be sent through CCMS / Speed Post / in Person.

#### **4.4 DELIVERY OF EQUIPMENT, SOLAR MODULES, MODULE MOUNTING STEEL STRUCTURES, CABLES, SCADA, SPARES ETC.**

The delivery periods shall be reckoned from the date of Letter of Award.

4.4.1 The delivery of equipment, solar modules, module mounting steel structures, cables, scada, spares etc, including the foundation bolts and inserts in respect of the plant and equipment shall be completed as given in the Overall time schedule.

4.4.2 Delivery of all indigenous equipment, steel structures including foundation bolts and inserts shall be completed on FOR site basis as given in the Overall Time schedule.

4.4.3 Delivery of all supplies shall be made strictly in sequence of erection at site unless otherwise differently agreed to by CLUVPL.

#### **4.5 MAINTAINING SPARES**

The required spares shall be maintained and shall be dispatched along with the consignment of the respective equipment. The required Mandatory spares shall be maintained by the Contractor at the stores till the end of the Ten years solar O & M period.

#### **4.6 DELIVERY OF ENGINEERING SERVICES**

The delivery of the engineering services, drawings and documents will be completed as per the time schedule mentioned herein before and will be delivered to CLUVPL.

#### **4.7 RESPECTS FOR TIME SCHEDULE AND PRICE REDUCTION FOR NON FULFILMENT OF THE TIME SCHEDULE.**

i. The time schedule stipulated in the Contract shall be adhered to on the clear understanding that the Contract Price has been fixed with reference to the said Time Schedule.

ii. If any delay is anticipated by the Contractor beyond the stipulated time schedule, the Contractor shall forthwith inform CLUVPL in writing of such anticipated delay and of the steps being taken by the Contractor to remove or reduce the anticipated delay, and shall promptly keep CLUVPL informed of all subsequent developments.

#### **4.8 PRICE REDUCTION CLAUSE (PR)**

1. Time is the essence of the CONTRACT. In case the CONTRACTOR fails to adhere to the time schedule specified in Clause No. 4.1.1 (Commissioning of the solar plants within 9 months ) of this section then, unless such failure is due to Force Majeure (as defined in Clause No. 10.31) or due to PURCHASER'S defaults, the EPC Contract price shall be reduced by 1/2 % (Half percent) of the contract price per week of delay or part thereof for the un commissioned capacity of the plants subject to a maximum of 5% (Five percent) of the EPC Contract price by way of reduction in price for delay and not as LD.
2. In case of delay on the part of CONTRACTOR, the invoice value shall be reduced proportionately for the delay and payment shall be released accordingly. Effecting of Price reduction shall in no way relieve the Contractor from its contractual obligations to complete the works or from any of the obligations under the contract. Any delay in effecting Price reduction shall not constitute waiver of the right of the Purchaser under the contract towards Price reduction.
3. Both CONTRACTOR and PURCHASER agree that this is a genuine pre-estimate of the loss/damage which the PURCHASER would have suffered on account of delay/breach on the part of the CONTRACTOR and the said amount will be payable on demand or said amount will be adjusted from the amount payable to the CONTRACTOR, without there being any proof of the actual loss/ damages having been caused by such delay/breach.
4. The decision of the PURCHASER with respect to applicability of Price Reduction shall be final and binding.
5. The Price Reduction will be calculated on the basis of EPC Contract Value of Contract excluding GST where such GST have been shown separately in the Contract.
6. In case of delay in execution of contract, Contractor will raise invoice for reduced value as per Price Reduction Clause. If Contractor has raised the invoice for full value, then Contractor will issue Credit Note towards the applicable Price Reduction amount.
7. In case, Contractor does not reduce the invoice value proportionately or does not issue credit note as mentioned above, Purchaser shall release the payment to contractor after effecting the Price Reduction or may deduct the amount so payable by Contractor from any amount falling due to the Contractor or by recovery against the Contract Performance Guarantee.

8. In the event any financial implication arises on PURCHASER due to issuance of invoice without reduction in price or non-issuance of Credit Note, the same shall be to the account of CONTRACTOR.”
9. If the reason for the delay is solely attributable to the Purchaser and/or Force Majeure, adequate time extension shall be given to the Contractor to that extent of delay without Price reduction.
10. If the reason for the delay is purely attributable to the Contractor, Price Reduction will be effected and extension of time may be granted.
11. The Purchaser, for this clause, shall include Purchaser and other entities/agencies engaged by the Purchaser for fulfilling its obligations for this project.
12. Without prejudice to its rights Price Reduction Clause hereof and to entitlement to amount accrued due to price reduction in terms thereof and in addition thereto, PURCHASER may at any time after the expiry of the stipulated date(s) of Delivery in respect of any Material(s) / Equipment(s)/ Service(s)/ Work(s), at its discretion, terminate in whole or part the Contract in respect of the undelivered Material(s)/ Equipment(s)/ Service(s)/ Work(s) or any of them and either purchase such Material(s)/ Equipment(s)/ Service(s)/ Work(s) from any other available source at the risks and costs of the CONTRACTOR and recover from the CONTRACTOR any additional cost incurred by it on such purchase, or recover from the CONTRACTOR without such purchase the difference between the market and contract price of such Material(s)/ Equipment(s)/ Service(s)/ Work(s) on the date of termination of Contract relative thereto. Provided, this shall not restrict PURCHASER's/CLUVPL's claim for damages or compensation, as the case may be, for acts of fraud, deliberate default, negligence or misconduct by the CONTRACTOR.
13. The Purchaser may, without prejudice to any method of recovery, deduct the amount of Price Reduction from any amount due to the Contractor, under this or under any other Contract awarded by the Purchaser in his / their favour.
14. If the implementation of the project gets delayed due to the delays in obtaining Environmental clearances and Statutory approvals from the Government and land acquisition process, which is not attributable to the Contractor, necessary extension of time will be given without effecting Price Reduction. However, no cost escalation will be considered for the extended period of completion.

## **4.9 Recovery**

The Purchaser may without prejudice to any method of recovery, deduct the amount for such Price Reduction from any amount/BG due or become due to the Contractor either under this or any other Contract. Payment of Price Reduction shall in no way relieve the Contractor from his Contractual obligations to complete the works or from any of the obligations under this Contract. Any delay in the recovery of Price Reduction shall not constitute waiver of the right of the Purchaser under the Contract towards levy and recovery of Price Reduction.

## **4.10 IMPLEMENTATION STRATEGY**

### **4.10.1 TIME SCHEDULE**

The heads to be covered in the L1 PERT network schedules broadly are:

Submission of basic engineering and approval, issue of ordering specifications, placement of orders of equipment, submission and approval of drawings for Mechanical/ Electrical/Instrumentation equipment, etc. manufacture and supply of equipment, civil and structural works, submission of erection drawings and manuals, erection of mechanical/electrical equipment, testing and trial power export and provisional take over etc. The major milestones for the principal items are to be highlighted in the schedule.

4.10.2 The Contractor shall submit:

- i) Level- 2 PERT network schedule including details of pre-construction activities and execution work.
- ii) Estimates of quantities/volume of work and other details such as list of specifications, list of drawings, quantum of work discipline wise, list of equipment (mechanical/ electrical/instrumentation) etc.
- iii) Updated level II networks [Tracking Gantt] along with progress reports (formats to be mutually finalized) shall be furnished as and when required.

## **4.11 CONSTRUCTION/ERECTION PLAN**

### **4.11.1 GENERAL**

The Contractor shall submit a write-up for construction/erection plan for the plant & equipment under his scope of supply.

- i. The plan will indicate a broad outline:
  - ii. The construction/erection techniques to be employed.
  - iii. Resource planning for deployment of construction / erection of equipment/ machineries.
- iv. List of various construction equipment such as cranes, dumpers, etc. planned to be mobilised with quantity & rated capacity/specification.
- v. List of machinery, tools and tackles such as welding transformers, welding generators/sets, gas cutting sets, drilling machines, chain pulley blocks, survey instruments, etc. and indicate specification and quantity of each item

#### 4.11.2 DEPLOYMENT OF MANPOWER

The Contractor shall submit a list showing deployment of manpower of the following categories indicating number of personnel, schedule and duration of their posting at site, educational background, and experience.

- i) Engineers to be engaged for design and engineering coordination, follow up and expediting.
- ii) Engineers and supervisors are to be directly attached to site work i.e. civil construction (as applicable), erection, testing, commissioning and demonstration of performance guarantee values.
  - ii) Organisation (proposed) for implementation of the package.

#### 4.12 PROGRESS MONITORING

- 4.12.1 It is proposed to have an effective system of progress monitoring to ensure timely completion of all project activities. The guidelines laid down herein shall ensure progress monitoring by CLUVPL.
- 4.12.2 The intention is to dwell upon the progress of the activities related to Engineering Procurement, Manufacturing, Dispatch, Site activity, PG Test.
- 4.12.3. In the interest of the timely completion of the project, the area of monitoring can be altered in consultation by CLUVPL with the Contractor. The Contractor shall furnish adequate information in the monthly progress reports on the formats to be mutually agreed upon. The Contractor shall submit the requisite no. of progress reports in five (5) copies.
- 4.12.4 The Purchaser will invite the Contractor for monthly/fortnightly meetings to review the progress of each activity, and depute Purchaser's authorized representatives for ascertaining/ expediting progress at Contractor's works and suggest remedial actions to bridge-up time gap if any between planned progress and observed progress.

#### 4.12.5. PROGRESS REPORT

- a) A monthly progress report with exception report showing current status of various activities including status of ordered/yet to be ordered items shall be submitted to CLUVPL by the Contractor in five hard copies, referring to the schedule of order, reasons for not achieving it and remedial measures proposed.
- b) The Contractor shall submit Program of execution both in the form of activities in 'Network' as well as quantitative Program in terms of month wise physical targets for various disciplines of work.
- c) The Contractor shall submit 'computerised - updated' time analysis report every month along with progress report. The updated PERT network drawing (both Level I and Level II) are to be submitted in requisite no. of copies at least once in every month. The format of the submission are to be mutually discussed and agreed.

- d) The monthly progress report shall indicate progress of activities against targeted dates and targeted quantities in Pro-forma as per the requirement of the Contract for maintaining consistency of reporting and for maintaining database by CLUVPL. Reasons for shortfalls, if any, shall be clearly brought out and proposed remedial measures to avoid the delays shall be indicated by the Contractor in the progress report, wherever applicable.
- e) Quantitative programme which is termed as “Work Plan” shall be updated regularly at a mutually agreed interval of time and Principal Contractor shall submit the same for CLUVPL’s approval keeping in view the balance time available to execute the balance of activities. Once if approved, subsequent progress report shall indicate the revised targets.
- f) The Contractor shall furnish information on site activities viz. daily progress report, weekly receipt of equipment, monthly erection plan, etc. The Contractor has also to indicate resource deployment at site, highlights of critical areas and constraints in the daily progress report once in a week.
- g) Other information related to site activities as may be required by the CLUVPL, shall also be submitted by the Contractor.
- h) The Contractor shall submit progress photographs in 5 copies and also in a hard copy/soft copy every month relating to the progress in sequence of work of all major site activities. The CLUVPL will arrange necessary permission for the same.
- i) The progress report will also highlight inspection status. The Contractor shall submit one copy of the inspection certificate duly signed by representatives/authorised agencies after inspection along with the progress report.

#### **4.13 OVERALL TIME SCHEDULE**

The overall time schedule shall be as follows:

1. The time schedule for the scope of work up to commissioning shall be 09 months from the date of LOA .
2. The time schedule for Provisional takeover of all the projects shall be 12 months from the date of LOA.
3. The time schedule for PG test for each project shall be for a period of Three Months after provisional take over of each project.
4. The Time schedule for Operation and maintenance is for a period of 10 years including first year Warranty period O & M, which shall commence from the date of Provisional Takeover of all the Projects.

#### **4.14 EXTENSION OF TIME**

- 4.14.1 The Contractor shall not be allowed for any extension of time for completion except in the following cases:



- i) Force Majeure – As per details stated in the Contract.
- ii) Major changes or substantial addition to work ordered by the PURCHASER adversely affecting the completion time.
- iii) Any other circumstance of any kind whatsoever which may occur making the Contractor entitled to an extension of time which, however, shall be in the absolute discretion of the CLUVPL.

4.14.2 The Contractor, upon the happening of any such event as stated above shall immediately inform the PURCHASER but nevertheless use constantly his best endeavours to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of the PURCHASER to proceed with the work.

4.14.3 Request for extension of time shall be submitted by the Contractor in writing and the PURCHASER, based on the merit, shall consider the request and convey his decision to the Contractor in writing within a reasonable time.

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## **SECTION- 5**

### **5.0 TAXES & DUTIES**

#### **5.1 General**

1. All other taxes, duties or other charges, except those specifically mentioned in the contract, legally levied on the Contractor in connection with the contract work, shall be borne and paid by the Contractor.
2. All bank charges in connection with payment to be made to the Contractor shall be borne and paid by the PURCHASER. All bank charges in connection with original submission of Bank Guarantee (BG) and extension if any, shall be borne and paid by the Contractor.
3. The Contractor shall comply with all the necessary tax related statutory compliances including but not limited to providing GST invoices or other documentation as per GST law relating to the Supply of Goods and Services or both to the PURCHASER, uploading, the details of the invoice, payment of taxes, timely filing of valid statutory returns for the tax period on the Goods and Service Tax Portal.
4. In case any demand is recovered from PURCHASER on account of any act of the Contractor, including but not limited to non-payment of GST charged and recovered, non-filing of Returns, non-uploading of valid invoices raised on PURCHASER in the Returns etc. the Contractor shall indemnify the PURCHASER in respect of all claims of tax, LD and/or interest, loss, damages, costs, expenses and liability that may arise due to such non-compliance.

#### **5.2 TAXES AND DUTIES**

##### **5.2.1 Goods and Service Tax (GST):**

- i) GST wherever applicable, shall be paid restricting to ceiling of taxes and duties indicated in the schedule of prices in the contract.
- ii) The ownership of all materials to be supplied by Contractor, dispatched directly from sub-supplier's/sub-contractor's works to the project site, shall rest with SECL on endorsement of dispatch document while the materials are in transit.
- iii) Any statutory variation on account of GST within the contractual delivery period shall be to the account of SECL.
- iv) Any statutory variation on account of GST arising beyond the contractual delivery period shall be to Contractor's account. However, the contractual delivery period ex-

tended for reasons not directly attributable to the contractor, variation in GST if any, shall be paid.

v) Details of item tariff no. with break up values for dispatches from Chhattisgarh, and other States attracting IGST, CGST & SGST shall be indicated separately in the Billing Breakup with rate of GST in percentage and total amount of GST.

vi) The billing Breakup should contain details of tariff head, tariff rate and amount in respect of GST. The respective total amount shall tally with the respective ceiling quoted for the GST. Payment for GST shall be paid based on the value mentioned in the Billing Breakup. Statutory variations shall also be payable only for those items for which basic GST has been indicated in the Billing Breakup.

vii) Any benefits out of application of GST availed by the Contractor shall be passed on to Purchaser in full.

viii) The Contractor shall comply with the Anti-profiteering measures at all times as prescribed under Sec 171 of CGST Act, 2017 and corresponding provisions of SGST / UTGST Act, 2017 and Anti-profiteering rules released there under.

5.2.2 The contract price is inclusive of all applicable GST, levies and duties.

The ceiling for Taxes & Duties shall correspond to the Base Price.

Obligations of the Purchaser/Contractor towards payment of statutory variations in taxes and duties are as follows:

i) In respect of items directly consigned to Site by approved sub suppliers/ sub vendors the GST and statutory variation on GST after the base date shall be payable within contractual delivery period.

ii) Additional amount of GST arising out of statutory variations within the contractual delivery period after the base date will be made by the Purchaser. Such payment shall be restricted only to finished goods supplied by the Contractor and its sub suppliers/ sub vendors directly to the Purchaser.

iii) Statutory variations due to imposition of new taxes, duties and levies or increase/reduction/withdrawal of existing GST, duties and levies by the Central or State Government as may be applicable on the supply of plant & equipment, erection, etc. shall be to Purchaser's account to the extent applicable as direct liability of the Contractor in execution of this contract with the Purchaser. In the case of any upward revision the same shall be paid by the Purchaser. However, the same will be limited within the contractual delivery period.

iv) The Contractor shall bear and pay all liabilities in respect of: (a) non- observance of all legal formalities as per various statutory provisions and (b) statutory variations in all taxes, duties and levies and imposition of new taxes, duties and levies that may be imposed after the contractual delivery period, in case the contractual delivery period is extended due to reasons attributable to the Contractor.

### **5.3 TAXES AND DUTIES (FOREIGN PORTION)Basic Custom Duty**

Ministry of New & Renewable Energy vide O.M. no 283/3/2018-grid solar dated 09.03.2021 has notified the imposition of basic customs duty (BCD) on solar PV modules & cells with effect from 01.04.2022. post this date solar modules will attract BCD@ 40% & solar cells will attract BCD @ 25%. bidder's are required to take note of this trajectory & bid accordingly, as the imposition of BCD as per this mentioned trajectory will not be considered under change in law.

### **5.4 TAX DEDUCTION AT SOURCE (TDS) TOWARDS INCOME TAX, GST AND OTHER TAXES**

Deduction of Tax at source at prevailing rate shall be effected by the Purchaser before payment as a statutory obligation wherever applicable. TDS on Income Tax, GST (CGST, SGST & IGST) and all other taxes as applicable as per statutory obligations/ enactments shall be progressively deducted from the payments released to Contractor, by the Purchaser, for depositing with the Income tax, GST and other Tax authorities as per Income Tax Act, GST Act, etc, as applicable.

### **5.5 PERSONNEL INCOME TAX & CESS**

Income Tax and cess, if any payable by the Contractors / sub-contractor's employees shall be paid by the said employees directly, and the Purchaser shall not be liable to pay the income tax & cess payable by the employee of the contractor / sub-contractor and the purchaser is not responsible for filing the tax returns of contracts employees / experts.

### **5.6 (1) BUILDING & OTHER CONSTRUCTION WORKERS' WELFARE (BOCW) CESS:**

“BOCW cess is in the scope of the contractor and shall be paid by the contractor and evidence of payment of the same shall be produced for processing progressive payments. The certification in this regard has to be produced to SECL/CLUVPL periodically as and when required. In case of any default/liability in the payment of BOCW cess by the contractor, the required amount to compensate such default / liability will be recovered from the progressive bills of the contractor. “

## **5.7 BILLING Breakup**

The billing Breakup should contain details of tariff head, tariff rate and amount in respect of all taxes & duties. The respective total amount shall tally with the respective ceiling for the taxes & duties. Payment for taxes & duties shall be paid based on the value mentioned in the Billing Breakup. However, the Billing Breakup shall be inline with the Clause 6.3.1 of Section -6 of volume-IB.

## SECTION-6

### **6.0 TERMS OF PAYMENT**

#### **6.1 GENERAL PROCEDURE:**

Payment to the Contractor for the supply, services & works under the Contract will be made by the Purchaser as per the guidelines and conditions specified herein. All payments made during the Contract shall be on account payment only. The final payment will be made on completion of all the works and on fulfilment by the Contractor of all his liabilities under the Contract to the satisfaction of the Purchaser.

#### **6.2 DUE DATES FOR PAYMENT:**

The Purchaser will make progressive payment as and when the payment is due as per the terms of payment set forth herein. Payment will become due and payable by the Purchaser within 30 days from the date of receipt of Contractor's bill/invoice/debit note by the Purchaser provided the documents submitted are complete and correct in all respects, and is accompanied with a checklist substantiating the pay ability of the bill /invoice.

The Contractor shall certify the following in all the bills.

"Certified that no payment has been claimed and received before, for the components for which payment has been claimed in this invoice".

Purchaser reserves the right to deduct any un-payable claims admitted inadvertently from any amount due to the Contractor.

6.2.1 Notwithstanding any amount becoming due and payable to the Contractor by the Purchaser, the Contractor shall not be entitled to any interest on delayed / overdue payments.

#### **6.3 PAYMENT SCHEDULE:**

6.3.1 The Contractor shall prepare and submit to the Purchaser for approval, a detailed Billing Breakup (BBU) of the Contract Price component wise as follows.

<b>SL No.</b>	<b>Components for payment</b>	<b>Percentage of EPC Contract price</b>
1	Site study and Site development	10%

2	Supply of materials-Plant and Equipment, civil and structural materials	30%
3	Erection, Installation, civil and structural works, Testing and commissioning	20%
4	Provisional takeover	20%
5	PG test	20%
6	Solar plant O & M period activities	Monthly payment on prorata basis

All payments under the Contract shall be made only after the BBU is approved by the CLUVPL. The aggregate sum of the BBU shall be equal to the Lumpsum Contract Price. BBU shall be reviewed, updated and submitted to the CLUVPL, by the Contractor as and when required. Price Breakup in BBU is Notional value and is only for purpose of billing and realisation of contract Value.

6.3.2 The Contractor shall submit to the CLUVPL his Sequential delivery schedule for all the equipment correlated to the sequence of erection within 1 month from the date of Letter of Award (LOA). Such schedules shall be in line with the agreed detailed PERT for all phases of the works of the Contractor. If required such schedules shall be reviewed, updated and submitted to the Purchaser, by the Contractor as and when required.

6.3.3 Dispatches shall be as per such approved time schedule and payment shall be regulated accordingly.

6.3.4 All demurrage's and wharfage if any arising out of any dispatches shall be to the account of the Contractor only.

6.3.5 All payments shall be made only after signing the contract agreement and shall be based on approved Billing Break-up” details.

The Required document in original shall be submitted In person / by Registered Post to SECL for payment to enable SECL to make progressive payment to the Contractor.

## **6.5 Payment Terms:**

The payment of contract price shall be regulated and paid as per the approved BBU and Payment terms.

## **6.6 Payment Terms for Site study and Site Development - 10% of the EPC contract price :**

6.6.1 After completion of each item covered under the Site study and Site development schedule and certification of the same in this regard by the CLUVPL site in-charge, payment shall be made by SECL on pro rata basis as per approved BBU.

6.6.2 Activities related to site study, soil investigation, survey, site related tests, vegetation removal, site development activities, project approval including connectivity approval, bay extension in SECL S/S, design and engineering, all initial project activities including site office development, storage area development etc. and its taxes and duties shall be included in the BBU for Site study and Site development schedule.

6.6.3 Payment for Site study and Site development schedule shall be made

- i. on establishing site office by the Contractor at any one of the Project site locations.
- ii. submission of Contract Performance Bank Guarantee in the prescribed format.

## **6.7. Payment Terms for Supply of materials-Plant and Equipment, civil and structural materials – 30 % of the EPC contract price:**

6.7.1 After receipt of each item covered under the approved BBU for Plant and Equipment, civil and structural materials schedule and certification of receipt of materials at site in this regard by the CLUVPL site in-charge, payment shall be made by SECL on pro-rata basis as per approved BBU.

6.7.2 Supply of materials- Plant and equipment, civil and structural works required for establishing the Solar Power Plant, associated power evacuation system, transportation, insurance, etc. and its taxes and duties shall be included in the BBU for Supply of materials schedule.

6.7.3 Payment for Supply of materials-Plant and Equipment, civil and structural materials schedule shall be made

- i. on establishing site office by the Contractor at any one of the Project site locations.
- ii. submission of Contract Performance Bank Guarantee in the prescribed format
- iii. on making ready the storage area before despatch of supply
- iv. Packing list (despatch note)
- v. Soundness certificate for each dispatch of material in the following format:  
"Certified that the materials despatched in ..... (RR/lorry way bill /delivery note) dated ..... for the value of Rs. .... against Contract No. .... were in sound condition at the time of despatch.
- vi. Test/ inspection certificate if applicable and/or certification by the Contractor
- vii. Freight invoice of the Contractor
- viii. RR/lorry way bill /delivery note
- ix. Transit insurance declaration
- x. In respect of last consignment in addition to the above documents the following certificate and document shall also be furnished:
  - a. Certificate by the Contractor that no further supplies will be made and supplies are complete in all respects.



- b. Summary of all invoices for the equipment, showing the amount due and amount claimed / received.

**6.8 Payment terms for Erection, civil and Structural works, Testing and commissioning – 20 % of the EPC contract price:**

- 6.8.1 After completion of each item covered under the Erection, civil and Structural works, Testing and commissioning schedule and certification of the same in this regard by the CLUVPL site in-charge, payment shall be made by SECL on pro rata basis as per approved Billing breakup.
- 6.8.2 Activities related to Erection, civil and Structural works, Testing and commissioning and its insurance, taxes and duties shall be included in the BBU for Erection, civil and Structural works, Testing and commissioning schedule.
- 6.8.3 Payment for Erection, civil and Structural works, Testing and commissioning schedule shall be made
  - i. on establishing site office by the Contractor at any one of the Project site locations.
  - ii. submission of Performance Bank Guarantee in the prescribed format.
  - iii. valid insurance for Erection, civil and Structural works, Testing and commissioning activities.
  - iv. Check lists / check measurements/ testing values/ relevant documents with respect to Erection, civil and Structural works, Testing and commissioning activities.

**6.9 Payment for Provisional Takeover – 20 % of the EPC contract price**

- 6.9.1 After completion of commissioning of each Solar PV power plant and certification of completion of all activities as per the contract conditions for the Provisional Take Over of each Solar Power Plant by CLUVPL site in-charge, payment shall be made by SECL on pro rata basis on completion of each Solar Power Plant capacity.

**6.10 Payment for Performance Guarantee - 20 % of the EPC contract price**

- 6.10.1 After successful completion of Performance guarantee of each Solar PV power plant and certification of completion of all activities as per the contract conditions for the Performance Guarantee of each Solar Power Plant by CLUVPL site in-charge, payment shall be made by SECL on pro rata basis on completion of all facilities as per scope of work of each Solar Power Plant.

**6.11 Payment for Operation and Maintenance of Solar Power Plant for 10 years period including first year warranty period O & M :**

- 6.11.1 After completion of solar power plant Operation and Maintenance activities and certification of the O & M works by CLUVPL site in-charge, payment shall be made on pro-rata monthly basis of O & M contract price by SECL for a period of 10 years including first year warranty period O & M.

**6.11.2 Payment for insurance charges.**

The Insurance Charges in respect of marine & inland transport, Installation, erection, testing, commissioning and ten years O & M, etc., shall be in the scope of the Contractor and included lump sum firm price of the contract.

Insurance charges shall be invoiced as per approved BBU subject to production of documentary evidence including the copy of respective policies.

All insurance charges during the entire period of contract shall be borne by the contractor with out any extra cost to SECL.

Modalities and methods of insurance claims by the contractor shall be mutually discussed and finalised.

The contractor shall take insurance to cover the requirements such as property damage, machinery breakdown , fire loss of profit , machinery loss of profit, public liability .

The reimbursement of premium can be made at periodical intervals as per the policy's conditions. The premium receipt issued by the Insurance company shall have to be produced for claiming reimbursement. After all the instalments of premium are paid, the difference between lump sum insurance charges indicated in the approved BBU and the premium actually reimbursed to the contractor on documentary evidence as referred above, shall be paid to the contractor on the basis of invoices from the contractor, without supporting documents to compensate the contractor during the pendency of the Insurance policy. However, the total claim shall be restricted to approved BBU.

## **6.12 GENERAL:**

- 6.12.1 All payments shall be paid only against submission of complete and correct invoices and documents by the Contractor duly certified by the CLUVPL except as otherwise specified in the Contract.  
Payment shall be due and payable by the Purchaser within a reasonable period, which will not normally exceed one month from the date of receipt of complete and correct invoices. If it is not payable the invoice will be returned to the Contractor stating the reasons for rejection within a month from the date of receipt by the Purchaser.
- 6.12.2 All payments shall be released directly by the Purchaser to the Contractor except as otherwise provided in the contract. If as per provisions of Contract any payments are made directly by the Purchaser to the Associates, such payments shall constitute a proper discharge of Purchaser's obligations for such payments to the Contractor.
- 6.12.3 All the progressive payments mentioned above shall be made by the Purchaser based on the satisfactory progress of work as agreed.
- 6.12.4 All interim/progressive payments shall be regarded as payments by way of advance against the final payment only and not as payment for work actually completed and shall not preclude defective/imperfect/ incomplete work to be removed.

It will not be considered as an admission by the Purchaser of the due performance of the Contract, or any part thereof by the Contractor nor shall it preclude, determine or affect in any way the powers of the Purchaser under these conditions or in any other way vary or affect the Contract.

- 6.12.5 The Purchaser reserves the right to encash Bank Guarantees if sufficiently convinced of negligence and lack of dedication to work on the part of the Contractor.
- 6.12.7 If the Contract is terminated due to default of the Contractor, the 'Mobilization Advance' pay would be deemed as interest bearing advance at the rate applicable to cash credit facility prevailing at the time of issue of NIT to be compounded quarterly.
- 6.12.8 For delays in scope within the agreed time schedule, interest at the prevailing rates applicable to cash credit facility will be charged on the unadjusted portion of advance paid.

### **6.13 PAYMENT PROCEDURE:**

- a. The successful Contractor shall submit the bills for claim in four copies. The payment shall be made after the verification of the bill by concerned Accounts Centre at SECL.
- b. It is expressly understood that the release of payment to the successful Contractor in the manner specified will not be construed as the fulfilment of the Contractor's obligations either in part or whole under the contract and that the Contractor shall continue to remain responsible to SECL until all the obligations under the agreement have been fulfilled.

### **6.14 PAYMENT OF CONTRACT'S BILLS THROUGH ELECTRONIC FUND TRANSFER (EFT)**

The Contractor should submit the consent in a mandate form for receipt of payment through NEFT and provide the details of bank A/c in line with RBI guidelines for the same. These details will include bank name, branch name & address, A/c type, bank A/c no., bank and branch code as appearing on MICR cheque issued by bank. Further, the Contractor should also submit certificate from their bank certifying the correctness of all above mentioned information in the mandate form.

### **6.15 Mode of Payment**

The payment shall be made direct to the Contractor by the Purchaser through e-payment only and bank charges if any would be to the Contractor's account. Payment, will become due and payable by the purchaser within a reasonable period which will not exceed one month from the date of receipt of Contractor's bill / invoice / debit note by the Purchaser provided the documents submitted are complete and correct in all respects. If it is not payable the invoice will be returned to the Contractor stating the reasons for rejection within a month from the date of receipt by the Purchaser.

The payment for supplies, the inland transportation, insurance and other lump sum charges shall be made direct to the Contractor by the Purchaser wherever applicable through E-payment.

## **SECTION - 7**

### **FACILITIES TO BE PROVIDED BY THE PURCHASER**

- 7.0** Non-encumbered, encroachment free and hindrance free land for development of the Project.
- 7.1** Necessary authorisation, documents, records etc. as per requirement for obtaining of all the Project approvals, permits and clearances including land usage, signing of agreements (banking and wheeling) and grid connectivity etc.,
- 7.2** Construction power (LT power 440V/220V , 3-phase 30 or 40 KVA ) from near by SECL works site will be provided for carrying out different activities if required and charges will be levied at the prevailing rates as per industrial tariff.

**SECTION -8**  
**CONTRACT TECHNICAL SPECIFICATIONS**

**8.0 CONTRACT SPECIFICATIONS:**

The Technical Specifications (Volume-II) issued along with the Tender Specifications duly modified and updated based on the changes/modifications agreed between the Purchaser and the successful Bidder shall constitute SECTION-8 "Contract Technical Specifications" of this Contract and shall form an integral part of the Contract for all purposes.

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**SECTION-9**

**PERFORMANCE REQUIREMENT GUARANTEE.**

**( Refer Technical Specification of Volume -II )**

## **SECTION-10**

### **10.0 GENERAL TERMS AND CONDITIONS OF THE CONTRACT**

#### **10.1 BANK GUARANTEES**

##### **10.1.1 GENERAL**

- i) All the Bank Guarantees shall be irrevocable and shall be from any nationalised / scheduled Bank in India authorised by Reserve Bank of India, other than Bank of China, acceptable to the Purchaser and drawn in favour of SOUTH EASTERN COAL FIELDS LIMITED, BILASPUR.
- ii) All the Bank Guarantees are to be furnished by the Bank directly to the Purchaser through RPAD/Speed Post/Courier.
- iii) The Bank Guarantee shall be furnished as per respective format prescribed by the Purchaser and shall be submitted on Non-Judicial stamp paper of suitable value and the stamp paper shall be in the name of the Bank.
- iv) All the Bank Guarantees shall be payable on first demand, without demur, irrespective of any dispute between the Bank and the Contractor to the Purchaser without any condition or dispute whatsoever.
- v) The Contractor shall arrange to keep the several bank guarantees referred to herein valid for the requisite duration by making timely request to the Bank or Banks concerned. All the extension for Bank Guarantees also shall be on non-Judicial stamp paper of appropriate value obtained in the name of Bank/Contractor.
- vi) No interest or any bank charges shall be payable by the Purchaser in respect of any Bank Guarantee furnished by the contractor in respect of this contract with respect to the period upto completion of all obligations under the Contract by the Contractor.
- vii) The Purchaser shall have the right to encash the Bank Guarantees for non-compliance of any or all the terms and conditions of the contract and also in terms of the Joint Deed of Undertaking, if any, which the Contractor may enter into along with other parties with the purchaser.
- viii) Non-compliance of any or all the terms and conditions of the contract by the Contractor, will be intimated to the Contractor, specifying the reason with supporting documents, before encashment of the Bank Guarantee.

#### **SUBMISSION OF BANK GUARANTEE:**

The Bank Guarantee issued by the issuing Bank on behalf of contractor/supplier in favour of “South Eastern Coalfields Limited” shall be in paper form as well as issued under “Structured Financial Messaging System” (SFMS). As such the Guarantor (BG issuing bank) shall send information about issuance of this Guarantee through SFMS gateway to the ICICI Bank, Vyapar Vihar, Bilaspur (IFSC- ICIC0000282) as the case may be.

The details of Beneficiary, i.e. South Eastern Coalfields Limited for issue of BG under SFMS platform are furnished below:

ICICI Bank as advising Bank of SECL:

1. Name of the Beneficiary and his Details

- i Name : South Eastern Coalfields Limited
- ii Area : SECL HQ, Bilaspur
- iii Name of Bank : ICICI Bank
- iv Bank Account No. : 028205003346
- v Department : Material Management

2. Beneficiary Bank, Branch and Address

- i Name of Bank : ICICI Bank
- ii Bank Branch Name : Vyapar Vihar, Bilaspur
- iii Branch Code : 0282
- iv Beneficiary Bank Branch IFSC : ICIC0000282
- v Beneficiary Bank Address : Surya Chambers, Plot No- A/09 Vyapar Vihar, Bilaspur - 495001, CG

**NOTE:** Vendors are requested to specifically advise BG issuing bank that in case they opt for ICICI Bank as beneficiary bank, they have to mention the code 'SECL14265' in field No. 7037 of IFN760COV/IFN767COV so that the advised BGs could be sent to the email id tagged with the account.

The Original Bank Guarantee issued by the Issuing Bank shall be sent by the Issuing Bank to concerned Department/Area by Registered/ Speed Post.

Bank Guarantee submitted in Physical mode, which cannot be verifiable through SFMS will be rejected summarily.

### 10.1.2 CONTRACT PERFORMANCE BANK GUARANTEE (CPG)

- i. As a contract security, the Contractor shall be required to submit an irrevocable Contract Performance Bank Guarantee( CPG) in the prescribed Pro-forma towards the Contract performance for a value of three percent (3%) of total EPC contract value including Taxes and duties in favour of SECL, Bilaspur within 21days from the date of Letter of Award.
- ii. The Bank Guarantee shall be for the time bound, due and faithful performance of the contract and shall remain binding notwithstanding such variations, alterations or extensions of time as may be made, given, conceded or agreed to between the Contractor and the Purchaser under these General Terms & Conditions or otherwise. The Bank Guarantee shall be as per Annexure –XIIIA. The Bank Guarantee towards Contract Performance shall be subject to approval of the Purchaser thereafter.
- iii. The Contractor shall ensure that the Contract Performance Bank Guarantee remain valid till the expiry of the period of the Contract plus three (3) months grace period.
- iv. The Guarantee amount shall, on demand, be payable without demur in respective of any legal dispute between bank and the Contractor and between the Contractor and the owner without any condition or dispute whatsoever.



- v. The Purchaser shall have the right to encash the Contract Performance Guarantee in full or part thereof for non-compliance of any or all the terms and conditions of the contract and to recover any PRICE REDUCTION under the contract as well as against defects in the equipment/ shortfall in guaranteed net energy export and for failure to comply with any of the warranty obligations as enumerated in the Contract.
- vi. The Contract Performance Bank Guarantee furnished by the Contractor will be subject to the terms and conditions of the Contract. The Purchaser will not be liable for payment of any interest on the Contract Performance Guarantee.
- vii. In case of part encashment, CPG shall be valid for the remaining period as per contract for the balance amount or for the period as requested by owner.
- viii. 90% of the Contract Performance Bank Guarantee amount will be returned to the Contractor without any interest within 90 (ninety) days from the date of expiry of EPC contract period. The balance 10% will be retained till the completion of operation and maintenance ( O & M) contract for a period 10 years.
- ix. The 90 % of the Contract Performance Bank Guarantee shall be released on application by the Contractor within ninety (90) days after the expiry of the EPC contract period and after the Contractor has discharged all his obligations under the Contract and produced a "No Demand Certificate" from the Purchaser. The Purchaser shall not unreasonably withhold the issue of "No Demand Certificate" after receipt of request for the same.
- x. The performance guarantee shall cover additionally the following guarantees to the purchaser:
  - (a) The Contractor guarantees the successful and satisfactory operation of the equipment furnished under the contract as per the specification and documents.
  - (b) The contractor further guarantees that the equipment provided and installed shall be new and free from all defects in design, material and workmanship. The Contractor shall upon written notice from the purchaser, fully remedy free of expenses to the purchaser such defects as may develop under normal use of the said equipment within the period specified in the contract.

### 3. **CONTRACT PERFORMANCE BANK GUARANTEE FOR O & M:**

- i. As a contract security for faithful performance of the Contract in accordance with the terms and conditions specified in the Operation and Maintenance Contract for a period of ten years including the first year warranty period O & M, the Contractor shall furnish a Contract Performance Bank Guarantee in the form of irrevocable bank guarantee from any Nationalised Bank or Scheduled Bank approved by RBI except banks from China in a non-Judicial stamp paper for the value of Rs.80/-, 30 days before commencement of operation and maintenance for an amount equal to 10 % of the total O & M Contract Price for 10 years including Taxes and duties .
- ii. The O & M Contract Performance Bank Guarantee shall be initially valid for 12 months and shall be extended suitably by the Contractor every year to be valid till the expiry of 90 days beyond the actual date of successful completion of operation and maintenance contract period.
- iii. The reduction in value of the O & M Contract performance Bank Guarantee every 12 months on pro rata basis shall not be permitted while extending the validity of the Bank Guarantee.

iv. The Purchaser shall have the right to encash the O & M Contract Performance Guarantee in full or part thereof for non-compliance of any or all the terms and conditions of the contract and to recover any dues under the contract as well as against defects in the equipment/ shortfall in guaranteed net energy export and for failure to comply with any of the warranty obligations as enumerated in the Contract.

#### **10.1.4 Backup BG for faithful compliance to JDU**

In addition to the CPG furnished by the Contractor, an Backup BG for faithful compliance to JDU shall be furnished by the executants of JDU other than the Contractor for a value equal to 1% of EPC Contract price within 21 days from the date of Letter of Award as per format in Annexure-XIIIB of this Volume.

### **10.2 LICENCES**

#### **10.2.1 Import Licence**

For any portion of the supplies to be imported by the Contractor for incorporation in or supplier of the equipment, the Contractor shall arrange the necessary import including arrangement of Licences and foreign exchange as may be required, on his own.

#### **10.2.2 Export Licence**

In case of foreign Contractor, he shall obtain and maintain the necessary Export licence from the competent authorities and shall pay at his cost any fee connected therewith. Failure to obtain and maintain export Licences shall not be considered as Force Majeure. In case the Contractor fails to obtain or maintain the Licences, or if the licences are withdrawn, he shall restore them within two months from the date of cancellation/withdrawal, failing which the Purchaser has the right to cancel the Contract and the Contractor shall forthwith return the Purchaser all the amounts paid by the Purchaser to the Contractor.

#### **10.2.3 Insurance**

The Contractor shall take insurance policies as mentioned below and the same shall be submitted to the CLUVPL for records.

#### **10.2.4 Insurance**

i) The Contractor shall take insurance policy against all risks of Physical loss or damage to the equipment /materials during handling, transit, storage, erection, Installation, testing and commissioning for the total contract price including price variation. The period of policy shall commence from the dispatch of first consignment of equipment/materials for the work and continue during transit, storage, erection, Installation and till the end of Ten years O & M period (Including 1st year warranty period O &

M ).  
Alternatively, the Contractor may take a Transit Insurance policy and a Storage- cum-  
Erection Insurance policy against all risks to cover the loss or damage during Transit  
and Storage & Erection respectively. The sum insured under the policy shall represent  
the cost of equipment / materials supplied by the Contractor for the work. The sum in-  
sured under the Storage-cum-Erection policy shall represent the complete erected val-  
ue of Plant & Equipment including freight, insurance, taxes and duties and erection  
cost.

ii) If the Contractor is already having an open Transit Insurance policy, the copy of  
the same shall be furnished.

iii) The Contractor shall also take additional covers (Add-On covers) given under  
MCE insurance like Third Party Liability, Surrounding properties, Flood Risk, Clear-  
ance and Removal of debris, Cross liability, Additional Customs Duty, Express  
Freight, Extended Maintenance Cover. The sum insured for such Add-On covers shall  
be decided by the Contractor based on its assessment and risk involved in the con-  
tract.

iv) Risks to be covered by insurance shall not be limited merely to the items men-  
tioned above. The Contractor shall arrange for insurance of any other risks he may  
deem prudent, but the expenses thereof shall be to the account of the contractor only.

v) If necessary, Transit and storage (all risks) insurance coverage for additional trans-  
it involved for sending equipment/material to Sub-Contractor/Fabricator's shop for  
fabrication/ reprocessing and receiving back at site shall be taken.

vi) The form and the limit of such insurance as defined shall be acceptable to the  
Purchaser. However, irrespective of such acceptance, the responsibility to maintain  
insurance at all times during the required period and for the required value shall be  
that of the Contractor alone. The Contractor's failure in this regard shall not relieve  
him of any of his contractual responsibilities and obligations.

vii) The transfer of title shall not in any way relieve the Contractor of the above re-  
sponsibilities during the period of the contract. Any loss or damage to the equipment  
during handling, transporting, storage and erection, Installation , commissioning till  
the completion of 10 Years O & M shall be to the account of the Contractor. The  
Contractor shall be responsible for preferring of all claims as applicable and make  
good at the Contractor's own cost for the damage or loss by way of repairs and/or re-  
placement of the portion of the works damaged or lost for the timely commissioning  
of the equipment/ completion of the works. Licenses, clearance etc., if any required

for the purpose of replacement of equipment lost/damaged in transit and/or during storage, erection, shall be made available by the Contractor.

viii) The Contractor shall provide the Purchaser with a copy of all insurance policies and documents taken out by him in pursuance of the contract. All copies of such documents shall be submitted to the Purchaser immediately after such insurance coverage for approval.

ix) The Contractor shall also inform the Purchaser in writing at least sixty (60) days in advance regarding the expiry cancellation and/or change in any of such documents and ensure revalidation/renewal etc, as may be necessary well in time.

x) The Contractor shall take insurance policy from an Insurance Company regulated by IRDA. The Insurance policy shall provide for payment of claim in Indian Rupees.

xi) The SECL shall be the principal holder of the policy along with the Contractor. The Purchaser reserves the exclusive right to assign the Policy.

xii) The Contractor shall arrange for comprehensive Insurance of equipment, transit, storage-cum-erection and commissioning. The reimbursement of premium can be made at periodical intervals as per the policy's conditions. The premium receipt issued by the Insurance company shall have to be produced for claiming reimbursement. After all the instalments of premium are paid, the difference between lump-sum insurance charges indicated in the contract and the premium actually reimbursed to the Contractor on documentary evidence as referred above, shall be paid to the Contractor on the basis of invoices from the Contractor, without supporting documents to compensate the service charges incurred by the Contractor during the pendency of the Insurance policy. However, the total claim shall be restricted to the lump-sum price quoted in the schedule of price.

xiii) If the Contractor fails to produce the Insurance Policy in time or fails to keep it in force, further payments will not be made, without prejudice to other terms and conditions of the Contract. Recovery from Contractor's bills may also be effected.

### **10.2.5 Workmen's Compensation Insurance**

The Contractor shall take Workmen's Compensation Insurance for this project work. This insurance shall protect the Contractor against all claims applicable under the Workmen's Compensation Act, 1948 (Government of India) as amended from time to time. This policy shall also cover the Contractor against all claims for injury, disability, disease or death of his or his Sub Contractor's employees which for any reason are not covered under the Workman's Compensation Act, 1948. The liabilities shall not be less than:

- i) Workmen's compensation: As per statutory provisions.
- ii) Towards Employees Liability: As per statutory provisions.

The Contractor shall provide the Purchaser with a copy of Workmen Compensation insurance policies taken out by him in pursuance of the Contract.

The Contractor taking Insurance policies for the total contract price indicated in the contract but only for part period or part liabilities which shall result in non-fulfilment of contractual conditions for the whole period of the contract or failure to cover all liabilities shall attract Penalty recovery from the Contractor as deemed fit as decided by the Purchaser.

### **10.3 Customs Clearance: Not Applicable.**

### **10.4 Liquidation, Death, Bankruptcy etc.**

If the Contractor shall die, dissolve or become bankrupt or insolvent or cause or suffer any Receiver to be appointed on its business or any assets thereof with its Creditors, or being a corporation commence to be wound up, not being a member's voluntary winding up for the purpose of amalgamation or reconstruction, or carry on its business under a Receiver for the benefits of its Creditors or any of them, the Purchaser shall be at liberty:

- i) to terminate the Contract forthwith upon coming to know of the happening of any such event as aforesaid by notice in writing to the Contractor or to the Receiver or Liquidator or to any person in whom the Contract may become vested to, or
- ii) to give such Receiver, Liquidator or other person the option of carrying out the Contract subject to his providing a guarantee upto an amount to be agreed for the due and faithful performance of the Contract.

### **10.5 RESPONSIBILITY FOR PERFORMANCE OF CONTRACT**

i) The Contractor shall be responsible for the due and faithful performance of the Contract in all respects according to the drawings, specifications and all other documents referred to in this Contract. Any approval which the CLUVPL may have given in respect of the materials, supplies or other particulars and the work or the workmanship involved in the Contract (whether with or without test carried out by the Contractor or the CLUVPL) shall not relieve the Contractor from his obligations and notwithstanding any approval or acceptance given by CLUVPL, it shall be lawful for the CLUVPL to reject the material on arrival at site, if it is found that the materials supplied and/or erection and/or construction work carried out by the Contractor are not in conformity with the terms and conditions of the Contract in all respects.

ii) The Contractor shall co-operate with the Purchaser's other contractors, if any, for any associated plant and freely exchange all relevant technical information with them to obtain the most efficient and economical design and to avoid unnecessary duplication of equipment. The Contractor shall also coordinate with other contractors for any interface activity at his battery limits. No remuneration shall be claimed from the Purchaser for such technical cooperation.

## **10.6 Responsibility for Completeness**

i) Any supplies and services which might not have been specifically mentioned in the Contract but are necessary for the design & engineering, supply, erection, commissioning, performance and/ or completeness of the works, shall be supplied/provided by the Contractor without any extra cost to the Purchaser within the time schedule for efficient and smooth operation and maintenance of the works under Indian conditions, unless expressly excluded from the scope of supplies and services in this Contract.

ii) The approval by the Purchaser at any stage for any supplies and services by the Contractor shall not relieve the Contractor of its obligations.

## **10.7 Despatch and Billing Breakup**

i) The Contractor shall prepare a detailed Billing-cum-Dispatch Schedule and a detailed Shipping Schedule for supplies of the plant, machinery and equipment in the logical sequence required for erection within the overall delivery schedule of the Contract. Billing-cum-Dispatch schedule for the Plant and Equipment shall be submitted within sixty (60) days from the date of Letter of Award. Detailed shipping schedule shall be submitted within 6 months from the Letter of Award indicating the breakdown of the complete Plant into shipment units with approximate weights and dimensions and the respective dates upon which such units will be dispatched from the Contractor's and/or his Sub-Contractor(s) works.

ii) The Billing-cum-Dispatch Schedule and the Shipping Schedule is subject to approval of CLUVPL. Six (6) copies of the approved Billing-cum-Dispatch Schedule and Shipping Schedule shall be submitted to CLUVPL within fifteen (15) days from the date of approval. The Contractor shall arrange for supplies of the Plant, Machinery and Equipment in the sequence as approved in the Billing- cum- Dispatch Schedule and Shipping Schedule. The Contractor shall promptly give written notice to the Purchaser of any anticipated delay in maintaining such schedule stating reasons and remedial measures, thereof. This shall not however in any way absolve the Contractor from his responsibility of timely delivery of plant and equipment as per contractual time schedule.

iii) No early payment shall be made for non-sequential or early delivery of any Plant & Equipment which will be required for erection at a later date. Further, the early delivery of such equipment will occupy storage space, which will be the responsibility of Contractor.

iv) The lapse of guarantee due to delay in performance guarantee test of any such equipment, if it is supplied by any sub-vendors, is the responsibility of the Contractor.

## **10.8 Shipping Notes and Documents**

### **10.8.1 Shipping Notification:**

Not applicable

### **10.8.2 Transport**

Ocean transportation and shipping procedure for imported equipment- **Not applicable.**

### **10.8.3 Shipping documents for Imported Materials:**

Not applicable.

### **10.8. 4 Shipping documents for Indigenous Materials**

#### **i) General**

The consignee for both rail and road despatches shall be clearly marked as, SOUTH EASTERN COAL FIELDS LIMITED( SECL) , 40MW Solar Power Project , BISHRAMPUR/BHATGAON, CHHATTISGARH, INDIA.

The Contractor shall arrange to despatch the following documents to: Project Manager – SECL 40MW Power Project , BISHRAMPUR/BHATGAON, CHHATTISGARH, INDIA.

- a) One (1) original and five (5) copies of the clean rail/lorry receipt.
- b) One (1) original and five (5) copies of Contractor's signed invoice.
- c) 6 (six) copies of Challan and Packing List.
- d) 6 (six) copies of inspection certificate, if any issued by the Purchaser.
- e) 6 (six) copies of Purchaser's dispatch clearance
- f) 6 (six) copies of Approved Test Certificates if any.

The RR/Challans duly endorsed by the CLUVPL will be handed over to the Contractor for taking delivery of materials from Railway/Trucks unloading the same from wagons/ trucks

and subsequent handling, transportation and storage at site after submission of custody-cum-indemnity bond in Purchaser's approved pro - forma. The demurrage charges, if any, will be payable by the Contractor.

### **ii) By Wagons**

In case of despatch of materials in railway wagons, the Contractor shall ensure that the following are observed by them and their Sub-Contractors.

- a) Identify, place necessary indents on the railways and obtain at the appropriate time the correct type of wagons required, keeping in view the consignments to be despatched.
- b) In case of Over Dimensioned consignments, the Contractor shall obtain the sanction for movement of the O.D. Consignment from the railways.
- c) Non-availability of special wagon or handling equipment shall not be an excuse for payment of demurrage and if so it shall be to the Contractor's account.
- d) Care being taken to avoid all possible chances of damages during transit and to ensure that all packages are firmly secured.
- e) The destination shall be clearly marked.

### **iii) By Road**

In case of the consignments despatched by road, the Contractor shall ensure that the following are observed by himself and the Sub-Contractors:

- a) Identify and obtain the correct type of trucks/trailers, keeping in view the nature of consignments to be despatched.
- b) Care being taken to avoid all possible chances of damages during transit to ensure that all packages are firmly secured.
- c) In case of Over Dimensioned consignments, the Contractor shall obtain necessary approval from concerned authority of State / Centre for movement of the O.D. Consignment.
- d) Non-availability of special trucks or handling equipment shall not be an excuse for payment of demurrage and if so shall be to the Contractor's account.
- e) All consignment despatched by road shall be on "door delivery" and freight paid basis.
- f) The destination shall be clearly marked.

## **10.9 Packing, Identification and Markings**



- i) The Contractor shall include and provide for securely protecting and packing the materials so as to avoid loss or damage during handling & transport by air, sea, rail and road.
- ii) All packing shall allow for easy removal and checking at site. Special precaution shall be taken to prevent rusting of steel and iron parts during transit by sea. Gas seals or other materials shall be adopted by the Contractor for protection against moisture during transit.
- iii) The number of each package in a shipment shall be shown in fraction, numerator showing number of the package and the denominator showing total number of packages in a lot / consignment. The packages number shall be generally prepared in the sequence in which they will be required for erection.
- iv) Each package delivered under the Contract shall be marked by and at the expense of the Contractor and such marking must be distinct and in English language (all previous irrelevant markings being carefully obliterated). Such marking shall show the description and quantity of contents, the name and address of consignee, the gross weight and net weight of the package, the name of the Contractor with a distinctive number of mark sufficient for purposes of identification. All markings shall be carried out with such materials as to ensure quickness of drying, fastness and indelibility. Each equipment or parts of equipment shall, when shipped or railed or otherwise despatched be tagged with reference to the assembly drawings and corresponding part numbers. Each bale or package shall contain a packing note quoting specifically the name of the Contractor, the number and date of contract and the name of the office placing the contract, nomenclature of the stores and include a schedule of parts for each complete equipment giving the part numbers with reference to the assembly drawing and the quantity of each part, drawings nos. and tag numbers.
- v) Rotor bearings should not be used as a support while packing.
- vi) Besides wherever necessary, packing shall bear a special marking "TOP", "BOTTOM", "DO NOT TURN OVER", "KEEP DRY", "HANDLE WITH CARE", etc.
- vii) All packing cases, containers, packing and other similar materials shall be new.
- viii) Notwithstanding anything stated in this clause, the Contractor shall be entirely responsible for loss, damage or depreciation or deterioration to the materials & supplies due to faulty and/or insecure packing.
- ix) One copy of respective standard manufacturer's erection instruction/operation instruction manual shall be kept in each package/container for immediate reference.
- x) Each and every package box shall be marked with the following, as a minimum:
  - (a) Name and address of Consignee :
  - (b) Project reference :
  - (c) Contract No.:

- (d) Packing No.: (1/10, 2/10, 3/10 ..... when there are 10 packages for one consignment)
- (e) Net Weight/Gross Weight :
- (f) Port of Loading :
- (g) Destination Port :
- (h) Packing Mark : [symbols indicating "TOP" and other special markings as per clause 10.09.(iv) & 10.09.(vi) above]
- (i) Type of Equipment :
  1. "E" (for Equipment supply)
  2. "T" (for Tools & Tackles)
  3. "S" (for Mandatory Spares)

#### **10.10 TYPE, QUALITY OF MATERIALS AND WORKMANSHIP:**

- i) The Contractor shall be deemed to have carefully examined and to have knowledge of the equipment, the general and other conditions, specifications, schedules, drawings, etc. forming part of the Contract and also to have satisfied himself as to the nature and character of the work to be executed and the type of the equipment and duties required including wherever necessary of the site conditions and relevant matters and details. Any information thus procured or otherwise obtained from Purchaser/ Consultants shall not in any way relieve the Contractor from his responsibility and contractual obligations for designing, manufacturing and supplying the Plant and Equipment at site and executing the work in terms of the Contract. If the Contractor shall have any doubt as to the meaning of any portion of the Contract, he shall before signing it set forth the particulars thereof and submit to Purchaser in writing in order that such doubt may be removed.
- ii) The Equipment under scope of supply shall be of the best quality and workmanship according to the latest engineering practice and shall be manufactured from materials of best quality considering strength and durability for their best performance. All material shall be new. Substitution of specified material or variation from the method of fabrication may be permitted with the prior written approval of the CLUVPL.
- iii) The Contractor shall procure and/or fabricate all materials and equipment in accordance with all requirements of Central and State enactments, rules and regulations governing such work in India and at site. This shall not be construed as relieving the Contractor from complying with any requirement of CLUVPL as enumerated in the Contract Specifications which may be more rigid than and not contrary to the above mentioned rules, nor providing such construction as may be required by the above mentioned rules and regulations. In case of variance of the Contract Specification from the laws, ordinance, rules and regulations governing the work, the Contractor shall immediately notify the same to the CLUVPL. It is the sole responsibility of the Contractor, however, to determine that such variance exists. Wherever required by rules and regulations, the Contractor shall also obtain the Statutory Authorities' approval for the plant, machinery and equipment to be supplied by the Contractor.
- iv) Codes and standards referred in Contract documents shall be followed. Codes and standards of other countries can be followed with the prior written approval

of CLUVPL, provided materials, supplies & equipment according to the standard are equal to or better than the corresponding standards specified in the Contract.

- v) All meters, gauges, recorders and other types of indicating, integrating or recording devices shall be calibrated in metric system and degree celsius. Where vernier attachments are related, English system gearing must be changed to produce result on a true decimal (metric basis). Functional and instruction plate shall be in English language.
- vi) Brand names mentioned in the Contract documents are for the purpose of establishing the type and quality of products to be used. The Contractor shall not change the brand name and qualities of the bought-out-items without the prior written approval of the CLUVPL. All such products and equipment shall be used or installed in strict accordance with original manufacturer's recommendations, unless otherwise directed by the CLUVPL.

## **10.11 ENGAGEMENT OF CONSULTANT**

The Purchaser has the option to engage a consultant to follow up the progress, inspect and examine the work during design, manufacture, supply, erection, functional tests and safety checks, take over test and output guarantee tests or for any other purpose in connection with the supply and services covered by this Contract. The Contractor shall properly coordinate with the consultant in the execution of the contract.

### **10.11.1 DRAWINGS AND DOCUMENTS**

The Contractor shall supply all drawings and documents to the Purchaser / Consultants as per respective volumes of Technical specifications.

## **10.12 Errors and Omissions**

- i) The Contractor shall be responsible for any discrepancies, errors and omissions in the drawings, documents or other information submitted by him, irrespective of whether these have been approved, reviewed or otherwise accepted by the CLUVPL or not.
- ii) The Contractor shall take all corrective measures arising out of discrepancies, errors and omissions in drawings and other information referred in above para within the time schedule and without extra cost to the CLUVPL.
- iii) The Contractor shall also be responsible any extra cost and the cost due to delay, if any, in carrying out engineering and site works by other agencies arising out of discrepancies, errors and omissions stated above as well as of any late revision/s of drawings and information submitted by the Contractor.

## **10.13 ACCEPTANCE OF THE SYSTEM**

1. On completion of erection of all the materials / items of equipment covered under the scope of the Contract, a joint inspection shall be carried out by the CLUVPL and the Contractor to verify physically that all materials /items /equipment have been placed and erected properly and the system is ready for commissioning. A defects list shall be prepared jointly listing the Defects and Incomplete Works. The Defects / Non-completion of works which will directly affect the power generation, performance / safety of the equipment, safety of the personnel will be categorised under Major Defects / Major Pending Works and others will be included in the Minor Defects / Minor Pending Works. Categorization of Defects / Pending Works as major and minor shall be jointly discussed and agreed by CLUVPL and Contractor and recorded.

2. On liquidation of the Major defects and Completion of Major Pending works (which shall be mutually discussed and agreed between the CLUVPL and Contractor and which shall not affect the commissioning of the system),

#### **10.13.1 Commissioning & Performance Guarantee (PG) Test:**

1. Commissioning shall include testing of individual sub systems till the successful completion of commissioning of the entire Solar PV Power plant and power evacuation system and exporting power to the grid.

2. Commissioning shall include all activities up to commencement of solar power export , electrical checkouts, calibration of instruments and protection devices, commissioning of sub/supporting system and charging the Plant/System/Equipment after getting statutory clearance(s), safety certificate etc., by the contractor from State/ Central Government authorities covered under the Contract.

3. Commissioning shall include all activities after completion of testing and shall be the integral operation of the complete System / Equipment covered under the Contract and gathering of operational data, calibration setting and commissioning of control systems and shut-down inspection and adjustment of the System / Equipment covered under the Contract.

After completion of the commissioning, the Contractor has to intimate the CLUVPL in writing regarding the readiness of the system for PG Testing as mentioned in the Technical Specification. However, Contractor has to furnish sufficient records / documents to satisfy the CLUVPL that all the equipment including services, metering and instrumentations are tested and ready for PG testing.

Before the commissioning of the plant, the power evacuation system along with the billing and metering with grid tie up shall be on operation. During the commissioning,

the Contractor shall be allowed to make minor adjustments as may be necessary, provided that such adjustments do not interfere with or prevent the operation of the plant.

During PG testing period, the contractor shall post sufficient number of qualified personnel. The onus of proving that any failure is not due to faulty design, materials and workmanship shall lie with the Contractor.

4. Commissioning report comprising observations and recordings of various parameters measured in respect of the 'reliability operation' shall be prepared and submitted to the CLUVPL. This report, besides recording the details of various observations during operation shall also include the dates of start and finish of the operation and shall be signed by the representatives of both the parties. The report shall have recordings of all details of interruptions that occurred, adjustments made and any repairs done during the commissioning. The commissioning shall be considered successful, provided that each item of plant can meet the specified requirements.

5. On completion of Commissioning of each solar projects, the SPP will be provisionally taken over by CLUVPL/SECL.—The Provisional Acceptance Certificate (PAC) will be issued by SECL for this effect.

The First year warranty period O & M shall commence from the date of Provisional takeover of all the solar power projects. The O&M activity shall be carried out by the Contractor.

The contractor shall carry out comprehensive O & M and any non-conformity arising in the system and any rectification works required during the O & M period shall be carried out by the Contractor at his own cost. CLUVPL shall not be held responsible for any such nonconformities arising during this period.

6. During First year O & M the contractor shall notify in writing to CLUVPL that the plant is ready for PG Test. On verification and approval of the same by CLUVPL, Performance Guarantee (PG) shall be carried out as per the terms and conditions of Technical volume -II.

7. The PG Test shall be conducted at each site for the entire system by the Contractor. The Contractor shall make the plant ready for such test and carry out all operation and maintenance activities during the test. The tests shall be binding on both the parties of the 'Contract' to determine compliance of the 'Plant' / 'Equipment' with the agreed performance values.

8. In case of delay in conducting the PG Test due to reasons attributable to the Contractor, ageing factor shall not be considered during " PG Test". However, the con-

tractor shall commence the PG Test, once the , provisional takeover of all the projects is completed. Results of the PG Test in the form of PG Test Report shall be submitted within 15 days of completion of PG Test to the CLUVPL for review and approval.

9. The PG Test procedure, including the definition of the calculation method to be used, the instrumentation to be installed and indicated in the schemes, the instrument accuracy classes, and calibration of instruments during the test period, the areas of responsibility and the items which specifically require preparation and agreement shall be submitted by the Contractor for review and approval by the CLUVPL during detail engineering phase.

10. The PG Test instruments shall be of precision type with instrument accuracy limits as required and defined in the Technical specification. The PG Test shall be carried out as per test procedures and codes agreed in the Technical specification.

11. All test instrumentation for the PG Tests as required shall be arranged by the Contractor. Data loggers shall be used for performance test. All costs associated with the supply, calibration, installation of the test instrumentation / data loggers / computers etc. are deemed to have been included in the contract price. The test shall be in accordance with those specified in the Technical specification.

12. Any special equipment, tools and tackles required for successful completion of the PG Test shall be provided by the Contractor.

13. It is the Contractor's responsibility to co-ordinate with SECL and Electricity authorities and other agencies for successfully carrying out the PG Test.

14. The plant parameters during the PG Test shall be as defined in the Technical specification.

15. The PG Test results shall be reported as computed from the PG Test observations.

16. Within 15 days after the completion of the PG Test the Contractor shall submit the test report to the CLUVPL.

(a). In the case of a PG Test, whether the Solar PV power plant passed or failed such test, accompanied by sufficient test data and calculations to demonstrate the level of performance attained with respect to each of the tested parameters as follows.

(i). Description of the test procedures

(ii). Standards that were used

- (iii). Instrumentation details and calibration
- (iv). Full schematic diagrams with indication of instrument test location and identification tag of same.
- (v). Test logs and summary of test readings used for performance calculations
- (vi). Full set of data logger readings
- (vii). Computation of test results.
- (viii). Conclusions of PG Tests : test passed or not

17. Within two weeks of receipt such test report, the CLUVPL shall either: (i). Concur with the information provided in the Contractor's test report, or (ii). Disputes some or all of the information provided in the Contractor's test report, the areas being disputed, and the levels of performance being disputed.

18. If the tests could be carried out but are being unduly delayed by the Contractor, the CLUVPL may, by notice require the Contractor to make the tests within 14 days after the receipt of such notice. The Contractor shall make the tests on such days within that period as the Contractor may fix and of which he shall give notice to the CLUVPL.

19. If the Contractor fails to make the tests within 21 (twenty one) days of such notice the CLUVPL may take action on its discretion as deemed fit.

20. If the CLUVPL and the Contractor disagree on the interpretation of the test results, each shall give a statement of his views to the other within 14 (fourteen) days after such disagreement arises. The statement shall be accompanied by all relevant evidence. If CLUVPL the Contractor, and CLUVPL shall meet at a mutually acceptable date & location to review and discuss the dispute. Mutual discussions will be held and agreed to determine the interpretation of the test results.

#### **10.14 Commercial operation Declaration ( COD ):**

The commercial operation declaration shall be the date on which all the solar power projects are provisionally taken over by CLUVPL and it shall be the date for the commence meant of 10 Years comprehensive O & M. The contractor shall carryout O & M activities of the commissioned solar projects till the commercial operation declaration without any extra cost to the purchaser.

#### **10.15 Approval by the CLUVPL**

- i) Documents and drawings as mentioned in Section-4 shall be subject to the approval of the CLUVPL .
- ii) Other drawings and documents as per Section-4 shall be subject to the review and reference of the CLUVPL .
- iii) All changes from the approved drawings/documents shall be subject to the prior approval of the CLUVPL .
- iv) All sub-contractors and sub-suppliers for raw materials testing, design and engineering, manufacture, supplies, construction and erection work and any other work/services covered under the Contract shall be subject to the written approval of the CLUVPL .
- v) While the Contractor shall make/execute/perform supplies, work and services in terms of the Contract, the CLUVPL shall have the right to check and approve design, type, quality, quantity, materials and workmanship of any or all items of supplies, work and services where considered necessary by CLUVPL to ensure that supplies, work and services made/executed/ performed by the Contractor are in accordance with the provisions of this Contract.
- vi) The Chief Project Manager of Contractor who shall be in overall charge of the Project at site shall be appointed in consultation with the CLUVPL.
- vii) Detailed assignment schedules of foreign Experts/ Specialist for rendering technical services shall be submitted by the Contractor for the approval of the CLUVPL within six (6) months from the date of LOA. The bio-data of key personnel shall be submitted within two months of the date of LOA and for others six (6) months before their deputation.
- viii) To enable the CLUVPL to accord approval and to review documents and drawings the Contractor shall submit back-up data/ drawings/basic calculations/assumptions as may be required by the CLUVPL .
- ix) Where approval of the CLUVPL is required or implied but is not specifically provided for elsewhere in this Contract, such approval shall also come within the purview of this Section.
- x) Approval by the CLUVPL in terms of this Section shall not relieve the Contractor of any of his obligations under the Contract. CLUVPL shall approve or refuse approval within twenty (20) days from the date of receipt of request with supporting documents.



xi) The approval requested by the Contractor shall not be withheld unreasonably by the CLUVPL. All requests for approval shall be accompanied by fully supporting documents, otherwise it shall not be considered as a request.

#### **10.16 SUB- CONTRACT**

i) The Contractor shall not sub-contract the Contract Work in whole to third parties for the performance of this Contract.

ii) The Contractor may propose a panel of Sub- Contractors as stipulated in the Technical specification for the part of scope of works. The Contractor shall thereafter select any sub-Contractor out of this panel subject to the approval of CLUVPL. Any such assignment shall not relieve the Contractor from any obligation, duty or responsibility under the contract. Any assignment as above without the prior concurrence of CLUVPL shall be void.

iii) The Contractor shall be responsible for transmitting all the pertinent data of all Contract terms and conditions with his Sub-Contractors. The Contractor shall also furnish the specification, place of manufacture, delivery schedule and adequate, un-priced copies of supply orders/contract he has entered into in respect of imported items and adequate copies of un-priced supply order/contract in the case of indigenous items.

iv) CLUVPL shall give approval for Sub- Contractor or shall refuse approval in writing within 15 days of receipt of request along with all supporting details.

v) Bought-out items, critical components, proprietary items and equipment manufactured and supplied by specialised manufacturers which the Contractor intends to incorporate in the Contract Work shall also be subject to the written approval of CLUVPL

vi) The approval extended by the CLUVPL in selecting Sub-Contractors recommended by the Contractor shall not discharge/relieve the later from his Contract obligations. The Contractor shall remain solely liable for any action, deficiency, and/or negligence on the part of his Sub-Contractors/sub-suppliers.

vii) In the event certain obligations extended by a Sub-Contractor to the Contractor should extend beyond the guarantee period specified in the Contract, CLUVPL shall automatically be entitled to the benefit thereof.

viii) In no event shall the CLUVPL be deemed to have any Contractual obligations whatsoever in respect of Contractor's/ Sub-Contractors and/or title-holders of any sub-orders placed by the Contractor.

#### **10.17 INSPECTION AND TESTS AT CONTRACTOR'S / MANUFACTURER'S PREMISES.**

i) CLUVPL or their authorised agent shall have the right of inspecting and testing the contract work or any part thereof at any stage during the manufacture and the Contractor on demand from CLUVPL shall carry out such tests in appropriate manner in the presence and free of charge to CLUVPL. The tests required as per relevant codes and the tests specifically agreed in the contract specifications and agreed QAP only will be done. Should the Contractor himself not be in a position to carry out the tests, he shall, on

CLUVPL demand prepare specimen and samples and send them at his own cost to such testing stations as the CLUVPL may specify and the cost of the test so effected shall be to the Contractor's account. However, cost pertaining to the PURCHASER'S inspection personnel shall be borne by the CLUVPL.

(a) Should a part of the plant be manufactured not on Contractor's own premises but on other premises, the Contractor shall like wise obtain permission for the CLUVPL/his authorised representative to inspect and test the work as if the said plant were being manufactured on the Contractor's premises.

(b) The inspection, examination or testing carried out by the CLUVPL shall not relieve the Contractor from any of his obligations under this Contract. The inspection procedure shall be discussed and finalised.

ii) The inspection and tests shall be so conducted as not to unreasonably impede the progress of manufacture.

iii) The CLUVPL shall have the right to be present during all tests carried out by the Contractor. The Contractor on being requested so to act, shall present sufficient documentary evidence that the material used shall meet the specified requirement. If called for, samples and specimen shall become the PURCHASER's property. The Contractor shall notify the contract work, particularly before any assembly, in order that the inspection or tests can be carried out as may be required to ascertain without prejudice to the Contractor's liability, whether the materials and/or services are in conformity with the requirement of the contract. All inspection and tests shall be carried out as per the approved procedure unless otherwise specified.

iv) The Contractor shall bear all costs of any and all agreed inspections and tests. If special tests are necessary based on the results of the agreed test, then cost of all such special tests also shall be to the account of the Contractor in all cases.

v) The CLUVPL upon giving fifteen(15)days notice in writing and stating any grounds of objection, shall have the right to reject any or all equipment or demand rectification or replacement thereof.

vi) The Contractor shall submit to the CLUVPL quarterly programme of inspection and tests one month in advance of the commencement of the quarter. The Contractor shall give the CLUVPL a minimum of fifteen (15) days clear notice for inspection within India and thirty (30) days clear notice for inspection at places other than India,of any work being ready for inspection and tests specifying the period likely to be required for such inspection and tests. Thereafter, the CLUVPL or his inspector shall, unless inspection or test is voluntarily waived, attend at the contractor's or his Sub-supplier(s)/Sub-

contractor(s) premises, such inspection and tests within seven (7) days of the date on which the equipment is notified as being ready for inspection and test. Should the CLUVPL fail to attend such inspection and test, the Contractor may proceed with the inspection and test at his option which shall be deemed to have been made in the PURCHASER's/CLUVPL's presence and shall forthwith forward to the CLUVPL copies of inspection/test certificates for acceptance by the CLUVPL. The pro-forma and number of copies for inspection/test certificates shall be mutually agreed. However, if the CLUVPL request the Contractor for a revised date of inspection but within fifteen(15) days of the date of inspection as communicated by the Contractor, the Contractor shall arrange the inspection on the revised date as requested by the CLUVPL.

vii) In all cases whether at the premises or works of the Contractor or of any sub-contractor, the Contractor shall, provide free of charge to the CLUVPL such labor, materials, electricity, fuel, water, stores, apparatus and instrument and/or facilities as may reasonably be deemed required to carry out efficiently such tests of the plant in accordance with the contract and shall give all such facilities to the CLUVPL or his authorised representative to accomplish such tests.

viii) When the inspection/tests have been satisfactorily completed at the Contractor's or his Sub- Contractor's premises, the CLUVPL shall issue a certificate to that effect. If a final certificate can not be issued, a provisional certificate shall be issued. If the tests were not witnessed by the CLUVPL or his representative the certificate shall be issued on receipt of the inspection and tests report from the contractor but not later than fifteen (15) days after the receipt of the said report by the CLUVPL. In the event a certificate is not issued by the PURCHASER during 15 (fifteen) days, the Contractor, if considered necessary, can arrange despatch along with the certificate as stated in 10.18.(vi) with the clear understanding that if the CLUVPL reject such equipment at a later date, the contractor shall rectify the same at his own cost to the PURCHASER's/CLUVPL satisfaction. No Plant shall be shipped or left or otherwise despatched before such certificate has been issued. The satisfactory completion of these inspection and tests or the issue of the certificate shall not bind the CLUVPL to accept the work, should it on further tests during or after erection be found not to comply with the Contract.

ix) In case any equipment fails in inspection/tests, re-inspection/retest shall be carried out only after necessary rectification work/replacement by the Contractor.

x) Subject to Clause-10.18(viii) above, no plant, equipment and material shall be shipped before inspection certificate and despatch instructions have been issued by the CLUVPL.

xi) The contractor shall furnish to the CLUVPL/his authorised Inspector five (5) copies of un-priced purchase orders including detailed technical specification and drawings placed on his Sub- Contractors as soon as such orders are placed by the Contractor, but in any case not later than two (2) months before the expected date of the equipment getting ready for inspection.

xii) In the case of mandatory spares, the same shall be offered for inspection along with the main equipment or after the main equipment has been satisfactorily inspected and tested.

xiii) In the case of such equipment, structural etc. where tests set forth above cannot be conducted either partially or fully in Contractor's/Sub-supplier(s) premises but have to be conducted at site only after erection, the provisions under this Section shall also apply. However, in such cases prior approval of the CLUVPL shall be obtained by the Contractor prior to despatch.

xiv) The Inspection by the CLUVPL and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of agreed QAP forming part of the Contract.

#### **10.18 Standards, Codes and Compliance with Laws & Regulations**

i) The design, engineering, manufacturing, supplying, assembling, erection, installation, testing and construction work shall be carried out in accordance with latest appropriate Indian Standards and Codes unless otherwise specified in the Contract specification. Where appropriate Indian Standards and Codes are not available, appropriate latest standards and codes of Country of Origin shall be used. Contractor shall however, obtain PURCHASER's/CLUVPL's prior approval before using such standards and codes of country of origin.

ii) The Contract Work shall be designed to suit the climatic, geological, hydrological, hydro-geological, and seismological and soil conditions of the site. Measures shall be taken against corrosion/erosion by ground water, storm surge, floods, cyclones, wind speeds etc.

iii) The Contractor shall, throughout the performance of this Contract comply with all laws, rules, regulations and statutory requirements of Government of India, Government of Chhattisgarh and other statutory bodies as far as such bodies have jurisdiction over the Contract work or any part of the site.

iv) If any new statutory regulation or law or modification of the existing regulation or law comes into force subsequent to the Base Date, the Contractor shall comply with the

same. However, if it calls for any modification of the design/equipment with financial implication, the same shall be discussed between the Contractor and CLUVPL and mutually agreed.

### **10.19 Protective Painting**

The General Specification for painting and colour code etc. shall be followed by the Contractor for painting of equipment, steel structures etc. as per the technical specification.

### **10.20 Weights & Measures**

- i) All weights, dimensions and measures shall be in metric system.
- ii) All weights, instruments, measures used in the contracted equipment shall be properly calibrated.

### **10.21 Secrecy & Titles**

- i) All technical information, maps, plans, drawings, specifications, schemes and the subject matter contained therein and all other information given to the Contractor by the CLUVPL in connection with the performance of the Contract Work shall be held confidential by the Contractor and shall remain the property of the Purchaser and shall not be used or disclosed to third parties by the Contractor for any purpose other than for which they have been supplied or prepared. The Contractor may disclose to third parties, upon execution of secrecy agreements, such part of the drawings, Specifications or information if such disclosure is necessary for the performance of the Work.
- ii) Maps, layouts and photographs of the solar projects including its surrounding regions showing vital installation for national security of PURCHASER'S/CLUVPL'S country shall not be published or disclosed to the third parties or taken out of the country without prior written approval of the CLUVPL.
- iii) Title to secret processes if any developed by the Contractor on an exclusive basis and employed in the design of the equipment shall remain with the Contractor. The CLUVPL shall hold in confidence such processes and shall not disclose such processes to the third parties without prior approval of the Contractor.
- iv) Subject to above Clause, title to technical specifications, drawings, flow sheets, norms, calculations, diagrams, interpretations of test results, schematics, lay-outs and such other information which the Contractor has supplied to the CLUVPL under the Contract shall be passed on to the CLUVPL. The CLUVPL shall have the right to use these for construction, erection, start-up, commissioning, operation, maintenance, modifications and/or expansion of the works including for the manufacture of spare

parts (other than those of proprietary in nature to the contractor) in connection with the project.

v) The provision of above Clauses shall not apply to information:

(a) Which at the time of disclosure are in the public domain or which later on become part of public domain through no fault of the party concerned, or

(b) Which were in the possession of the party concerned prior to disclosure to him by the other party, or

(c) Which were received by the party concerned after the time of disclosure without restriction on disclosure or use, from a third party.

## **10.22 Rejection of Defective Plant & Works or Other Installation**

i) If the completed plant, or any portion thereof, before it is finally accepted be found to be defective or fails to fulfil the requirements of the Contract, the CLUVPL shall give the Contractor notice setting forth particulars of such defects or failure and the Contractor shall forthwith make the defective plant good, or alter the same to make it comply with the requirements of the Contract. Should he fail to do so within a period of time as deemed reasonable by the CLUVPL and stated in the said notice, the CLUVPL may reject and replace at the risk and cost of the Contractor, the whole or any portion of the plant, as the case may be, which is defective or fails to fulfil the requirements of the Contract. However, such rejection/replacement by the CLUVPL shall not absolve the Contractor of any of his responsibilities under this Contract.

ii) Without prejudice to the above, the PURCHASER /CLUVPL shall be entitled at his discretion to the use of the rejected plant in a reasonable and proper manner for a time reasonably sufficient to enable him to obtain other replacement plant. However, such usage shall not be deemed as waiver or acceptance of such defective plant by the PURCHASER.

## **10.23 NEGLIGENCE**

i) If the Contractor shall neglect to execute work with due diligence or expedition or shall refuse or neglect to comply with any reasonable order given to him in writing by the CLUVPL in connection with the work or shall contravene the provisions of Contract, the CLUVPL may give notice in writing to the Contractor calling upon him to make good the failure, neglect or contravention complained of within such time as may be deemed reasonable by the CLUVPL and in default of compliance with the said notice, the CLUVPL without prejudice to its rights under clauses 10.24.(ii) hereto and Cl. 6.6.(ix), may rescind or cancel the Contract as provided in Cl.10.30 holding the Contractor fully liable for the damages that the CLUVPL may sustain. In addition,

the Contractor shall refund all amounts paid to him by the PURCHASER for all such work which may become in fractious due to such cancellation.

ii) Should the Contractor fail to comply with such notice within the period as mentioned in the notice or any other period considered reasonable by the CLUVPL for such compliance, from the date of serving thereof, then and in such case, without prejudice to the PURCHASER's/CLUVPL right under clause 10.24.(i) hereto, the CLUVPL shall have at his option the right to take the affected work wholly or in part out of the Contractor's hands and may complete the work, as envisaged in the Contract either departmentally or by awarding fresh Contract(s) at a reasonable price to any other persons or firm or company to execute the same, at the cost of the Contractor.

iii) In such event the CLUVPL shall, without being responsible to the Contractor for fair wear and tear to the same, be entitled to seize and take possession of all materials, construction equipment, tools, tackles and other things belonging to the Contractor and also to have free use of all materials, construction equipment, tools, tackles and other things of the Contractor / its sub-contractors which may be on the site for use at anytime in connection with the work to the exclusion of any right of the Contractor over the same and the CLUVPL shall be entitled to retain and apply any sum which may otherwise be then due as per the Contract or any other contract from him to the Contractor as may be necessary for the payment of the cost of execution of such work as aforesaid.

iv) If the cost of executing the work as aforesaid shall exceed the sum due to the Contractor and the Contractor fails to make good the deficit, the said materials, tools, tackles, construction plant or other things and properties belonging to the Contractor as may not have been used up in the completion of the work, may be sold by the CLUVPL and proceeds applied towards the payment of such difference and the cost of and incidental to such sale. Any outstanding balance existing after crediting the proceeds of such sale shall be paid by the Contractor on the demand of the CLUVPL, but when all expenses, cost and charges incurred in the completion of the work are paid by the Contractor, all such materials, tools, tackles, construction plant or other things not used in the completion of the work and remaining unsold shall be removed by the Contractor with the written permission of the CLUVPL only.

v) In addition, such action by the CLUVPL as aforesaid shall not relieve the contractor of his liability towards Price Reduction to pay for delay in completion of work as defined in Section-4.

## **10.24 Progress Report**

- i) The Contractor shall prepare and regularly update his detailed PERT/CPM Networks and submit the same with computerised time analysis reports showing starting and completion dates of all activities of engineering, purchasing, procurement of materials, manufacture, supply, inspection and despatch, construction, erection etc., in his scope of work and those of his sub-contractor(s).
- ii) The Contractor shall submit the progress report in such pro-forma and details as may be required by the CLUVPL showing the agreed detailed programme of various activities as per above clauses and actual progress achieved to monitor the progress of the work.
- iii) The Contractor shall submit the progress report every month and in 5 (five) copies. CLUVPL shall have the right to depute his's representatives at the premises of works of the Contractor or any of his sub-contractors to ascertain the progress of work.
- iv) The Contractor shall submit the progress photographs in 5 (five) copies every month relating to the progress in sequence of work of all major activities.

### **10.25 Training:**

The Contractor shall arrange for Training of the Purchaser's personnel as per requirements.

### **10.26 Patents**

- i) If the performance of the Contract involves the use of a patent, trade mark, registered design, copy rights and/or industrial property rights of which the Contractor holds the title, the Contractor shall not be entitled to any licence fee, royalty and/or compensation from the CLUVPL outside of the Contract Price which shall be deemed to include such licence fee, royalty and/or compensation.
- ii) Where the title holder of a patent, trade mark, registered design, copy rights and/or industrial property rights used is a third party, the Contractor shall be liable for settling with such party and paying any licence fee, royalty and/or compensation thereon.
- iii) The Contractor shall submit to the CLUVPL a certificate from the licensor attesting technology of the licence granted.
- iv) In the event of any third party raising claim or bringing action against the CLUVPL including but not limited to action for injunction in connection with third



party's alleged rights affecting the equipment covered under the Contract or the use thereof, the Contractor agrees and undertakes:

(a) To defend and assist the CLUVPL in defending at the Contractor's cost against such third party's claim and/or actions and against any law suits of any kind initiated against the PURCHASER.

b) To indemnify, keep indemnified and hold harmless the CLUVPL against all actions, claims, demands, costs, charges and expenses raised by third parties and arising from or incurred by reason of any infringement of patent, trade mark, registered design, copy rights and/or industrial property rights by manufacture, sale or use of the equipment supplied by the Contractor whether or not the CLUVPL is held liable for by any court Judgement. Provided, however, that:

1. The CLUVPL shall, as soon as reasonably possible notify the Contractor in writing of such third party's claim and/or action and:

i. The Contractor shall at his own cost defend or assist the CLUVPL in defending his rights against any such claims and/or actions.

ii. If the Contractor defends the case, the CLUVPL shall assist the Contractor free of charge by providing all such information and documents as are available with the CLUVPL, save and except that in case of production of any witness at the request or insistence of the Contractor shall bear the costs and expenses required in this regard.

2. The CLUVPL shall not without the Contractor's consent (which shall not be unreasonably withheld) enter into any commitment or admit any fact capable of supporting third party's claims, unless the CLUVPL shall release the Contractor of his liabilities and obligations.

3. The Contractor shall at his own cost, without prejudice to the provisions of this Section, may either carry out such alterations or modifications of the equipment which are necessary to avoid the infringement without affecting the efficient operation of the equipment to the satisfaction of the CLUVPL or to procure a right to the unrestricted use of the infringing equipment by the CLUVPL.

v) Nothing in this article shall abrogate or abridge the Contractor's own liability for infringement or violation of patent, trade mark, registered design, copy rights and/or indus-

trial property right of a third party, if such infringement or violation is proved before and sustained in court of law and the Contractor fails to take action in terms of provision of Clause 10.27.(iv)

vi) If required and mutually agreed, the CLUVPL shall enter into Process Licence Contract(s) as per clause 10.27.(ii).

vii) The rights and liabilities of the parties under this Clause shall survive this Contract.

## **10.27 Indemnity**

i) The Contractor shall at all times indemnify and keep indemnified the CLUVPL against all claims which may be made against the PURCHASER in respect of any infringement of any rights protected by patent registration of design of trade mark. In this connection, the CLUVPL shall pass on all claims made against him to the Contractor for settlement.

ii) The Contractor assumes responsibility for and shall indemnify and save harmless the CLUVPL from all liability, claims, costs, expenses, taxes and assessments including penalties, punitive damages, attorney's fees and court costs which are or may be required to be paid by the CLUVPL arising from any breach of the Contractor's obligations under the Contract or for which the Contractor has assumed responsibilities under the Contract including those imposed under any Contract local or national law or laws, or in respect to all salaries, wages or other compensation or all persons employed by the Contractor or his Associate(s)/Sub-Contractors or suppliers in connection with the performance of any work covered by the Contract. The Contractor shall execute, deliver and shall cause his Sub- Contractor and suppliers to execute and deliver, such other further instruments and to comply with all the requirements of such laws and regulation as may be necessary there under to conform and effectuate the Contract and to protect the CLUVPL.

iii) The CLUVPL shall not be held responsible for any accident or damages incurred or claims arising there from during the period of construction and erection under the responsibility of the Contractor/sub-contractors and putting into operation of the plant under the supervision of the Contractor in so far as the latter is responsible. However, the Contractor shall be liable for such accidents as may be due to negligence on his part to carry out work in accordance with Indian laws and regulations.

iv) The Contractor shall be responsible for proper fencing, lighting, guarding and watching of all works at site until they are taken over and further arrange proper provisions for like period of temporary drainage, roadways, footways, guards and fences as far as may be rendered necessary by reason of works for accommodation and protection of the PURCHASER's adjacent property and that of the public and others during the entire construction and O&M period. No naked light shall be used by the Contractor on the site otherwise than in the open air without the special permission in

writing from the PURCHASER. The PURCHASER shall not be responsible for any theft or misuse of material/plant, equipment.

#### **10.28 INDEMNITY BOND FOR O&M**

- i. The successful Contractor shall execute indemnity bond against loss or damage of the Solar PV Power Plant with all associated materials/equipments after 12 (Twelve) months of provisional take over and before the expiry of warranty period for an amount equivalent to the project cost which is valid till the expiry of the O&M period (10) Ten years. The Indemnity Bond has to be executed by the successful Contractor in the manner specified by CLUVPL.
- ii. The said Contractor hereby agreed to maintain the Solar PV Power Plant as per conditions of O&M agreement and his possession in trust for the CLUVPL as their property until such time the O&M period is completed and the plant is handed over back to the authorised representatives of the PURCHASER as per the terms of the Agreement.
- iii. The said Contractor further agree to hold the CLUVPL harm less and free from all liabilities for all losses, damages, etc., arising from any cause, whatsoever to the material while in his possession, and further under takes to indemnify and reimburse the CLUVPL to the extent of loss or damage caused to the materials or any loss or any claims to the CLUVPL in respect of the said material during O&M period.

#### **10.29 Termination, Suspension and Foreclosure**

- i) The CLUVPL may at any time on breach of this Contract by the Contractor give him a written notice of such breach. If the Contractor does not take appropriate measure to the satisfaction of the CLUVPL within a period of 30 days after issuance of such notice to remedy that breach, then the CLUVPL may terminate this Contract at any time thereafter stating therein the date of termination. The Contractor shall then be liable to the CLUVPL in accordance with the Clause- 10.24 herein above.
- ii) The CLUVPL reserves the right to terminate this Contract at any time either in part or in full due to reasons such as the Contractor failed to commence work, abandoned the work during progress, neglected to proceed and progress, failed to perform his obligations, by giving a notice of not less than fifteen (15) days. The Contractor upon receipt of such notice shall discontinue the work on the date and to the extent specified in the notice, make all reasonable efforts to obtain cancellation of all orders and Contracts to the extent they are related to the work terminated and terms satisfactory to the CLUVPL, stop all further sub contracting or purchasing activity related to the work terminated and assist the CLUVPL in maintenance, protection and disposition of the works acquired under the Contract by the CLUVPL. The Contractor shall hand over all the drawings, documents, plant, equipment, supplies, material etc. including all the rights of work to the CLUVPL. The CLUVPL shall pay to the Contractor the cost incurred in accordance with the Contract terms and rates as decided by the

CLUVPL till the date of termination as compensation. No consequential damages shall be payable by the CLUVPL to the Contractor in the event of termination.

In the event that the Collaborator is not performing the contractual obligation or the main Contractor intends to change the Collaborator on whose strength the Contract was bagged by the Contractor, the Contract will be terminated at the Cost & Risk of the Contractor.

iii) The CLUVPL reserves the right to suspend and reinstate execution of the whole or any part of the works without invalidating the provisions of the contract by giving Contractor notice in writing to such effect stating the nature, the date and the anticipated duration of such suspension.

iv) On receiving the notice of suspension as per above clause, the Contractor shall stop all such work which the CLUVPL has directed to be suspended with immediate effect. The Contractor shall continue to perform other work in terms of the Contract which the CLUVPL has not suspended.

v) The CLUVPL may at anytime cancel the suspension notice for all or any part of suspended work by giving written notice to the Contractor specifying the part of work to be resumed and the effective date of suspension withdrawal. The Contractor shall resume the suspended work as expeditiously as possible after receipt of such withdrawal of suspension notice.

vi) In the event of suspension of work, the CLUVPL shall not be liable to the Contractor for any damage or loss or idle labor caused by such period of suspension of work. The CLUVPL shall not be liable to Contractor for any payment towards watch & ward and any other expenditure. However, the compensation for the suspension period beyond 30 days for the reason attributable to the PURCHASER shall be mutually discussed and agreed. Further for the actual suspension period for the reason attributable to the PURCHASER, which will affect the progress of Contractor's work and scheduled completion time, the extension time shall be granted on request from the contractor.

vii) The contract shall be terminated due to any unforeseen circumstances which may lead to the foreclosure of the project for reasons such as resource crunch, non-availability of funds, and for other administrative reasons etc. PURCHASER shall however, give 60 days prior written notice to the contractor of the effective date of termination.

viii) In the event of termination of the Contract by the PURCHASER, the PURCHASER shall pay to the Contractor the following amounts:

(a) the Contract Price, properly attributable to the parts of the Facilities executed by the Contractor as of the date of termination.

(b) the costs reasonably incurred by the Contractor in the removal of the Contractor's Equipment from the Site and in the repatriation of the Contractor's and its Sub contractors' personnel.

(c) costs incurred by the Contractor in protecting the Facilities and leaving the Site in a clean and safe condition and

(d) any other claims like compensation for loss in profit, compensation for loss of reputation etc. or any other consequential damages if any claimed by the Contractor shall not be given by the PURCHASER.

### **Suspension of the Contractor:**

If the performance of the Contractor is found to be unsatisfactory or if the conduct is under suspicion or in the event of any breach of the conditions committed by the contractor or collaborator will lead to suspension of the Contractor for six (6) months.

### **Banning of the Contractor:**

Supplying defective / poor quality materials or performing substandard works and failure to rectify /replace the same even after reasonable extension is given to the contractor will lead to banning of the Contractor for one (1) year.

### **10.30 Termination of Services of Contractor's Personnel**

In the event, any of the Contractor's or his Sub - Contractor's, personnel, agents, sub- agents, assistants, or other employees shall be guilty of any misconduct or be incompetent or insufficiently qualified or negligent in the performance of their duties or it is undesirable for any administrative reasons for such person to be employed, the Contractor, if so directed, shall immediately remove such person or persons from employment thereon. Any person or persons so removed shall not again be employed in connection with this Contract without the written permission of the CLUVPL. Any person so removed shall immediately be replaced by a qualified and competent substitute at the Contractor's cost and expenses. Should the Contractor be requested to repatriate any person he shall do so and shall bear all costs and charges in connection therewith.

### **10.31 Force Majeure**

The following shall constitute Force Majeure:

- i) Natural phenomena, including but not limited to floods, droughts, earthquake and epidemics.

(a) Acts of any Government, domestic or foreign including but not limited to war, declared or undeclared priorities, quarantines, embargoes.

(b) Strikes, lock outs and sabotage.

(c) Riots and civil commotions.

(d) Piracy.

(e) Provided either party shall within 15 days from the occurrence of such a cause notify the other in writing of such cause.

ii) If the Contractor suffers delay in the due execution of the contractual obligations due to delays caused by Force Majeure as defined above, the agreed time of completion of the work covered by this contract and of the obligations of the Contractor shall be extended by a period of force majeure, provided, that on the occurrence of any such contingency, the Contractor immediately reports to the CLUVPL in writing, the cause of delay with requisite documentary evidence and also the remedial steps being taken and the expected period of interruption.

However, as regards to the Sub-Contractors of the contractor, the events or occurrences enumerated above in Clause 10.32 (i) which are site-specific to Bishrampur & Bhatgaon shall constitute force majeure events but excluding strikes, Lockouts or other concerted action of workmen of such subjects.

iii) The decision of the PURCHASER whether there is a Force Majeure condition or not and whether extension of time shall be granted or not shall be final.

iv) Force Majeure conditions prevailing at the works of the collaborator / Suppliers / Sub-Suppliers / major Sub-Contractors other than a maximum of 10 (Ten) major collaborator / major Suppliers / major Sub-Contractors (the names of which have to be indicated by the contractor and got approved by the CLUVPL: however, the decision of the PURCHASER shall be final) shall not be recognised by the CLUVPL on any account and it shall be upto the Contractor to make necessary alternative arrangement to execute the Contract within the agreed time schedule. The Contractor shall furnish the list of Sub-Suppliers / Sub-contractors to be considered under Force Majeure conditions before signing of the contract

v) The contractor or the CLUVPL shall not be liable for delays in performing his obligations resulting from any Force Majeure cause as referred to and/or defined above. The date of completion shall subject to hereinafter provided, be extended by a reasonable time even though such cause may occur after the contractor's performance of his obligations has been delayed for other causes.

vi) No increase in price shall be payable due to force majeure condition. However, any benefit of price fall shall be passed on to the PURCHASER.

### **10.32 Jurisdiction, Resolution of Disputes & Arbitration Jurisdiction**

The laws applicable to this Contract shall be the laws in force in India. The civil courts having ordinary original jurisdiction over Bilaspur shall alone have exclusive jurisdiction over all matters concerning this Contract including the arbitration proceedings if any arising under the Contract.

#### **Resolution of Disputes**

Any dispute / disputes or difference / differences arising out of or in connection with the Contract shall, to the extent possible be settled amicably between the parties.

#### **Informal Dispute Resolution**

i) The parties agree to use reasonable efforts to resolve all disputes equitably and in good faith. If any dispute between the Contractor and the PURCHASER arises it shall in the first instance be referred in writing to the PURCHASER, who shall endeavour to resolve the dispute amicably and render a decision within 30 days. The period of 30 days shall be reckoned from the date of intimation of the dispute received by the PURCHASER.

ii) Save as here in after provided, in respect of a dispute so referred, the decision of the PURCHASER shall be final and binding upon the Parties until the completion of the Contract and shall forthwith be given effect to by the Contractor who shall proceed with the Contract with all due diligence, whether or not either Party has sought conciliation of the dispute as hereinafter provided.

#### **Conciliation (For other Contractors and not for PSUs)**

i) If the party is dissatisfied with the decision rendered by the PURCHASER, or if the PURCHASER omits or declines to render a decision within the said period of 30 days, then within a further period of 30 days, the dissatisfied Party shall require by a notification that the dispute be referred to Conciliation in the manner as per the 'SECL Conciliation Rules', copy of which is available with the SECL offices and also in SECL website. The Contractors shall abide by the SECL Conciliation Rules' for resolving any dispute arising out of this contract. Such a notification shall be in writing and it shall be duly served on the other party. Failure to invoke the Conciliation within the time stipulated shall debar the party from seeking reference to Conciliation.

ii) Except as otherwise provided in this clause, any dispute arising out of or relating to this agreement, or the breach, termination or validity thereof, shall be settled by Conciliation in

accordance with 'SECL Conciliation Rules'. The Conciliation shall be held at Bilaspur. The Conciliation proceedings shall be conducted, and the award shall be rendered in English. The award shall state the reasons upon which it is based.

iii) There shall be three Conciliators, who will be appointed as per Section-5 of the 'SECL Conciliation Rules'.

iv) The Contract conditions and the rights and obligations of the Parties, shall remain in full force and effect during the Conciliation proceedings. Supplies and / or services under the Contract shall, if reasonably possible, continue during the Conciliation proceedings.

v) For the purpose of this clause, the term 'dispute' shall include a demand or difference of any kind whatsoever, arising out of the Contract and respecting the performance of the Contract, whether during the Contract period including extensions if any, or after completion, and whether before or after termination, abandonment or breach of the Contract. (except as to any matter, the decision of which is specifically otherwise provided for in any of these conditions).

vi) Only in case of failure to resolve the dispute through Conciliation, Arbitration can be resorted to.

vii) Once the settlement agreement is signed with respect to a dispute, the same dispute is not subject to further appeal through Arbitration or JUDICIAL Proceedings.

viii) Anything not found included in the 'SECL Conciliation Rules', but necessary to conduct the conciliation proceedings will be dealt with as per the provisions of the 'Arbitration and Conciliation Act 1996 -Part-III' or as per the statutory provisions modified from time to time.

## **Arbitration**

### **i) Between SECL & another Central PSE**

In the event of any dispute or difference, relating to the interpretation and application of the provisions of the Contracts, such dispute or difference shall be referred by either party for resolution through Administrative Mechanism for Resolution of CPSE's Disputes (AMRCD) as mentioned in DPE OM No. 4(1) 2013-DPE-(GM)/FTS-1835 dated. 22.05.2018 and its Amendments issued from time to time.

### **ii) For Other Contractors**

Arbitration shall be applicable only for the dispute(s) involving claims from Rs.25 Lakhs to Rs.20 Crores. The claims below Rs.25 Lakhs are subject to the jurisdiction of the respective



Civil Court having jurisdiction over Bilaspur. The claims above Rs.20 Crores are subject to the exclusive jurisdiction of the Court situated at Bilaspur

(a). In case of failure to resolve the dispute through Conciliation, then within a further period of 30 days, the dissatisfied Party may require by a notification that the dispute be referred to arbitration in the manner hereinafter provided. Such a notification shall be in writing and it shall be duly served on the other party. Failure to invoke the arbitration within the time schedule shall debar the party from seeking reference to arbitration.

(b). Except as otherwise provided in this clause, any dispute arising out of or relating to this agreement, or the breach, termination or validity thereof, shall be finally settled by arbitration in accordance with the Arbitration and Conciliation Act 1996 (the "Act") as may be amended from time to time. The arbitration shall be held at Bilaspur, The arbitration proceedings shall be conducted, and the award shall be rendered in English. The award shall state the reasons upon which it is based.

(c). There shall be three (3) arbitrators of whom each Party shall appoint one. The Party requesting that the dispute be referred to arbitration shall, within 30 days of the notification in terms of Clause 10.33.2.3 (ii) (a), appoint an arbitrator as also call upon the other Party to appoint an arbitrator within thirty (30) days. The two arbitrators so appointed shall, within thirty (30) days of the date on which the second of them is appointed, agree on the third arbitrator who shall act as the presiding arbitrator of the tribunal.

(d). The agreement and the rights and obligations of the Parties, shall remain in full force and effect pending the award in any arbitration proceedings. Supplies and/ or services under the Contract shall, if reasonably possible, continue during arbitration proceedings.

(e). For the purposes of this clause, the term `dispute' shall include a demand or difference of any kind whatsoever, arising out of the Contract and respecting the performance of the Contract, whether during the Contract period including extensions if any, or after completion, and whether before or after termination, abandonment or breach of the Contract (except as to any matter, the decision of which is specifically provided for in any of these conditions).

(f). The Arbitrators shall publish a speaking award which shall be binding on both the parties. The party, in whose favour the award is passed, shall be entitled to recover the entire cost of Arbitration from the other party. The Arbitrator shall indicate the above in their award clearly.

## **10.33 Warranty**

### **Warranty and Extended Warranty**

1. The Contractor shall guarantee that all the equipment / systems shall be new and in accordance with the Contract documents and be free from defects in design, material and workmanship. The Contractor's shall be responsible for the replacement of any defective parts in the

equipment of his own manufacture or those of his Sub vendors/Sub-Contractors, under the normal use and arising from faulty design, materials and/or workmanship. The plant shall be operated as per the operating instructions and all records, log books and other information about the operation shall be kept. Such replaced defective parts shall be taken back by the Contractor. The Contractor shall carry out operation and maintenance of the entire Solar PV Power Plant and Power evacuation system including Civil maintenance, Horticulture maintenance and Security during the warranty period.

2. The Contractor shall carry out all the maintenance works including repairs and /or replacement to fulfill the warranty obligations.

3. In the event of any emergency where, in the Judgement of the CLUVPL, delay would cause serious loss or damage, repairs, replacements or adjustments may be made by the CLUVPL or a third party chosen by the CLUVPL with advance notice indicating the reasonable time required to the Contractor and the cost of such work shall be paid by the Contractor, or by the Surety. In the event of such action being taken by the CLUVPL, the Contractor shall be notified promptly and the Contractor shall assist wherever possible in making the necessary corrections. This shall not dilute the Contractor's liability under the terms and conditions of the Contract.

4. If it becomes necessary for the Contractor to replace or renew any defective portions of the plant under this clause, the provisions of this clause shall apply to the portion of the plant so replaced or renewed until the expiry of 12 months from the date of such replacement or renewal. If any defects be not remedied within a reasonable time, the CLUVPL may proceed to do the work at the Contractor's risk and costs, but without prejudice to any other rights which the CLUVPL may have against the Contractor in respect of such defects.

5. The repaired or new parts shall be furnished and erected free of cost at site by the Contractor. If any repair is carried out on his behalf at the site, the Contractor shall bear the cost of such repair.

6. The cost of any special or general overhaul rendered necessary during the guarantee period due to defects in the plant or defective work carried out by the Contractor shall be borne by the Contractor.

7. The acceptance of the equipment by the CLUVPL shall not in any way relieve the Contractor of his obligations under this clause.

8. In case of these defective parts which are not repairable at site but are essential for the commercial use of the equipment, the Contractor and the PURCHASER shall mutually agree to a programme of replacement or renewal which shall minimise interruption to the maximum extent, in the operation of the equipment.

9. At the end of the warranty period, the Contractor shall carryout the Comprehensive O & M for balance nine years and All replacements, repair, spares, consumables etc., shall be on the account of contractor without any extra cost to the SECL.

OEM recommended mandatory spares for the trouble free operation and maintenance of the plants shall be maintained by the contractor for the entire period of O & M.

The equipment shall be operated as per the Original Equipment Manufacturer's O&M Manual and standard O & M practices being followed for Solar PV Power Plants and power evacuation systems.

10. All costs on account of these warranty obligations shall be to the account of the Contractor.

11. The Contractor should furnish an Indemnity Bond in the prescribed format as enclosed for the equipment to be taken away from Project site for repair/rectification.

#### 12.( I ) Defect Liability for Civil Works

(a). The Contractor guarantees that within one year from the date of work completion certificate or in the event more than one certificate having been issued by the PURCHASER from the respective date so certified, the contract work shall not show any sign of defects, cracks, settlements, disfiguration, shrinkage, leakage, dampness or any other faults.

(b). The Contractor shall maintain and satisfactorily execute at his own cost all such works of repair, amendment, reconstruction, rectification, replacement and any other work to make good any faulty work during the defect liability period.

(c). The Contractor shall, if required by the PURCHASER, search for the causes of any defects, imperfection or fault under the direction of the PURCHASER. The cost of such work shall be borne by the Contractor.

(d). At intervals specified by the PURCHASER, the Contractor along with the PURCHASER shall inspect the contract work to satisfy himself that no defects have cropped up in the contract work. Should there be any signs of defects; the Contractor shall take immediate steps to rectify the same.

(e). At the end of the defect liability period, the Contractor along with the CLUVPL shall carryout final inspection of the contract work to prove that no defects had appeared in the contract work or that all defects which appeared in the contract work have been rectified to the satisfaction of the CLUVPL. If during the final inspection it is found that the defects still remain in the contract work, the period of defect liability shall be extended for further period, which will be mutually discussed and agreed, for rectifying the defects and the Contractor

shall be liable to make good the defects and be responsible for the maintenance of the work till the defect have been fully removed.

(f). To the intent that the works shall or as soon as practicable after the expiration of defect liability period be handed over to the PURCHASER in perfect condition to the satisfaction of the PURCHASER, all such repair works as stated herein above, shall be carried out by the Contractor at his own expense if the necessity thereof shall in the opinion of the PURCHASER be due to the use of materials or workmanship not in accordance with the contract or failure on the part of the Contractor to comply with any obligation expressed or implied on Contractor's part under contract.

(g). If the Contractor fails to commence rectification of such defects within 14 (fourteen) days from the date of Notice by the CLUVPL or does not complete the said rectification with diligence and within mutually agreed time period, the CLUVPL shall be entitled to carry out such work by his own workmen or by other Contractors and if such work is the work which the Contractor should have carried out at his own cost, the CLUVPL shall be entitled to recover from the cost thereof or may deduct the same from any money due or that become due to the Contractor.

(h). Up on the successful completion of defect liability period, the PURCHASER shall issue final acceptance certificate to the Contractor along with the final take over.

### **10.34 Tests on Completion**

The PAT shall be carried out by the Contractor in the presence of CLUVPL from the date on which the plant is provisionally taken over. Should the result of these test be not as specified, the tests shall be repeated by the Contractor within one month from the date of plant is made ready by the Contractor for retest and the Contractor shall pay to the PURCHASER the expenses which the PURCHASER may incur due to such retests.

### **10.35 Access to and Possession of Site.**

All temporary access roads at works site and other areas allotted to the contractors in connection with contract works shall be constructed and maintained by the Contractor.

ii) In the execution of the work, no person other than the Contractor, Sub-Contractor and his or their employees shall be allowed on the Site except with the written permission of the CLUVPL. Facilities to inspect the works at all times shall be afforded by the Contractor to the CLUVPL and his representatives and other authorised officials.

iii) The Contractor shall afford to the CLUVPL and to other Contractors whose names shall have been previously communicated in writing to the Contractor by the CLUVPL, reasonable facilities for the execution of the work concurrently with his own.

iv) Unless otherwise provided in the Specification, the CLUVPL shall allow the Contractor for carrying out the work at the Site continuously, without hindrance. While normally the CLUVPL shall allow normal working hours, for completing the work within the time schedule, the CLUVPL, if necessary, shall also allow the Contractor for carrying out the work round-the-clock for which written approval shall be obtained by the Contractor from the PURCHASER / CLUVPL and subject to applicable labor laws in this regard.

**v) Access by Road .**

Contractor, if necessary, shall build other temporary access roads to the actual site of construction for his own work at his own cost. The Contractor shall be required to permit the use of the roads so constructed by him for vehicles of any other parties who may be engaged on the project site. The Contractor shall also facilitate the construction of any permanent roads should the construction thereof starts while he is engaged on this work. He shall make allowance in his Tender for any inconvenience he anticipates on such account. Non-availability of access roads, for the use of the Contractor shall in no case condone any delay in the execution of work nor be the cause for any claim for compensation against the SECL.

**10.36 Due Dates of Payment**

Payment shall be due and payable by the PURCHASER within a reasonable period which shall not normally exceed one month from the date of the receipt of each complete and correct invoice by him supported by requisite certificate issued by the CLUVPLhis authorised agency and proper documentation. If it is not payable the invoice shall be returned to the Contractor stating the reasons for rejection within 15 (fifteen) days from the date of receipt by the CLUVPL.

**10.37 Deductions from Contract Price**

The Contractor shall reimburse the PURCHASER all costs, charges, damage or expenses which the PURCHASER may have paid or incurred, if and to the extent to which the Contractor is liable under this Contract to pay within thirty (30) days upon written request of the PURCHASER, failing which such costs, charges, damages or expenses shall be deducted by the PURCHASER from any money due or becoming due by him to the Contractor under this Contract or any other Contract failing which such amounts shall be considered as debt due from the Contractor to the PURCHASER and shall be recoverable accordingly.

**10.38 Construction of Contract**

The Sections and terms and conditions herein contained including Annexure's shall construe the entire contract and understanding between the parties and shall be binding on both the parties. All other communications which were made prior to the signature of the Contract be-

tween the parties hereto with respect to the subject matter hereof shall form the schedule of references and form part of the Contract.

### **10.39 Rights of PURCHASER to Vary Scope**

i) The PURCHASER shall have the right, during the performance of the Contract, to change the scope and/or technical character of the Project and/or of the supplies and services stipulated in the Contract.

ii) If any changes are required for completeness of the work the Contractor shall not be entitled to extra price or time.

iii) In the event, the PURCHASER requests a change the Contract price and time shall be adjusted upwards or downwards, as the case may be and as shall be mutually agreed. The Contractor shall not be entitled to any extension of time unless such changes adversely affect the time schedule.

iv) The Contractor shall not change any work to be made pursuant to this Contract except as may become necessary to enable him to meet his technical obligations under this Contract, provided however that such changes shall be subject to prior written approval of the PURCHASER.

v) If any changes are required for completeness of the works or the Contractor himself makes changes, the Contractor shall not be entitled to extra price or time.

vi) The Contractor shall proceed with the changes as requested pending adjustment of Contract price and time schedule where so applicable in terms.

vii) In the event that a request for changes by the PURCHASER should affect the guarantees of the plant/process, a readjustment of such guarantees shall be agreed upon jointly, before the Contractor proceeds with the change.

viii) Changes occasioned due to non - observance by the Contractor of the provisions of this Contract or arising out of detection by the PURCHASER of errors in the documents or in works not in compliance with the design, specifications & drawings or with the best engineering practice, shall neither give rise to price adjustment nor extension of time. The Contractor shall take immediate steps to restore the contractual position.

### **10.40 Waiver**

i) Non-enforcement by either party of any of the provisions of this Contract shall not operate or constitute as a waiver of the provision itself or any subsequent breach thereof.

ii) The validity of the Contract shall not be affected, should one or more of its stipulations be or become legally invalid and such stipulation is severable from and not fundamental to the obligations of either party to this Contract. In such a case, the parties shall negotiate in good faith to replace the invalid clause by an agreed stipulation which is in accordance with the applicable law and which shall be as close as possible to the parties original intent.

#### **10.41 Assignment**

i) The Contractor shall not assign its rights and obligations under the terms of this Contract to any party other than its legal successor without the written consent of the PURCHASER.

ii) Should loan/financial agreement(s) require the Contractor to assign, by way of charge, any money due or to become due to it, to a bank/credit agency for the benefit of receiving payment by the Contractor under this Contract from such bank/credit agency, or if any partial assignment is necessary to be made to any insurer in terms of Insurance Policy approved by the PURCHASER, the PURCHASER shall not refuse consent in such cases.

#### **10.42 Contract Amendments**

i) Any amendment to the terms of this Contract (including Sections & Annexures) shall be made in writing by both parties hereto and shall specifically state that it is an amendment to the Contract.

ii) Contractor shall not suspend the performance of this Contract during review and negotiation of any amendment to the contract except as may be directed by the PURCHASER.

iii) No amendment shall have any effect until the PURCHASER and Contractor have agreed to the amendment in writing.

#### **10.43 Applicable Law**

This Contract shall be governed by prevailing Indian Laws.

#### **10.44 Notices**

i) All notices under this Contract shall be given in writing and shall be deemed sufficiently given when delivered either in person or by fax, e-mail or by registered mail addressed to the other party at its address set forth in the contract agreement with a copy to the nominated representative at site.

ii) If any such notice is delivered by hand, it shall be duly acknowledged and if given, by fax it shall be confirmed by Registered Letter within seven days of the date of such notice. Either party shall by notice in writing inform the other party of any change of its address as stated under Clause 10.45 (i) for receiving such notices.

iii) Date of notices under Clause-10.45 (i) shall be the date of receipt of such notice by the receiving party.

### **10.45 Language**

i) All documents, instructions, catalogues, brochures, pamphlets, design data, norms and calculations, drawings, operation, maintenance and safety manuals, reports, labels, on deliveries and any other data shall be in the English Language

ii) The Contract documents and all correspondence between the PURCHASERs and the Contractor shall be in the English language.

iii) However, all signboards required to indicate "Danger" and/or security at site and other statutory signage shall be in English and Hindi. Other Indian languages shall also be considered depending upon the workforce deployed at site.

### **10.46 Statutory and Other Regulations**

i) The Contractor shall comply with all the statutory obligations of Government of India/State Government of Chhattisgarh applicable at site and the CLUVPL shall not be liable for any action of the statutes applicable due to non-fulfilment of statutory obligations by the Contractor.

ii) Explosives shall not be used at the site by the Contractor without the permission in writing of the CLUVPL and then only in the manner and to the extent to which he has prescribed. Where explosives are used, the same shall be stored in a special magazine to be provided by and at the cost of the Contractor, who shall be liable for all damages loss or injury to any person or property and shall be responsible for complying with all statutory obligations in these respects.

iii) The Contractor shall give all notices and pay all fees required to be given or paid under any Central or State statute, ordinance or other law or any regulation or by-law of any local or other duly constituted authority in relation to the execution of the Contract Work.

iv) The Contractor shall conform in all respects with the provisions of any statute, ordinance or laws as aforesaid and the rules, regulations or by-laws of any local or other duly constituted authority which may be applicable to the works or to any temporary works and with such rules and regulations of public bodies as aforesaid and shall keep the PURCHASER indemnified against all penalties and liabilities of every kind for breach of any such statute, ordinance, law, rule, regulation or by-law.

v) All fossils, coins, articles of value of antiquity and structures and other remains or things of geological or archaeological interest discovered on the site shall as between the PUR-



CHASER and the Contractor be deemed to be the absolute property of the PURCHASER and the Contractor shall take reasonable precaution to prevent its workmen or any other person from removing or damaging any such article or thing and shall immediately upon discovery thereof and before removal acquaint the PURCHASER of such discovery and carry out at the expense of the PURCHASER as to the disposal, removal or otherwise of the same.

vi) Except where otherwise specified, the Contractor shall pay all tollage and other royalties, rent and other payments or compensation, if any, for getting stone, gravel, clay, or other materials required for the work or in connection therewith.

vii) All operations necessary for the execution of the works and for the construction of any temporary works shall so far as compliance with the requirements of the Contract permits be carried on so as not to interfere unnecessarily or improperly with the public convenience or the access to use and occupation of public or private roads and footpaths or of properties whether in the possession of the PURCHASER or any other person and the Contractor shall save harmless and indemnify the PURCHASER in respect of all claims demands, proceedings, damages, costs, charges and expenses, whatsoever arising out of or in relation to any such matters.

viii) The Contractor shall use every reasonable means to prevent any of the highways and bridges communicated with or on the routes to the site from being damaged or injured by any of his or any of his Sub-Contractor's traffic and in particular shall select routes, choose and use vehicles and restrict and distribute loads so that any such extraordinary traffic as shall inevitably arise for moving of plant and materials from and to the site shall be limited as far as reasonably possible so that no unnecessary damage or injury may be occasioned to such highways and bridges. For any damage caused by the breach hereof, the Contractor shall be solely responsible.

ix) Where the nature of the work is such as to require the use by the Contractor of water borne transport, the foregoing provisions of this clause shall be construed as though "high sea" including a lock, dock, seawall or other structure related to waterway and "vehicles" including craft and shall effect accordingly.

## **SITE CLEARANCE**

x) On completion of the work, all rubbish, kilns, VATs, tanks, materials and temporary structure of any sort or kind used for the purpose or connected with the construction/erection work are to be removed by the Contractor and all pits and excavations filled up and the site handed over in a tidy and workmanlike condition and no final payment in settlement of the account for the said work shall be held to be due or shall be made to the Contractor till such site clearance shall have been effected by him and such clearance may be made by the CLUVPL at the expenses of the Contractor in the event of his failure to comply with this

provision within 15 (fifteen) days after receiving notice in writing from the CLUVPL to that effect. If it becomes necessary for the CLUVPL to have the site cleared as indicated above at the expense of the Contractor, the CLUVPL shall under no circumstances be held liable for any losses or damages to such of Contractor's property as may be on such site due to such removal there from, which removal may be effected by means of public sale of such materials and property or in such a way as seems fit and most convenient to the CLUVPL.

xi) The Contractor must take sufficient care in moving its construction plants and equipment from one place to another so that they may not cause any damage to the property of the PURCHASER, particularly to the existing structures and overhead and underground services and in the event of Contractor's failure to do so, the cost of such damages shall be borne by the Contractor.

## **10.47 Labour**

### **10.47.0 Labour rules**

I. In respect of all labour directly or indirectly employed on the works by the Contractor, the Contractor shall comply with and implement all the provisions of the Contract Labor (Regulation and Abolition) Act 1970, or any amendment thereof, and all legislations and rules of the State and/or Central Government or other local authority formed from time to time governing the protection of health, sanitary arrangements, wages, welfare and safety of labor employed on the works and the Contractor shall be deemed to be the Principal employer for this purpose. The rules and other statutory obligations with regard to fair wages, welfare and safety measures, maintenance of register etc. shall be deemed to be part of the Contract. The Contractor shall get himself registered with the concerned statutory authorities as provided in the Act and shall be directly responsible to the authorities there under for compliance with the provisions thereof.

The Contractor shall provide and employ on Site in the installation of the Facilities such skilled, semi- skilled and unskilled labor as is necessary for proper and timely execution of the Contract. The Contractor is encouraged to use local labor that has the necessary skills.

Unless otherwise provided in the Contract, the Contractor shall be responsible for the recruitment, transportation, accommodation, sanitation, first aid facility and catering of all labor, local or expatriate, required for the execution of the Contract and for all payments in connection therewith.

The Contractor shall be responsible for obtaining all necessary permit(s) and/or visa(s) from the appropriate authorities for the engagement and entry of all labour and personnel to be employed by Contractor on the Site including that of his sub-Contractors.

The Contractor shall at all times during the progress of the Contract use its best endeavors to prevent any unlawful, riotous or disorderly conduct or behavior by or amongst its employees and the labour of its SubContractors.

The Contractor shall, in all dealings with its labour and the labour of its SubContractors currently employed on or connected with the Contract, pay due regard to all recognized festivals, official holidays, religious or other customs and all local laws and regulations pertaining to the employment of labor.

The Contractor shall keep the Owner indemnify, during construction as well as during O&M period, in respect of compliance with the statutory provisions in respect to the labor employed at site.

Upon completion of the construction activities/ O&M activities, the Contractor shall obtain no – objection certificate (NOC) from local/ statutory bodies in respect to the fulfillment of all compliance and submit a copy to the Owner prior to the final settlement

## **II. Provision of Minimum Wages Act and Payment of Wages**

i) The Contractor shall comply with the provisions of the Minimum Wages Act 1948. The minimum wages Central Rules 1950, the Payment of Wages Act 1936 or any other rules made there under by the Government of CHHATTISGARH in respect of all employees employed by him or his Sub-Contractor directly or indirectly for the purpose of carrying out the works. In the event of retrenchment of workers by the Contractor or Sub-Contractors employed by the Contractor during or after the completion of the work, the retrenchment compensation and other benefits shall be paid by the Contractor to the workers as per the Industrial Dispute Act.

ii) If any money shall, as a result of any claim or application made under the said acts, be directed to be paid by the PURCHASER, such money shall be deemed to be money payable to the PURCHASER by the Contractor and/or failure by the Contractor to repay the PURCHASER, any money paid by the PURCHASER as aforesaid, latest within thirty (30) days after the same shall have been demanded from the Contractor, the PURCHASER shall be entitled to recover the same from any money due or accruing to the Contractor under this or any other contract with the PURCHASER, failing which such amount shall be considered as debt due from the Contractor to the PURCHASER.

iii) The Contractor shall comply with the provisions of bi-partite and tripartite agreement entered into by the PURCHASER from time to time with the Labor Unions and/or the circulars issued by the PURCHASER regarding payment of minimum wages and benefits applicable.

## **III. Reporting of accidents**

The Contractor shall be responsible for the safety of his and his Sub- contractor(s)/Workmen and employees. All accidents at site are to be immediately reported to the required authorities. The Contractor shall be responsible for all such accidents.

#### **IV. Provision of Workmen's Compensation Act**

The Contractor shall be liable for in respect of any damages or compensation payable by law in respect of or in consequence of any accident or injury to any workmen or other person in the employment of the Contractor or any of his Sub-Contractors and the Contractor shall save harmless and shall indemnify and keep indemnified the PURCHASER against all such damages and compensation and against all claims, demands, proceedings, costs, charges and expenses, whatsoever, in respect thereof or in relation thereto. The Contractor shall at all times indemnify and keep indemnified the PURCHASER against all claims for compensation under the provisions of the Workmen's Compensation Act 1948 or any other law for the time being in force by or in respect of any workmen employed by the Contractor or his Sub-Contractors / agencies in carrying out the Contract and against all costs and expenses of penalties incurred by the PURCHASER in connection therewith. In every case in which by virtue of the provisions of Section- 12, Sub-Section(1) of the Workmen's Compensation Act 1923, the PURCHASER is obliged to pay compensation to a workmen employed by the Contractor or his Sub-Contractor/ agencies, the amount of compensation so paid and without prejudice to the rights of the PURCHASER under Section-12, Sub-Section (2) of the said Act, the PURCHASER shall be at liberty to recover such amount or any part thereof from the security deposit or from the sums due or to become due to the Contractor (whether under this Contract or any other Contract).

#### **V. Provisions of Apprentices Act**

The Contractor shall comply with the provisions of the Apprentices Act 1961, and the rules and orders issued there under from time to time. If he fails to do so, his failure may be treated as breach of the Contract and the PURCHASER may, in his discretion, terminate the Contract. The Contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the said Act.

#### **Labour Returns**

The Contractor shall submit daily statements of labor employed by him/Sub- contractor(s) in the proforma prescribed by the CLUVPL.

#### **Labour Camps**

The Contractor shall, at its own expense, make adequate arrangements for housing, electricity, road, supply of drinking water and provision of latrines and urinals for its staff and labor,

disposal of sewerage and sullage and for temporary creche (balmandir) where 50 or more women are employed at a time.

### **Preservation of Peace**

The Contractor shall take requisite precautions and use his best endeavour to prevent any riotous or unlawful behaviour by, or amongst its workmen and/or others employed on the works by him or his Sub-contractor(s) and for the preservation of peace and protection of the inhabitants and security of the property in the neighbourhood of the works/site. In the event of the CLUVPL requiring the maintenance of a special police force at or in the vicinity of the site during the tenure of the Contract in consequence of the riotous or unlawful behaviour by, or amongst the Contractor's or his Sub-contractor(s)/Workmen and/or others staff employed by him/them, all expenses thereof and costs of all damages due to such riotous or unlawful behaviour shall be borne by the Contractor and if paid by the PURCHASER, shall be recoverable from the Contractor from any money due or that may become due to the Contractor by the PURCHASER.

#### **10.47.1 Payment of Wages**

i) The Contractor shall make regular and prompt payment of wages to its workmen engaged in the work and in no case shall the payment be delayed more than seven days following the period for which the wages are due. The Contractor shall send a certificate to the CLUVPL to this effect every month. If it is found that workers are not paid regularly, the Contract is liable to be terminated.

ii) The CLUVPL shall have the right to enquire into and decide against any complaint alleging that the wages paid by the Contractor to any labourer for the work done by such labourer is less than the wages paid for similar work in the neighbourhood.

iii) As a number of Contractors may be working at the same time in the erection of different parts at the Project site, there is need for pursuance of a coordinated policy in regard to employment, wages and other conditions of work. The Contractor shall consult the CLUVPL on all such matters to arrive at mutually agreed settlements.

#### **10.47.2 Sanitary arrangements**

The Contractor shall comply with all local sanitary rules in force and carry out all sanitary measures and permit inspection of all sanitary arrangements at all reasonable times by the PURCHASER /CLUVPL/ local bodies.

#### **10.47.3 Infectious diseases**

The Contractor shall employ such persons as are found to be free of contagious diseases and shall produce, if required by the CLUVPL, certificate of fitness of all its employees working at site. The Contractor shall, if required by the CLUVPL, subject all its employees to regular medical check up and produce satisfactory evidence of their being free from any contagious disease.

The Contractor shall remove from its labour camp such labour and their families who refuse protective inoculations and vaccination when called upon to do so by any competent authority.

#### **10.47.4 Medical Facilities at Site**

The Contractor shall provide reasonable medical facilities at the site as per rules in force in relation to the strength of the Contractor's staff and workmen deployed at site.

#### **10.47.5 Use of intoxicants**

The use or sale of ardent spirits or other intoxicating beverages, within the works or in any of the buildings, boarding houses, encampments or other tenements owned, occupied by or within the control of the Contractor or any of its employees or his Sub-contractor is strictly forbidden and the Contractor shall ensure strict compliance.

#### **10.47.6 Age limits of labour**

The Contractor shall not employ, for the purpose of the work, any person below the age of eighteen (18) years as it is statutorily forbidden. The CLUVPL reserves the right to dis-allow any labourer, whom he considers to be underage, to be employed by the Contractor. The Contractor shall submit periodical statements to the CLUVPL, of labor employed by him.

#### **10.47.7 Provident Fund**

i) The Contractor shall be solely responsible for deduction and contributions under the Employees' Provident Fund Act 1952 and Family Pension Act 1971 and the scheme made there under as amended from time to time. He shall be solely responsible for the maintenance of records for payment of contributions and submission of returns in accordance with the said act and scheme.

ii) In case the Contractor fails to make payments under the above act and the scheme made there under and as amended from time to time, the PURCHASER reserves the right to make such payment on behalf of the Contractor on demand from the authorities under the act and recover the same from the payments due to the Contractor. Further, the Contractor shall indemnify and keep indemnified the PURCHASER against any loss or damage whatsoever that may be suffered by the PURCHASER as a results of any claims, damages, penalties for any

failure, non-compliance on his part with the provisions of the aforesaid act and the scheme framed there under.

#### **10.47.8 Observance by Sub-Contractor(s)**

The Contractor shall also be responsible for the observation of all the above clauses by his Sub contractor(s).

#### **10.48 Care of Works**

From the commencement to the completion of trial operation of respective unit / provisional take over, the Contractor shall take full responsibility for the care of works and for all temporary works and in case any damage or loss shall happen to the works or to any part thereof or to any temporary works from any cause whatsoever, the Contractor shall at his own cost replace or repair and make good the same.

#### **10.49 Restriction of Visitors**

The Contractor shall not allow any visitors on the works except with the prior written approval of the CLUVPL.

#### **10.50 Possession Prior to Completion**

The PURCHASER shall have the right to take possession or use any completed or partially completed work. Such possession or use shall not be deemed to be an acceptance of any work done not in accordance with the Contract. However, any damage to such work solely due to such provision or use shall be to the PURCHASER's account.

#### **10.51 Work Permit, Passport, Etc.**

The Contractor shall be responsible for arranging and obtaining at his own cost, the necessary work permits, passports, visas, police permits and expenses and for other effects of any personnel employed or engaged by him for work, who are non-residents of India.

#### **10.52 General**

No Director or Official or Employee of the CLUVPL shall in any way be personally bound or liable for the acts or obligations of the CLUVPL under the contract or answerable for any default or omission in the observance or performance of any of the acts, matters or things or conditions which are herein contained.

#### **10.53 General Liability Provision**

The rights and obligations of the parties are finally and conclusively defined in this Contract.

### **10.53.0 Limitation of Liability**

Except in case of Criminal Negligence or Wilful Misconduct,

- i) The Contractor shall not be liable to the PURCHASER, whether in Contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the Contractor to pay price reduction and liquidated damages to the PURCHASER, and,
- ii) The aggregate liability of the Contractor to the PURCHASER, whether under the Contract, in tort or otherwise, shall not exceed the total Contract Price, provided

that this limitation shall not apply to any obligation of the Contractor to indemnify the PURCHASER with respect to Patent infringement.

#### **10.53.1 Replacement of Defective Parts and Materials**

- i) If during the progress of the Work, Owner shall decide and inform in writing to the Contractor, that the Contractor has manufactured any plant or part of the plant unsound or imperfect or has furnished plant inferior to the quality specified, the Contractor on receiving details of such defects or deficiencies shall at his own expenses within 07 (Seven) days of his receiving the notice, or otherwise within such time as may be reasonably necessary for making it good, proceed to alter, re-construct or remove such work and furnish fresh equipment's up to the standards of the specifications.
- ii) In case the Contractor fails to do so, Owner may on giving the Contractor 07 (Seven) day notice in writing of his intentions to do so, proceed to remove the portion of the Work so complained of and at the cost of Contractor's, perform all such works or furnish all such equipment's provided that nothing in the clause shall be deemed to deprive the Owner of or affect any rights under the Contract, the Owner may otherwise have in respect of such defects and deficiencies.

### **10.54 Transfer of Titles**

Not Applicable

#### **10.54.1 Self Manufactured Indigenous Items**

Ownership of equipment supplied under the supply portion of the contract shall vest with PURCHASER as soon as they are despatched ex-works/place of despatch, in respect of indigenous items. However for executing the erection portion of the contract, Contractor shall take over, all such equipment from CLUVPL and further shall take full responsibility for safe custody, transportation to site, handling at all intermediate points and at site, storage, erec-



tion, testing and commissioning of equipment and for their exclusive use for purposes specified in this contract. Contractor's liability under the contract shall not be over till the plant in successfully commissioned and taken over by PURCHASER. The despatch document consigned in the name of the PURCHASER, shall be endorsed by the PURCHASER, in favour of the Contractor for receipt of goods and then for storage, erection testing and commissioning. PURCHASER's responsibility shall be limited to endorsement of despatch documents in Contractor's favour to enable the contractor to carryout services under the erection portion of the contract.

#### **10.54.2 Bought out items**

The procedure described in the above clause covers the self manufactured items of the Contractor. For bought out items directly consigned to PURCHASER's site, from approved sub-supplier, the consignee shall be the PURCHASER. The dispatches shall be made as performance relevant provisions of GST Act. However, the contractor shall ensure that no additional liability towards GST arises to the PURCHASER.

#### **10.55 Indemnity Bond**

For the equipment handed over to Contractor, for performing the work under this contract, Contractor shall execute a custody cum indemnity bond in favour of PURCHASER as per Annexure - XV. The endorsement and handing over of despatch documents by PURCHASER to contractor shall be construed as having handed over and entrusted to the Contractor all the equipment covered in such despatch documents. The Contractor shall hold the equipment handed over to him by PURCHASER, as trustee on behalf of the PURCHASER without having any lien or charge against the equipment at any stage. For any loss or damage to the equipment and material till these are finally taken over by PURCHASER, the contractor shall immediately replace/repair the loss or damaged equipment entirely at his cost irrespective of the extent and/or time of realisation of claims by him from the insurer/underwriters.

The title of ownership and property to all goods materials equipment etc. originating in India shall pass to the PURCHASER as per the terms and conditions of this contract after the Contractor has effected the despatch of the same to Project Site and the Contractor has prepared necessary documentation for handing over the same to PURCHASER's authorised representative provided however, such passing of titles of ownership and property to the PURCHASER shall not in any way absolved, dilute or diminish the responsibility and obligations of the Contractor under this Contract including loss or damage and all risks which shall vest with the Contractor till the successful commissioning as per this Contract.

#### **10.56 Safety**

The Contractor shall abide by the Safety Code for Contractors which is annexed as Annexure-XVIII.

#### **10.57 General Conditions for Erection & Civil works**

The Contractor shall abide by the General Conditions for Erection & Civil Works, which is annexed to this Volume as Annexure-XIX.

#### **10.58 Emission Test Certificate**

The vehicles being used by the Contractors must have valid Emission Test Certificate issued by the authorized agency.

### **10.59 PUBLIC PROCUREMENT - Preference to Make in India**

The order has been placed based on the declaration submitted in the offer by the contractor to comply with Department for Promotion of Industry and Internal Trade (formerly, Department of Industry Policy and Promotion), Ministry of Commerce and Industry, Government of India, Public Procurement (Preference to Make in India) Order 2017 – Revision; Dt: 16.09.2020. Accordingly, the Contractor shall ensure that the supplies made and services rendered have been complied with the local content indicated in their offer.

### **10.60 HINDRANCES**

- 10.60.1 Events that caused hindrance to proceed and progress with the work shall be recorded daily and signed by the Construction Dept and the Contractor. The Project Coordination Committee shall take these data for settling the issues.  
A record of events shall be maintained by the Contractor as under with the Signature of the Contractor and the SECL / CLUVPL against each case.

#### **HINDRANCE RECORD REGISTER**

<b>Name of work:</b>				<b>Value of Contract:</b>			
<b>Name of Contractor:</b>				<b>Scheduled date of Completion:</b>			
Sl · No.	De- scri- ption of Hin- dra- nce	D u r a- t i- o n	Over lapping Period (if any)	R e m e- d y	Delay by Contra- ctor/ PUR- PUR- CHASER	Signature of the	
						Con- trac- tor	PUR- CHAS- ER

- 10.60.2 The details of Hindrance Register along with the relevant factors will be taken into consideration for determining extension of time to the contract /LD.

### **10.61 AMENDMENT**

- 10.61.1 Any amendment to the terms of this Contract (including Schedules & Annexures) shall be made in writing by both parties hereto and shall specifically state that it is an amendment to this Contract.

10.61.2 No amendment as per above Clause shall have any effect until the PURCHASER has received such consent in writing (including that of the Contractor) as may be necessary under and in terms of the loan/financial Agreements.

## **10.62 CORRESPONDENCE**

All further correspondence in connection with this offer shall be addressed to:

Office of the Chief Executive Officer  
CLUVPL  
Address: Projects & Business Development  
NLC India Limited, Corporate Office, Block – 1,  
Neyveli – 607 801, Cuddalore (Dt), Tamil Nadu  
Phone No: 04142- 212379 Fax- 04142-252645

Email: [cluvpl@nclindia.in](mailto:cluvpl@nclindia.in)

## **10.63 Contract Closure:**

The Contractor shall execute subject work as per the terms and conditions of the Contract and furnish required documents /Clearance certificate(s) – No claim certificate immediately on completion of all the contractual obligation under the contract for the closure of contract.

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## **SECTION-11**

### **11. QUALITY ASSURANCE**

#### **Quality System for Inspection & Testing of Plant & Equipment at Manufacturer's Premises**

##### **11.1 General**

- i) Inspection & testing of plant & equipment shall be carried out by SECL/CLUVPL at the works of successful bidder (Contractor/Sub-contractor) during manufacturing and on final product to ensure conformity of the same with acceptable criteria of technical specifications, approved drawings, authenticated manufacturing drawings and reference national / international standards.
- ii) This specification is in addition to provisions laid-down elsewhere in PURCHASER's Draft Contract and special instructions to tenderers, if any.
- iii) Contractor must recognise the importance of quality and follow defined quality programme in all manufacturing and quality control activities of the product. Contractor must define and implement the tasks and controls that shall provide needed assurance in case manufacturing of product is sub contracted either partly or fully and/or for the procured components of the product.
- iv) PURCHASER/ CLUVPL reserve the right to verify the quality programme and entire product characteristics to assure the intended and specified quality of the product.
- v) The inspection, examination or testing carried out by the PURCHASER /CLUVPL shall not relieve the contractor from any of his obligation under this contract. The inspection procedure shall be discussed and finalized.

## **11.2 Quality Assurance Plan (QAP)**

- i) Inspection and test requirements shall be decided with due consideration of factors like safety, duty cycle, operating conditions, equipment life, environmental conditions, place of installation and statutory regulations, as applicable, for a particular equipment.
- ii) Detailed QAP shall be prepared by Contractor in consultation with Sub- contractors / Manufacturers to avoid any complication later.
- iii) QAP shall clearly indicate the followings:
  - (a) Range of inspection & tests to be done by Manufacturers and cross checked by Contractor during manufacture of equipment from raw materials to finishing stage.
  - (b) Suggestive check/ hold points for CLUVPL's Inspection and witnessing of tests during the manufacturing and final product inspection.
  - (c) Inspection documents to be furnished by Contractor/ Manufacturers to CLUVPL for reference during inspection.

## **11.3 Internal Inspection by Contractor / Manufacturer**

- i) Inspection and tests shall be carried out by Contractor/ Manufacturer in accordance with approved drawings, Contract Specification, Purchase Order, and approved QAP. Contractor/ Manufacturer shall maintain record of each inspection and test carried out and signed documents shall be submitted to CLUVPL for verification.
- ii) Contractor shall carry out their internal inspection & obtain clearance from statutory bodies e.g. IBR, CCE, TAC, Weights & Measures, safety, IE rules etc. However, CLUVPL shall carry out inspection as agreed in approved QAP prior to Contractor offering the equipment for statutory clearance.
- iii) All the measuring & test instruments shall be calibrated by manufacturers and record of the same shall be maintained for CLUVPL's scrutiny. Contractor shall ensure use of appropriate calibrated measuring & test instruments during their internal inspection, as well as, make available the same for PURCHASER's/CLUVPL's inspection and tests. Calibration standard shall be national standard, if existing. Otherwise, manufacturers' own standard & calibration procedure shall be accepted. Valid calibration certificates traceable to national/ international standards shall be submitted to CLUVPL during / prior to inspection.
- iv) Contractor / Manufacturers shall identify all the inspected equipment/component/raw materials & shall maintain the record of status of inspection viz. inspected & found acceptable, require rectification/rework, rejected etc.

v) The Contractor shall establish and maintain procedures to ensure that product that does not conform to specified requirements, is prevented from inadvertent use or installation. The description of non-conformity that has been accepted subsequently by Designer / CLUVPL by concession and/or of repairs, shall be recorded and forms part of the subsequent drawings / schedules relevant to the products.

vi) Repaired and reworked product shall be offered for re- inspection to CLUVPL along with records of corrective action taken.

vii) Contractor / Manufacturer shall not dispatch any equipment till receipt of dispatch clearance from CLUVPL.

#### **11.4 Method of Undertaking Inspection & Testing By CLUVPL**

##### **Agency Responsible**

Inspection/Waiver of inspection of equipment shall be undertaken by CLUVPL.

##### **Method of Issuing Inspection Call to CLUVPL**

Inspection call shall be given only on readiness of the equipment/ assembly/ sub- assembly and approval of all relevant drawings and QAP. In case, equipment/ assembly/ sub-assembly offered for inspection are found not ready, all the cost of visit of PURCHASER'S/CLUVPL'S engineer shall have to be borne by the Contractor.

##### **Obligations of Contractor**

i) Contractor shall provide all facilities and ensure full and free access of the Inspection Engineer of CLUVPL to the Contractor's or their Sub-Contractor's premises at any time during contract period, to facilitate him to carry out inspection & testing of the product during or after manufacture of the same.

ii) The Contractor shall delegate a Representative / Co-ordinator to deal with CLUVPL on all inspection matters. Also, Contractor's Representative shall be present during all inspection at Sub-Contractor's works.

iii) The Contractor shall comply with instructions of the Inspection Engineer fully and promptly.

iv) The Contractor / Sub-Contractor shall provide all instruments, tools, necessary testing & other inspection facilities to Inspection Engineer free of cost for carrying out inspection.

v) The cost of testing welds by ultrasonic, radiographic and dye penetration tests etc. in the fabrication workshop shall be borne by the Contractor.

vi) The Contractor shall ensure that the equipment / assembly /component of the plant and equipment required to be inspected, are not dismantled or despatched before inspection.

vii) The Contractor shall not offer equipment for inspection in painted condition unless otherwise agreed in writing by CLUVPL.

viii)The Contractor shall ensure that the equipment and materials once rejected by the Inspection Engineer, are not re-used in the manufacture of the plant and equipment. Where parts rejected by the Inspection Engineer have been rectified as per agreed procedures laid down in advance, such parts shall be segregated for separate inspection and approval, before being used in the work.

## **Stamping and issue of inspection documents**

### **i) Inspection Memo**

For stage inspection and for rejected items/items which do not conform to Technical specification in one or more quality characteristics requiring rectification/rework, Inspection memo shall be issued in standard form indicating therein the details of observation and remarks. All the non-conformities with respect to specification of the product shall be indicated in the inspection memo for further control by manufacturer.

### **ii) Inspection Certificate**

On satisfactory completion of final inspection and testing, an inspection Certificate in standard form shall be issued by the Inspection engineer for the accepted items.

### **iii) Inspection Waiver Certificate**

For the inspection waiver category of items identified in the approved QAP, CLUVPL shall issue Inspection Waiver Certificate.

## **11.5 General Clauses**

i) Inspection& tests carried out by CLUVPL shall not absolve the responsibility of the Contractor/ Manufacturer to provide acceptable product nor shall it preclude subsequent rejection.

ii) CLUVPL reserve the right to inspect any product at any stage of manufacturing without prior notice to Contractor/Manufacturer beyond pre-identified stages & hold points of approved QAP. The inspection mentioned in this clause is meant for PURCHASER getting apprised of status of manufacturing and not to obstruct the manufacturing program of the Contractor.

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**VOLUME – IB**  
**DRAFT CONTRACT**  
**ANNEXURES**

**ANNEXURE – XIII A**  
**PROFORMA FOR CONTRACT PERFORMANCE BANK GUARANTEE**

**[To be furnished by Bidder]**



TOR having agreed to provide a Contract Performance Guarantee for the faithful performance of the entire "CONTRACT" including the Warranty Obligations /Liabilities under the CONTRACT equivalent to 3% of the said value of the CONTRACT to PURCHASER

amounting to Rs \_\_\_\_\_ (Rupees \_\_\_\_\_  
\_\_\_\_\_) as Contract Security in the form of a Bank Guarantee.

2. We, \_\_\_\_\_ (Name) \_\_\_\_\_ (Address) hereinafter referred to as the "Bank" which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, representatives and assignees do hereby irrevocably guarantee and undertake to pay the PURCHASER merely on demand without any previous notice and without any demur and without referring to any other source, any and all monies payable by the CONTRACTOR by reason of any breach of the said CONTRACTOR of any of the terms and conditions of the said CONTRACT including non-execution of the "CONTRACT AGREEMENT", to the extent of 3% of the EPC Contract price to Purchaser amounting to Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_). Any such demand made by the PURCHASER on the Bank shall be conclusive and binding, absolute and unequivocal notwithstanding any difference between the PURCHASER and CONTRACTOR or any dispute or disputes raised/ pending before any Court, Tribunal, Arbitrator or any other authority. The Bank agrees that the guarantee herein contained shall continue to be enforceable till this sum due to the PURCHASER is fully paid and claims satisfied or till the PURCHASER discharges this Guarantee.

3. The Bank further irrevocably guarantees and undertakes to pay on mere demand without any demur, reservation, contest, recourse or protest and / or without any reference to the Contractor any and all monies due and payable by the CONTRACTOR by reasons of non-fulfilment of any of the following obligations :

a) For the successful and satisfactory operation of the equipment furnished and erected under the said Contract as per the specifications and documents.

b) That the equipment installed under the said Contract shall be new and in accordance with Contract Documents and be free from all defects in design, engineering, material workmanship and performance including modifications, improvements and replacements for a period of twelve (12) calendar months immediately upon final take over by the PURCHASER of the equipment and that upon written notice from the PURCHASER, the CONTRACTOR shall remedy free of expenses to the PURCHASER, such defects as noticed and developed under the normal use of the said equipment, within the said guarantee period.

4. The PURCHASER shall have the fullest liberty without affecting in any way the liability of the Bank under this guarantee, from time to time, to extend the time of Performance by the

CONTRACTOR. The Bank shall not be released from its liabilities under these presents by any exercise of the PURCHASER of the liberty with reference to the matter aforesaid.

5. The PURCHASER shall have the fullest liberty, without affecting this guarantee to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the CONTRACTOR and to exercise the same at any time in any manner, and either to enforce or to forbear to enforce any covenants, contained or implied in the CONTRACT between PURCHASER and the CONTRACTOR or any other course or remedy or security available to the PURCHASER and the BANK shall not be released of its obligations/liabilities under these presents by any exercise by the PURCHASER of his liberty with reference to the matters aforesaid or any of them or by reasons of any other act or forbearance or other acts of omission or commission on the part of the PURCHASER or any other indulgence shown by the PURCHASER or by any other matter or thing whatsoever which under law would, but for this provision, have the effect of relieving the Bank Guarantee. The Bank further undertakes not to revoke this guarantee during its currency without the previous consent of the PURCHASER.

6. The Bank further agrees that the decision of the PURCHASER as to the failure on the part of the CONTRACTOR to fulfill their obligations as aforesaid and/or as to the amount payable by the Bank to the PURCHASER hereunder shall be final, conclusive and binding on the Bank. The Purchaser shall have the fullest liberty to lodge their claim for encashment of the guaranteed sum either in full or part, in the manner suitable to them. However, payment made for a sum lesser than the guaranteed amount shall not relieve or discharge the bank from their obligations guaranteed under the bank guarantee, till the contractual obligations are fully performed by the Contractor or the Bank Guarantee is discharged by the Purchaser, as the case may be and the Bank Guarantee shall continue to be in force till such time.

7. The Bank also agrees that the PURCHASER shall be entitled at his option to enforce this guarantee against the Bank as a Principal Debtor, in the first instance notwithstanding any other security or guarantee that it may have in relation to the CONTRACTOR's liabilities.

8. This guarantee will not be discharged due to the change in the constitution of the Bank or the CONTRACTOR(S).

9. Notwithstanding anything contained herein:

a) Our liability under this bank guarantee shall not exceed ..... (in words)

b) This bank guarantee shall be valid upto ..... and

c) We are liable to pay the guaranteed amount or any part thereof under this bank guarantee only and only if you serve upon as a written claim or demand on or before. ....

Signed at \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_ 202\_\_.

Signature :

Name :

Designation :

Staff Code No :

Bank Seal :

Date :

**Witness:**

1. Signature

Full name in block letters :

Occupation :

Address :

2. Signature :

Full name in block letters :

Occupation :

Address :

\*\*\*\*\*

**ANNEXURE – XIII B**

**BANK GUARANTEE PROFORMA FOR BACKUP BANK GUARANTEE FOR**

## FAITHFUL COMPLIANCE TO JDU

- I. This Guarantee should be furnished by a Scheduled Commercial Bank authorized by Reserve Bank in India other than Bank of China.
- II. The Bank Guarantee should be furnished on Stamp Paper of value of not less than Rs.80/-.
- III. The Stamp papers should be purchased in the name of Bank executing the Guarantee.
- IV. In case of Foreign Bidder the bank guarantee shall be issued by any bank in India as stated above or any foreign commercial bank which is in the approved list of Reserve Bank of India (RBI) other than Bank of China.
- V. The Bank Guarantee shall be furnished by the Bank directly to the Purchaser through RPAD/Speed Post/Courier.

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Place:

Bank Guarantee No:

Date:

To

M/s. SOUTH EASTERN COAL FIELDS LIMITED,  
REGD. OFFICE- SEEPAT ROAD,  
BILASPUR, DISTT.-BILASPUR (C.G)-495006  
Phone: 07752 - 246322      Fax: 07752 - 246472  
web site: [www.secl.gov.in](http://www.secl.gov.in)      E-mail :

In consideration of SOUTH EASTERN COAL FIELDS (SECL) (hereinafter referred to as Purchaser which expression shall unless repugnant to the context or meaning thereof include its successors, administrators and assignees) having awarded to ..... (Bidder's Name) having its Registered Office at..... (hereinafter referred to as CONTRACTOR), a Contract for Site study, Site development, Design, Engineering, Manufacture, Inspection at supplier's works, Supply, Insurance, Transport, Storage, Erection, Installation, Testing, approval from Chhattisgarh State Electricity Authorities, Bay Extensions, external transmission lines, Metering arrangements and Commissioning with associated power evacuation system including grid connectivity. Performance Guarantee and Operation & Maintenance for a period of 10 years including first year warranty period O & M for total 40 MW (AC) capacity at Bishrampur and Bhatgaon locations on Lump-sum turnkey basis to SOUTH EASTERN COAL FIELDS LIMITED (SECL) vide its Letter of Award / Contract No. .... dated ..... and the same having been unequivocally accepted by ..... (Contractor's Name) resulting in a 'Contract' which was awarded on the strength of Joint Deed of undertaking (JDU), dated ..... given by

.....(Contractor's Name) M/s ..... having its Registered Office at ..... (hereinafter referred to as which expression shall unless repugnant to the context or meaning thereof include its successors, administrators and assignees) and the Consortium Partner, having agreed to provide an Backup Bank Guarantee amounting to 1% of EPC Contract price to the Purchaser for the faithful performance of the Contract on the terms and conditions specified in the JDU dated.....

1. We, ..... Bank .....having its Head Office at.....  
.....(hereinafter referred to as the 'Bank' which expression shall, unless repugnant to the context or meaning thereof, include its successors,

administrators, executors and assignees) do hereby guarantee and undertake to pay to the Purchaser merely on demand without any previous notice any and all monies amounting to Rs.....(in figures and words) as aforesaid at any time up to end of three (3) months after the expiry of warranty period, without any demur, reservation, contest or recourse or protest and/or without any reference to. Any such demand made by the Purchaser on the bank shall be conclusive and binding notwithstanding any difference between the Purchaser and Consortium Partner pending before any Court, Tribunal, Arbitrator or any other Authority. The Bank do hereby undertake not to revoke this guarantee during its currency without previous written consent of Purchaser and further agrees that the guarantee herein contained shall continue to remain enforceable till the Purchaser discharges this guarantee.

2. The Purchaser shall have the fullest liberty without affecting in any way the liability of the Bank under this Guarantee from time to time to extend the time for performance of the contract. The Purchaser shall have the fullest liberty without affecting this guarantee to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Consortium Partner and to exercise the same at any time, in any manner, and either to enforce or to forbear to enforce any covenants, contained or implied in the said Contract or JDU or any other course or remedy or security available to the Purchaser.

3. The Purchaser shall have the fullest liberty to lodge their claim for encashment of the guaranteed sum either in full or part, in the manner suitable to them. However, payment made for a sum lesser than the guaranteed amount shall not relieve or discharge the bank from their obligations guaranteed under the bank guarantee, till the contractual obligations are fully performed by the Contractor or the Bank Guarantee is discharged by the Purchaser, as the case may be and the Bank Guarantee shall continue to be in force till such time.

4. The Bank shall not be released of its obligations under these presents by any exercise by the Purchaser of its liberty with reference to the matters aforesaid or any of them or by reason of any other acts or omissions or commissions on the part of the Purchaser or any other indulgence shown by the Purchaser or by any other matter or thing whatsoever which under law would, but for this provision, have the effect of relieving the bank from its obligations. The Bank also agrees that the Purchaser at its option shall be entitled to enforce this

Guarantee against the Bank as a Principal Debtor in the first instance without proceeding against the Consortium Partner and notwithstanding any security or other guarantee that Purchaser may have in relation to Consortium Partner liabilities.

5. Notwithstanding anything contained herein above our liability under this Guarantee is restricted to Rs.....(in figures and words) and it shall remain in force upto and including .....and shall be extended from time to time for such period, as may be desired by Consortium Partner on whose behalf this guarantee has been given. This guarantee shall expire on..... unless the Purchaser`s claim under this guarantee in accordance with the above mentioned conditions has reached us by the end of the said date.

6. Notwithstanding anything contained herein:

- a) Our liability under this Bank Guarantee shall not exceed Rs.....(in figures and words),
- b) This Bank Guarantee shall be valid upto .....; and
- c) We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only and only if you serve upon us a written claim or demand on or before.....

This guarantee must be returned to us upon the expiration of the guarantee or after fulfillment of obligation specified in the guarantee.

In witness whereof the Bank through its authorized officer has set its hand and stamp on this ..... day of ..... 202..

Signature :

Name :

Designation :

Staff Code No :

Bank Seal

Date :

Witness:

1. Signature

Full name in block letters :

Occupation :



Address :

2. Signature :

Full name in block letters :

Occupation :

Address :

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**ANNEXURE- XIV**  
**PROFORMA FOR ADVANCE PAYMENT BANK GUARANTEE**

**Not Applicable**

**ANNEXURE-XV**  
**PROFORMA FOR CUSTODY CUM INDEMNITY BOND**  
(On Non-JUDICIAL stamp paper of appropriate value)

This CUSTODY CUM INDEMNITY BOND is made this..... day of .....  
202..... by .....(Contractor's name) a Company registered under the Companies

Act 1956/Partnership firm/proprietary concern having its registered office at .....  
(hereinafter called as the “Contractor” or “Obligor” which expression shall include its suc-  
cessors and permitted assignees) in favour of the SOUTH EASTERN COAL FIELDS  
(SECL) , a company incorporated under the Companies Act, 1956 having its registered office  
at Chennai.

WHEREAS SECL has awarded to the Contractor a Contract for ..... vide its Letter  
of Award/Contract No..... date ..... and its Amendment  
.....(Applicable when amendments have been issued) (hereinafter called the “Contract”) in  
terms of which SECL is required to hand over various equipment to the Contractor for execu-  
tion of the Contract.

AND WHEREAS by virtue of Clause No..... of the said Contract, the Contractor is re-  
quired to execute the Custody cum Indemnity Bond in favour of SECL for the Equipment to  
be handed over to it by SECL for the purpose of performance of the Contract/Erection Por-  
tion of the Contract (hereinafter called “Equipment”).

NOW, THEREFORE, this Custody cum Indemnity Bond witnessh as follows:

1. That in consideration of various Equipment as mentioned in the Contract, valued at Rs.  
..... (Rupees ..... ) to be handed over  
to the Contractor in installments from time to time for the purpose of performance of the  
Contract, the Contractor hereby undertakes to indemnify and shall keep SECL indemnified,  
for the full value of the Equipment. The Contractor hereby acknowledges receipt of the initial  
installment of the Equipment as per details in the schedule appended hereto. Further, the  
Contractor agrees to acknowledge receipt of the subsequent installments of the Equipment as  
required by SECL in the form of schedules consecutively numbered which shall be attached  
to this Custody cum Indemnity Bond so as to form integral part of this Bond. It is expressly  
understood by the Contractor that handing over the despatch title document in respect of the  
said equipment duly endorsed by SECL in favour of the Contractor shall be construed as  
handing over of the equipment purported to be covered by such title documents and the Con-  
tractor shall hold such equipment in trust as a Trustee for and on behalf of SECL.

2. That the Contractor is obliged and shall remain absolutely responsible for the safe trans-  
it/protection and custody of the Equipment at SECL Project site against all risks whatsoever  
till the Equipment are duly used/erected in accordance with the terms of the Contract and the  
plant/package duly erected and commissioned in accordance with the terms of the Contract is  
taken over by SECL.

3.The Contractor undertakes to keep SECL harmless against any loss or damage that may be  
caused to the Equipment.

4.The Contractor undertakes that the Equipment shall be used exclusively for the perfor-  
mance/execution of the Contract strictly in accordance with its terms and conditions and no

part of the Equipment shall be utilised for any other work or purpose whatsoever. It is clearly understood by the Contractor that non-observance of the obligations under this, Custody cum Indemnity Bond by the Contractor shall interalia constitute a criminal breach of trust on the part of the Contractor for all intents and purposes including legal/penal consequences.

5. That SECL is and shall remain the exclusive, Purchaser of the Equipment free from all encumbrances, charges or liens of any kind, whatsoever. The Equipment shall at all times be open to inspection and checking by Engineer-in-charge/Engineer or other employees/agents authorised by him in this regard. Further, SECL shall always be free at all times to take possession of the Equipment in whatever form the Equipment may be, if in its opinion, the Equipment are likely to be endangered, mis utilised or converted to uses other than those specified in the Contract, by any acts of omission or commission on the part of the Contractor or any other person or on account of any reason whatsoever and the Contractor binds itself and undertakes to comply with the directions or demand of SECL to return the equipment without any demur or reservation.

6. That this Custody cum Indemnity Bond is irrevocable. If at any time any Loss or damage occurs to the Equipment or the same or any part thereof is mis utilised in any manner whatsoever then the Contractor hereby agrees that the decision of the Engineer-in-charge/Engineer of SECL as to assessment of loss or damage to the Equipment shall be final and binding on the Contractor. The Contractor binds itself and undertakes to replace the lost and/or damaged Equipment at its own cost and/or shall pay the amount of Loss to SECL without any demur, reservation or protest. This is without prejudice to any other right or remedy that may be available to SECL against the Contractor under the Contract and under this Custody cum Indemnity Bond.

7. Now the condition of this Bond is that if the Contractor shall duly and punctually comply with the terms and conditions of this bond to the satisfaction of SECL then, the above shall be void, but otherwise it shall remain in full force and virtue.

8. IN WITNESS, WHEREOF, the Contractor has hereunto set its authorised representative under the common seal of the company, the day, month and year first above mentioned.

**SCHEDULE NO. 1**

Particulars of the Equipment handed	Qty.	Particulars of despatch: Documents & Value	Title	Signature of Attorney in token of receipt
-------------------------------------	------	--	-------	---

over		RR/GR No. Carrier Date, Bill of lading	Value of the Equipment	
-- Please number subsequent Schedule (s) --				

Signature :  
Name :  
Designation :  
Company :

Company Seal

Date :

For and behalf of: M/s.....

Name:

Signature:

Designation:

Authorised Representative\*

(Company Seal-in case of Company)

**Witness:**

1. Signature

Name :

Full name in block letters:

Occupation:

Address :

2. Signature:

Full name in block letters :

Occupation:

Address :

\*Indemnity Bonds are to be executed by the authorised persons and (i) in case of Contracting company, under company seal of the company or (ii) having the power of attorney issued under company seal of the company with authority to execute Indemnity Bonds, (iii) in case (ii), the original Power of Attorney if it is specifically for this Contract or a Photostat copy of the

power of attorney if it is a General Power of Attorney and such documents should be attached to Indemnity Bond.

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**ANNEXURE –XVI  
PROFORMA FOR RETENTION MONEY BANK GUARANTEE**

**Not Applicable**

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**ANNEXURE - XVII**

**PROFORMA FOR RELEASE OF LIQUIDATED DAMAGES BANK GUARANTEE (LDBG)-**

**Not Applicable**

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**ANNEXURE-XVIII**

**SAFETY CODE FOR CONTRACTORS**

1.1 Safety is the responsibility of every employee, individually and collectively.



1.2 Head of the Dept/Division should ensure that a copy of this Contractor's Safety Code is handed over to every Contractor working under his control and he should in turn prominently display all rules on the office/site notice board for the benefit of all the men working under him.

1.3 The Contractor shall in connection with provide adequate guards, illumination, fencing and watch wherever necessary at the construction site & working area, for the safety & convenience of general public.

1.4 Fire extinguishers adequate in number and with proper validity shall always be kept by the Contractor at the site of works, where there is risk of fire hazard, especially near the site stores.

1.5 Adequate washing facilities with proper drainage shall be provided and properly maintained near the place of work but at a safe distance from railway tracks and busy roads.

1.6 Whenever work is to be undertaken near a place, where there is a risk of drowning, arrangements to be made for safe barricading of such areas. All necessary equipment shall be provided and kept ready for use and necessary steps taken for prompt rescue of any person in danger and adequate provision shall be made for prompt first-aid treatment of all injuries likely to be sustained during the course of the work, in case of a mishap.

1.7 To ensure effective enforcement of the rules and regulations relating to safety precautions, the arrangements made by the Contractor shall be open to inspection by the Safety Engineer, the Labour Officer, Engineer-in-charge of the concerned Department or their representatives.

1.8 Notwithstanding the above clauses, there is nothing in these to exempt the Contractor from the operation of any other Act or Rule in the Republic of India for the safety of men and materials.

1.9 An injury sustained in the plant, must be immediately reported to the First-Aid Station or next higher Supervisor/Officer in-charge, no matter how minor the nature of the injury.

1.10 In case of a fatal accident, the Contractor must inform the Engineer in-charge of the department for which he is working and a report in writing should be made, clearly explaining the sequence of events leading to the accident.

1.11 Smoking or use of naked lights is strictly prohibited near gas lines, valves and any other equipment linked to the gas distribution networks.

1.12 Smoking and carrying of matches, lighters and other spark producing devices is strictly prohibited within the area where inflammable liquids are stored, handled or used or where loading or unloading operations are performed. Any tank or container containing inflammable liquid should be properly grounded for preventing ignition due to static electricity charg-

es. Contractor should ear-mark such areas and provide necessary signage and warning signals.

1.13 Contractors should ensure that employees do not report to work while under the influence of intoxicants. Any employee found on duty under the influence of liquor or of intoxicating drugs, will be liable to severe disciplinary action.

1.14 Work surroundings should be kept clean, free from oil, grease and other obstructions or fallen objects like nuts bolts etc.

1.15 After a job or work is completed, all left-over junk and other scrap materials should be cleared from the area immediately.

1.16 Drums or other make-shift arrangement must not be used in place of ladders or as work benches or supports for any job.

1.17 Employees shall not walk through or cross any operating units unless their duties require them to do so, or they are authorised.

1.18 Compressed air should not be used for removing dust from one's clothes and deliberately directed or used on any person as it is likely to cause serious injury.

1.19 If an employee, in the course of his work, encounters conditions of unusual hazard with which he is not familiar, he should contact the supervisor for advice before proceeding further. He should also inform the Contractor as well as the Engineer in-charge.

1.20 Contractors should particularly ensure that they or their employees do not meddle with any equipment they are not concerned or unfamiliar with and see that they should generally keep away from such equipment.

1.21 It should be ensured that no one takes rest/shelter below any under cut pit/excavation or near any stock-pile of materials.

1.22 For any work involving repair & maintenance underground, the Contractor shall follow the safety procedural orders/instruction issued by the Purchaser.

1.23 The Contractor shall ensure supervision of such jobs by competent persons within the meaning of Factories Act & Rules.

1.24 All persons engage on such jobs shall have to have before hand proper training instructions as required under Factories Act & Rules.

## 2 SAFETY MEASURES IN CONTRACT WORK

Whereas, it is necessary to take steps to ensure safety at work sites by the executing contractual agency, it is incumbent of the Purchaser to introduce all measures to guide, induce, train

and bind the agencies concerned to adopt remedial steps to prevent accidents. Problem gets aggravated in contractual zones due to lack of training, in-adequate supply of personal protective equipment, shortage of skilled labour changing deployment of works etc. Accordingly, the following measures are intended to be introduced and the salient clauses will be included in the contract documents.

2.1 The Contractor shall take all safety precautions and provide adequate supervision in order to carryout the job safely and without damage to men & equipment.

2.2 Any special safety precautions, if required to be followed by the Contractor, such clauses shall be added.

2.3 The executing department would take necessary shut-downs wherever there are hazards of gases, electricity, moving machinery etc. The Contractor shall ensure that the shut-down/clearance are taken before deploying workers to such locations.

2.4 The Contractor shall supply safety appliance such as safety shoes, safety belts, helmets, gloves, harness etc. to his workers depending on working conditions and life saving jackets shall always be kept in readiness at the site. The Contractor shall not deploy any workmen without safety shoes and safety helmet and the safety applicable to the specific work conditions.

2.5 Before starting the day's job, the Purchaser's Supervisor/representatives will ensure that safety briefing has been done to the Contractor's supervisor who has previously been imparted safety induction training.

2.6 Head/Zonal in-charge will nominate Engineer in-charge of the contractual work under reference who will be fully responsible for the safe execution of the work at site.

2.7 In case of injury to persons, the Contractors shall first take the injured person to nearest hospital with the necessary forms. In no case the Contractors are allowed to take injured persons directly to their own Doctors.

2.8 The Contractor shall abide by the provisions of Factories Act, State Factory Rules, Workmen's Compensation Act, Payment of Wages Act, Contract Labour (Regulation) Act etc. and keep the Purchaser indemnified of provision the above Acts and Rules.

2.9 The Head of Deptt. executing the contract upon the satisfaction that the Contractor is not conforming to the Safety requirements may direct stoppage of work and require the Contractor to remedy the defects. The Contractor shall not proceed with the work until he has complied with each directions to the satisfaction of such Head of the Department.

2.10 The Contractor shall be fully responsible for accidents caused due to him or his agents or workmen's negligence or carelessness in regard to the observance of the safety requirements and shall be liable to pay compensation for injuries.

2.11 Without prejudice to the right conferred by the above clause, for stoppage of work for violations of safety requirements the Contractor shall be liable for penalty as deemed fit for violation of safety rules & regulations upto first two instances. For the third violation he shall be liable to be debarred from further contracts upto a period of one year from the date of issue of debarring notice.

2.12 The Head of the Safety Engg. Deptt. or the Head of the Deptt. executing the contract will assess the penalty amount having regard to the circumstances, in particular, the nature and gravity of the violation. After issuing a notice to the Contractor to show cause why the amount specified therein shall not be imposed as a penalty and considering the cause shown by the Contractors, if any, he shall pass final orders which shall then be final and binding on the Contractor. The penalty amount will be recoverable from any bill and/or EMD/SD of the Contractor without any further reference to him.

2.13 Whenever work, at heights is involved, Contractor must obtain necessary permissions and clearances from the contractors Safety Engg. Dept. for such persons required to do work at height.

2.14 Contractor must insure all the workmen under the "Workmen Compensation Act."

#### 2.15 Site Regulations and Safety

Contractor shall submit the EHS policy for the site to the Project Incharge/CLUVPL/SECL within 14 (fourteen) days from effective date and shall abide by the rules and regulations of the EHS policy.

The Contractor shall have to provide necessary and adequate safety measures including personal protective equipment and precautions to avoid any accident, which may cause damage to any equipment / material or injury to workmen. The Owner shall not be liable for any such accidents during the performance of the contract.

The Contractor, if required, will provide necessary safety training to workmen. Also, Contractor shall engage sufficient security guards to protect Facility from any theft and unauthorized access to site during the entire construction and O&M periods.

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## **ANNEXURE - XIX**

### **GENERAL CONDITIONS FOR ERECTION AND CIVIL WORKS**

#### **GENERAL CONDITIONS FOR ERECTION WORKS**

#### **1. General**

1.1. The following shall supplement the conditions already contained in the other parts of the specifications and documents and shall govern that portion of the work of the Contract to be performed/undertaken at the project site.

1.2. The Contactor upon signing of the Contract shall, in addition to a Project Coordinator, nominate another responsible officer as its representative at site suitably designated for the purposes of overall responsibility and co-ordination of the Works to be performed at site. Such person shall function from the site office of the Contractor during the execution of Contract. This representative shall have full technical capability and complete administrative and financial powers to expeditiously and efficiently execute the work under the Contract.

1.3. The Contractor shall proceed with the work to be performed under the Contract and each and every part and detail thereof, in the best and most workman like manner by engaging qualified, diligent and efficient workers, and undertake the several parts thereof, at such time and in such order as agreed in the contract , and finish such work in strict conformity with the plans, drawings and/or specifications, and any changes, modifications or amplifications thereof made by the Purchaser/Consultant.

1.4. The Contractor shall not sell, assign, mortgage hypothecate or remove equipment or materials or materials which have been installed or which may be necessary for the completion of the Contract, without the written consent of the Purchaser.

## **2. Regulations of Local Authorities and Statues**

2.1. The Contractor shall ensure compliance with all statutes, laws, rules and regulations of the Central or State Government or any other authority such as the Workmen's Compensation Act 1923, Payment of Wages Act, Minimum Wages Act 1948, Employees State Insurance Act, Employees Provident Fund Act, Contract Labour (Regulation) Act, Interstate Migrant Workmen Act, Building and other contract workers Act etc. and any and all statutory modifications thereof in connection with employees engaged by him or his Sub-Contractors in performance of the work.

2.2. The Contractor shall conform to the provisions of Indian Boiler Regulation, State government Factory Laws, Indian Electricity Act and rules made there under, and any other acts of legislature relating to the work and to the regulations and bye-laws of any national or local authority and of any water, lighting and other companies and/or authorities with whose systems the plant/structure is proposed to be connected and shall before making any variations from the drawings or specifications that may be necessitated by so conforming, giving to the Purchaser/Consultant written notice, specifying the variations proposed to be made and the reason for making it any apply for instructions thereof.

2.3. The Contractor shall arrange to give all notices required by the said Acts, Regulations or Bye-laws to be given to any Authority or to any Public Officer and pay all fees that may be properly chargeable in respect of the works and lodge the receipts with the Purchas-

er/Consultant, unless otherwise, specified in the specification. Obtaining all permits and licenses required there upon is the responsibility of the Contractor.

2.4. All registration and statutory inspection fees, in respect of the work pursuant to the Contract shall be to the account of the Contractor. However, any registration, statutory inspection fees lawfully payable under the provisions Regulations and any other statutory laws and its amendments from time to time during erection in respect of the plant and equipment ultimately to be owned by the Purchaser shall be to the account of the Purchaser. Should any such inspection or registration need to be re-arranged due to the fault of the Contractor or its Sub- Contractor, the additional fees for such inspection and/or registration shall be borne by the Contractor.

### **3. Contractor's Health and Safety Program**

Refer Technical specification and also Annexure-XVIII of this Volume -IB for safety code.

### **4. Purchaser's Lien on Equipment**

The Purchaser shall have lien on all equipment including those of the Contractor brought to the site for the purpose of erection, testing and commissioning of the plant. The Purchaser shall continue to hold the lien on all such equipment throughout the period of Contract. No material brought to the site shall be removed from the site by the Contractor and/or its Sub-Contractor's without the prior written approval of the Purchaser/Consultant.

### **5. Inspection, Testing and Inspection Certificate**

5.1. The provisions of the clause entitled Inspection, Testing and Inspection Certificates shall also be applicable to the erection portion of the works. The Purchaser / Consultant shall have the right to re-inspect any equipment (though previously inspected and approved by him, at the Contractor's works) before and after the same are erected at Site. Inspection will be carried out as per the approved QAP for shop manufactured items. After receipt of the materials / equipments at site, in case of doubt, the Purchaser may ask for re-inspection after mutual discussion and agreement with the contractor as per the approved QAP for the materials / equipments to perform as per the contract within the contract price. If by the above inspection, the Purchaser / Consultant rejects any equipment, the Contractor shall make good for such rejections either by replacement or modifications / repairs as may be necessary, to the satisfaction of the Purchaser / Consultant. Such replacements will also include the replacements or re-execution of such of those works of other Contractor's and/or agencies, which might have got damaged or affected by the replacements or re-work done to the Contractor's work.

5.2. Any work, which proves faulty, shall be corrected by the Contractor without undue delay. The fact that the Purchaser / Consultant or their representatives have not pointed out faulty work or that which is not in accordance with plans and specifications, shall not relieve

the Contractor from correcting such work as directed by the Purchaser / Consultant, without additional compensation.

5.3. In the event finished/completed work is ‘dismantled’ for the purpose of re-inspection due to damage (arising due to transportation and storage at site), in case of doubt, the Purchaser may ask for re-inspection after mutual discussion and agreement with the contractor as per the approved QAP for the materials / equipments to perform as per the contract within the contract price.

5.4. The Purchaser / Consultant, their representatives and employees shall, at all reasonable times, have free access to the works and/or to the workshops, factories or other places where materials are being prepared or constructed in performance of the Contract and also to any place where the materials are lying or from where they are being obtained, and the Contractor shall give every facility to the Purchaser / Consultant and his representatives for inspection and examination and test of the materials and workmanship even to the extent of discontinuing portions of the work temporarily, or of uncovering or taking down portions of finished work after mutual agreement.

## **6. Access to Site And Works On Site**

6.1. Suitable access and possession of the site shall be provided to the Contractor by the Purchaser in reasonable time.

6.2. The Purchaser shall make ready the necessary foundations to be provided by it ready, as per the agreed schedule, for the execution of the individual phases of works.

6.3. In the execution of the works, no persons other than the Contractor or its duly appointed representative, Sub-Contractor and workmen shall be allowed to undertake work on the site, except by the special permission, in writing of the Purchaser / Consultant or its representative.

6.4. Access to the site at all times shall be accorded to the Purchaser / Consultant and other authorized officials and statutory Public Authorities. Nevertheless, the Contractor shall not object to the execution of the work by other Contractors or tradesmen whose names shall have been previously communicated in writing to the Contractor by the Purchaser / Consultant and afford them to coordinate for the execution of their several functions simultaneously with his own.

## **7. Contractor’s Site Office Establishment**

7.1. The Contractor shall establish a Site Office at the site and keep posted an authorized representative for the purposes of the Contract. Any written order or instruction of the Purchaser / Consultant or his duly authorized representative, shall be communicated to the authorized representative for the purposes of the Purchaser / Consultant or his duly authorized Contrac-

tor at the Site Office and the same shall be deemed to have been communicated to the Contractor at his legal address.

7.2. The Contractor shall employ at least one competent representative whose name or names shall have previously been communicated in writing to Purchaser/Consultant by the Contractor, to supervise the erection of the plant and to carry out the work. The said representative or if more than one shall be employed, then one of such representatives shall be present at the site during working hours, and any written orders or instructions which the Purchaser/Consultant may give to the said representatives of the Contractor shall be deemed to have been given to the Contractor. It is essential that the supervisory personnel shall be capable of speaking and writing in English language and preferably conversant with the local language –Hindi.

## **8. Co-Operation with Other Contractors**

8.1. The Contractor shall cooperate with all other Contractors or tradesmen of the Purchaser, who may be performing other works on behalf of the Purchaser and the workmen who may be employed by the Purchaser and doing work in the vicinity of the works under the Contract. The Contractor shall also so arrange to perform its work as to minimize, to the extent possible, interference with the work of other Contractors and its workmen. Any injury or damage that may be sustained by the employees of the other Contractors and the Purchaser due to the Contractor's work shall promptly be made good at its own cost. The Purchaser/Consultant shall determine the resolution of any difference or conflict that may arise between the Contractor and other Contractors or between the Contractor and the Workmen of the Purchaser in regard to their work.

8.2. The Purchaser/Consultant shall be notified promptly by the Contractor of any defects in the other Contractor's works that could affect the Contractor's works. The Purchaser/Consultant shall determine the corrective measures, if any, required to rectify this situation after inspection of the works and such decisions by the Purchaser/Consultant shall be binding on the Contractor. If a part of the Contractor's work depends, for proper execution, upon the work of any other Contractor, the Contractor shall inspect and promptly report in writing to the Purchaser/Consultant any defect in such work of other Contractors that render it unsuitable for proper execution of the work under the Contract. Failure to so inspect and report shall constitute an acceptance of 'Others' work as fit and proper for the reception of his work, except as to defects which may develop in the work of 'Others' after the proper execution of the work. To ensure proper execution of his sub-sequent work, the contractor shall inspect work already in place and shall at once report to the Purchaser/Consultant any discrepancy between the executed work and the drawings.

## **9. Discipline of Workmen**

The Contractor shall adhere to the disciplinary procedure set by the Purchaser/Consultant in respect of its employees and workmen at site. The Purchaser/Consultant shall be at liberty to



object to the presence of any representative or employee of the Contractor at the site, if in the opinion of the Purchaser/Consultant such employee has misconduct himself or be incompetent or negligent or otherwise undesirable and then the Contractor shall remove such a person object to and provide in his place a competent replacement at his own expense.

## **10. Contractor's Field Operation**

10.1. The Contractor shall keep the Purchaser/Consultant informed in advance regarding his field activity plans and schedules for carrying out each part of the works. Any review of such plan or schedule or method of work by the Purchaser/Consultant shall not relieve the Contractor of any of his responsibility towards the field activities. Such reviews shall also not be considered as an assumption of any risk or liability by the Purchaser/Consultant or any of his representatives and no claim of the Contractor will be entertained because of the failure or inefficiency of any such plan or schedule or method of work reviewed. The Contractor shall be solely responsible for the safety, adequacy and efficiency of plant and equipment and his erection methods.

10.2. The Contractor shall have the complete responsibility for the conditions of the work site including the safety of all persons employed by him or its Sub-Contractor and all the properties under his custody during the performance of the work. This requirement shall apply continuously till the completion of his 'Contract' and shall not be limited to normal working hours. The construction review by the Purchaser/Consultant is not intended to include review of Contractor's safety measures in, on or near the work-site, and their adequacy or otherwise.

10.3. The work so far as it is carried out on the Purchaser's premises/the project site, shall be carried out at such time as the Purchaser may approve consistent with the construction schedule and so as not to interfere unnecessarily with the conduct of the Purchaser's business and the Purchaser will give the Contractor all reasonable facilities for carrying out the work.

## **11. Photographs and Progress Report**

Refer relevant clause of Section-10 of Volume -IB, Draft Contract.

## **12. Manpower Report**

12.1 The Contractor shall submit to Purchaser/Consultant on the first day of every month, a Manpower Report for the upcoming/next month, detailing the manpower scheduled/proposed/planned to be deployed for the month, skill-wise and area-wise.

12.2 The Contractor shall also submit to the Purchaser/Consultant on the first day of every month, a manpower report of the previous month detailing the number of persons planned to have been deployed to that and actually deployed, skill-wise and the areas of employment of such labour.

### **13. Protection of Work**

13.1 The Contractor shall have total responsibility for protecting his works till it is finally accepted by the Purchaser/Consultant. No claim will be entertained by the Purchaser/Consultant for any damage or loss to the Contractor's works and the Contractor shall be responsible for the complete restoration of the damaged works to its original condition to comply with the specifications and drawings. Should any such damage to the Contractor's works occur because of another party not under his supervision or control, the Contractor shall make and take-up its claim directly with the party concerned. If disagreement or conflict or dispute develops between the Contractor and the other party or parties concerned regarding the responsibility for damage to the Contractor's 'works' the same shall be resolved as per the provisions of above Clause-8 titled 'Cooperation with other Contractors'. The Contractor shall not cause any delay in the repair of such damaged 'Works' because of any delay in the resolution of such disputes. The Contractor shall proceed to repair the work immediately and no cause thereof will be assigned pending resolution of such dispute.

13.2 The Contractor and his sub-Contractors shall take necessary care to see that no damage to the work which has been completed by others is caused by Contractor's own men during the course of execution of their work. The Contractor or its sub- Contractor are not responsible for protection of others work. However, Contractor shall ensure that no damage is caused by its own men during the course of execution of their work.

13.3 All other work completed or in progress as well as machinery and equipment that are liable to be damaged by the Contractor's work shall be protected by the Contractor and such protection shall remain and be maintained until its removal is directed by the Purchaser.

13.4 The Contractor shall effectively protect all the works from action of weather and from damages or defacement and shall cover finished parts where required for their thorough protection. Face work shall be perfectly clean and free from defects.

13.5 The work shall be carried out onto completion without damage to any work and property adjacent to the area of his work, to whomsoever it may belong, without interference with the operation of their existing machines or equipment.

13.6 The Contractor shall provide the necessary temporary roadways, footways, guards as may be rendered necessary by reason of his work, for the protection and accommodation of foot passengers of other traffic of the Purchaser or occupier of adjacent property and of public. The Contractor shall at the times provide sufficient temporary barriers, notice boards and lights to protect and warn the public and post necessary watchman to guard the site and equipment. He shall take all precautions necessary and shall be responsible for the safety of the work to be performed by him. The Contractor shall also observe and display Safety First signs and shall have proper safety and fire protection equipment.

13.7. Adequate lighting at and near all the storage, handling, fabrication, pre-assembly and erection sites for properly carrying out the work and for safety and security shall be provided by the Contractor. The Contractor's work area shall be adequately lighted during night time too. The Contractor should also engage adequate electricians/wiremen, helpers, etc., to carry out and maintain these lighting facilities. If the Contractor fails to provide all the above listed facilities, the Purchaser may provide such facilities as it may deem necessary and charge the cost thereof to the Contractor. In any case the Contractor shall be liable for any damages and consequences arising out of its neglect in this regard.

#### **14. Employment of Labour**

14.1. The Contractor/Sub-Contractors is expected to employ on the work skilled employees with experience of his particular work. No person below the age of eighteen years shall be employed.

14.2. The Contractor shall furnish details of the qualifications and experience of his senior supervisors and Consultants assigned to the work, including their experience in supervising erection and commissioning of plant and equipment of comparable capacity.

14.3. All travelling expenses including provisions of all necessary transport to and from site, loading allowances and other payments to the Contractor's employees shall be the sole responsibility of the Contractor.

14.4. The hours of work on the site shall be decided by the Purchaser and the Contractor shall adhere to it. Working hours for each employee will normally be 8 (eight) hours per day.

14.5. The Contractor's employees shall wear suitable identification badges while on work at site clearly indicating his name, designation, Employer etc, among other essential details.

14.6. The Contractor shall ensure that it pays its personnel/workmen regular wages, overtime and other compensations. The attendance register and the wage register shall be submitted to the Purchaser for verification at regular intervals. The Contractor shall also furnish the Purchaser at fortnightly intervals a certificate that he has paid all the dues to his workmen. In case such payment is not made regularly by the Contractor, the Purchaser will be in his right to make such payments and deduct the same from the Contractor's progress payments.

14.7. In case the Purchaser becomes liable to pay any wages or dues to the labour or to any Government agency under any of the provisions of the Minimum Wages Act, Workmen's Compensation Act or any other law due to act of omission of the Contractor, the Purchaser may make such payments and shall recover the same from the Contractor's bills.

14.8. None of the Contractor's superintendents, supervisors, Consultants or labour may be withdrawn from the work without due notice being given to the Purchaser/Consultant. Further, no such withdrawal shall be made if, in the opinion of the Purchaser/Consultant, it will jeopardize the required pace of progress and/or the successful completion of the work.

14.9 In connection with the performance of work under this Contract, the Contractor shall not discriminate on the basis of race, religion, colour or national origin. It is also expected that the Contractor in his selection of personnel will give due regard to their ability to co-operate with the Purchaser/Consultant. Suggestions and recommendations made by the Purchaser/Consultant relating to the work and coordination thereof are to be carefully and courteously considered.

## **15. Facilities to Be Provided By The Purchaser**

### 15.1 Electricity

Refer Section -7 of this Volume-IB, Draft Contract

## **16.0 Tools, Tackles and Scaffoldings**

16.1.1. The Contractor shall provide at its own cost & expense, all the construction equipment, false work, erection tools, machine tools, power tools, tackles, hoists, cranes, derricks, cables, slings, skids, scaffolding work benches, tools for rigging, cribbing and blocking, welding machines preheating and stress relieving equipment, X-ray and all associated protective equipment, instruments, appliances, materials, and supplies required for unloading, transporting, storing, erection, testing and commissioning that may be required to accomplish the work under the Contract unless otherwise specifically provided for. Adequacy of such tools will be subject to final determination of the Purchaser/Consultant. He shall submit a list of all such materials to the Purchaser / Consultant before the commencement of pre-assembly at site. These tools and tackles shall not be removed from the site without the written permission of the Purchaser/ Consultant.

The Contractor will ensure provision of necessary safety equipment such as barriers, signboards, warning lights and alarms, etc. to provide adequate protection to persons and property. The Contractor shall be responsible to give reasonable notice to the Purchaser/Consultant and the Owner of public or private property and utilities when such property and utilities are likely to get damaged or injured during the performance of his 'Works' and shall make all necessary arrangements with such owners, related to removal and/or replacement or protection of such property and utilities.

16.1.2. The Contractor shall also furnish all necessary expandable devices like anchors, grinding and abrasive wheels, raw plugs, hacksaw blades, taps, dies, drills, reamers, chisels, files, carborandum stones, oil stones, wire brushes, necessary scaffolding, ladders, wooden planks, timbers, sleepers and consumable material like welding electrodes, oxygen, acetylene, argon, lubricating oils, greases, cleaning fluids, cylinder oil, graphite powder and flakes, fasteners, gaskets, temporary supports, stainless steel shims of various thickness as required, cotton waste, cheese cloth and all other miscellaneous supplies of every kind required for carrying out the work under the 'Contract'.

16.1.3. The Contractor shall provide all reasonable facilities including tools, personnel, etc and ensure coordination with the Purchaser / Consultant and the sub-Contractor's erection supervisors to enable them to carry out all supervision, measurements, checks, etc. in a satisfactory manner.

16.1.4. The Contractor shall not dispose of, transport or withdraw any tools, tackles, equipment and material provided by him for the 'Contract' without taking prior written approval from the Purchaser/Consultant, and the Purchaser/Consultant at all times shall have right to refuse permission for disposal, transport or withdrawal of tools, tackles, equipment and material if, in his opinion, the same will adversely affect the efficient and expeditious completion of the 'Project'.

## **16.2. Communication**

The Contractor will make its own arrangement for all his communication needs such as telephone, email etc. at its Site Office. The Purchaser/consultant will assist or facilitate the Contractor in obtaining the above facilities, if requested.

## **16.3. First-Aid**

The Contractor shall provide necessary first-aid facilities for all its employees, representatives and workmen at the site.

## **16.4. Cleanliness**

16.4.1. The Contractor shall be responsible for proper house-keeping the entire area allotted to him, clean and free from rubbish, debris etc. during the period of 'Contract'. The Contractor shall employ sufficient number of special personnel to thoroughly clean his work area at least once in a day. All rubbish and scrap material shall be identified, stacked or disposed in a place to be identified by the Purchaser / Consultant. Materials and stores shall be so arranged to permit easy cleaning and upkeep. In areas where equipment might drip oil and cause damage to the floor surface, a suitable protective cover of a flame resistant, oil-proof sheet shall be provided to protect the floor from such damage.

16.4.2. Similarly, the offices of the Contractor shall be kept clean and neat to the satisfaction of the Purchaser/Consultant. Proper sanitary arrangements shall be provided by the Contractor in the work areas and offices of the Contractor.

## **17. Lines and Grades**

17.1. All the works shall be performed to the lines, grades and elevations indicated on the drawings. The Contractor shall be responsible to locate and layout the works. Basic horizontal and vertical control points will be established and marked by the Purchaser/Consultant at site at suitable points. These points shall be used as datum for the 'Works' under the Contract. The Contractor shall inform the Purchaser / Consultant well in advance of the times and places at which he wishes to do work in the area allotted to him, so that suitable datum points

may be established and checked by the Purchaser / Consultant to enable the Contractor to proceed with its works. Any work done without being properly located may be removed and/or dismantled by the purchaser/Consultant at Contractor's expense.

17.2 Where the Purchaser/Consultant had already established the base lines and bench marks adjacent to the various sections of work, the same must be carefully preserved by the contractor, and in case of their unnecessary destruction by him or any of his employees, these will be re-established by the Purchaser/Consultant at the Contractor's expense.

17.3 The Contractor shall be responsible for the accuracy of all dimensions within the various sections of the work according to the figures of dimensions in the drawings.

## **18. Fire Protection:**

**Refer Technical volume-II**

## **19. Security**

Refer Section- 2, Cl 2.3.4 (iii) of this Volume -IB, Draft Contract

## **20. Contractor's Area Limits**

The Purchaser/Consultant will clearly demarcate the boundary limits of access roads, parking, spaces, storage and construction areas and the Contractor shall not trespass areas not so marked out for him. The Contractor shall be responsible to ensure that none of its personnel move out of the areas marked out for its operations. In case of such a need for the Contractor's personnel to work out of the areas marked out for him, the same shall be done only with the written permission of the Purchaser/Consultant.

## **21. Contractor's Cooperation with The Purchaser**

21.1. In cases where the performance of the erection work by the Contractor affects the operation of the system facilities of the Purchaser/Consultant such erection work of the Contractor shall be planned to be performed only in the manner stipulated by the Purchaser/Consultant and the same shall be acceptable at all times to the Purchaser/Consultant. The Purchaser/Consultant may impose such restrictions on the facilities provided to the Contractor such as electricity, water etc. as he may think fit in the interest of the Purchaser and the Contractor shall strictly adhere to such restrictions and co-operate with the Purchaser/Consultant. It will be the responsibility of the Contractor to provide all necessary temporary instrumentation and other measuring devices required during start-up and operation of the equipment systems, which are erected by him. The Contractor shall also be responsible for flushing and initial filling of all the oil and lubricants required for the equipment furnished and erected by him, so as to make such equipment ready for operation. The Contractor shall be responsible for supplying such flushing oil and other lubricants unless otherwise specified elsewhere in these documents.

21.2. The Contractor at all times shall work in coordination with the Purchaser's Consultants and offer them all reasonable facilities to become familiar with the erection, operation and maintenance of the equipment.

21.3. In respect of observations of local rules, administrative orders, working hours and the like, the Contractor and his personnel shall cooperate with the Purchaser.

## **22. Commissioning**

The 'Commissioning' of the equipment supplied and erected by the Contractor shall be the responsibility of the Contractor as detailed in Tender specification. The Contractor shall provide in addition, test instruments, calibrating devices etc. and the labour required for the successful performance Test. If it is anticipated that the above tests may prolong for a long time, the Contractor's workmen required for the above tests shall always be present at site during such tests.

## **23. Material Handling And Storage**

23.1. All the equipment furnished under the Contract and arriving at site shall be promptly received, unloaded and transported and stored in the storage spaces by the Contractor.

23.2. The Contractor shall be responsible for examining all the shipment and notify the Purchaser/Consultant immediately of any damage, shortage, discrepancy etc. for the purpose of Purchaser's / Consultant's information only. The Contractor shall submit to the Purchaser / Consultant every week a report detailing all the receipts during the week. However, the Contractor shall be solely responsible for any shortages or damage in transit, handling and/or in storage and erection of the equipment at the site (Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor).

23.3. 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 Purchaser/Consultant at any time.

23.4. All equipment shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc shall be used for unloading and/or handling of the equipment without the specific written permission of the Purchaser/Consultant. The equipment stored shall be properly protected to prevent damage either to the equipment or to the floor where they are stored. The equipment from the store shall be moved to the actual location at the appropriate time so as to avoid damage for such equipment at site.

23.5. All electrical panels, control gears, motors and such other devices, shall be properly dried by heating before they are installed and energized. Motor bearings, slip rings, commutators and other exposed parts shall be protected against moisture ingress and corrosion during storage and periodically inspected. Heavy rotating parts in assembled condition shall be

periodically rotated to prevent corrosion due to prolonged storage and shall also be periodically inspected.

23.6. All electrical equipment such as motors, generators etc. shall be tested for insulation resistance at least once in three months from the date of receipt till the date of commissioning and a record of such measured insulation values shall be maintained by the Contractor. Such records shall be open for inspection by the Purchaser/Consultant.

23.7. The Contractor shall ensure that all the packing materials, and protection devices used for the various equipment during transit and storage are removed before the equipment are installed.

23.8. The consumables and other supplies likely to deteriorate due to storage must be thoroughly protected and stored in a suitable manner to prevent damage or deterioration in quality by storage.

23.9. All the materials stored in the open or dusty locations must be covered with suitable weatherproof and flameproof and flame proof covering material wherever applicable.

23.10. If the materials belonging to the Contractor are stored in areas other than those earmarked for him, the Purchaser/Consultant will have the right to get it moved to the area earmarked for the Contractor at the Contractor's cost.

23.11. The Contractor shall be responsible for making suitable indoor storage facilities to store all equipment which require indoor storage. Normally all the electrical equipment, such as motors, control gears, generators, exciters and consumables like welding electrodes, lubricants, etc. shall be stored in the closed storage space. The Purchaser/Consultant in addition, may direct the Contractor to move certain other materials which in his opinion will require indoor storage, to indoor storage areas which the Contractor shall strictly comply with.

23.12. The Contractor shall arrange for periodic inspection of material/equipment in his custody until taken over by the Purchaser and shall carry out all protective and preservative measures required thereupon.

23.13. The Contractor shall also keep a check on the deliveries of the equipment/material covered in his scope of erection and shall advise the Purchaser well in advance regarding possible hold-ups in his work due to expected delays in delivery of equipment, to enable the Purchaser to expedite the deliveries if Supplier is different from the Contractor.

23.14. All materials of Contractors should be received only during normal working hours. Damage of any of the roads due to movement of heavy trucks, trailers, crane and other equipment of the Contractor shall be made good by the Contractor. Otherwise same shall be got rectified by the Purchaser at the risk and cost of the Contractor.



23.15. All C&I electronic equipment shall be stored in Air-conditioned storage facility under the specified temperature and humidity conditions.

## **24. Construction Management**

24.1. The field activities of the Contractors working at site, will be coordinated by the Purchaser/Consultant and the Purchaser/ Consultant's decision shall be final in resolving any disputes or conflicts between the Contractor and other Contractors of the Purchaser regarding scheduling and co-ordination of work. Such decision by the Purchaser/Consultant shall not be a cause for extra compensation or extension of time for the Contractor.

24.2. The Purchaser/Consultant shall hold weekly meetings of all the Contractor's working at site, at time and a place to be decided by the Purchaser/Consultant. The Contractor shall attend such meetings and take notes of discussions during the meeting and the decisions of the Purchaser / Consultant and shall strictly adhere to those decisions in performing his 'Works'. In addition to the above weekly meetings, the Purchaser / Consultant may call for other meetings either with individual Contractors or with selected number of Contractors and in such a case the Contractor, if called, will also attend such meetings.

24.3. Time is the essence of the 'Contract' and the Contractor shall be responsible for performance of its works in accordance with the specified construction schedule. If at any time, the Contractor is falling behind the schedule, he shall take necessary action to make good for such delays by increasing his work force or by working overtime or otherwise accelerate the progress of the work to comply with the schedule and shall communicate such action in writing to the Purchaser / Consultant satisfying that his action will compensate for the delay. The Contractor shall not be allowed any extra compensation for such action.

24.4. The Purchaser / Consultant shall however not be responsible for provision of additional labour and/or materials or supply or any other services to the Contractor except for the co-ordination work between various Contractors as set out earlier.

## **25. Field Office Records**

25.1. The Contractor shall maintain at its site Office up-to-date copies of all drawings, specifications and other Contract Documents and any other supplementary data, complete with all the latest revisions thereto. The Contractor shall use only 'Approved-For Construction' drawings on the field, showing the approval stamp & category (Approval by Purchaser/Consultant). The Contractor shall also maintain, in addition, the continuous record of all changes, approval (by Purchaser/Consultant) status to the above Contract Documents, drawings, specifications, supplementary data, etc. effected at the field and on completion of his total assignment under the Contract shall incorporate all such changes on the drawings and other Consultant data to indicate as-built conditions of the equipment furnished and erected under the Contract. Such drawings and Engineering, data shall be submitted to the Purchaser / Consultant in required number of copies. A record of all readings taken during the align-

ment of the equipment shall be maintained by the Contractor. This shall be signed by the erection supervisor and the Purchaser/Consultant as a token of their acceptance of the same. All such records shall be handed over to the Purchaser on completion of the works.

## **26. Contractor's Material Brought to Site**

26.1. The Contractor shall bring to site all equipment, components, parts, materials including construction equipment, tools and tackles for the purpose of the works under intimation to the Purchaser/Consultant. All such goods shall, from the time of their being brought vest in Purchaser, but may be used for the purpose of the works only and shall not on any account be removed or taken away by the Contractor without the written permission of the Purchaser/Consultant. But the Contractor shall nevertheless be solely liable and responsible for any loss or destruction thereof and damage thereto.

26.2. The Purchaser shall have a lien on such goods belonging to the Contractor for any sum or sums, which may at any time, be due or owing to him by the Contractor, under, in respect of or by reasons of the 'Contract'. After giving a 30 (thirty) days notice in writing of his intention to do so, the Purchaser shall be at liberty to sell and dispose of any such goods, in such manner as he shall think fit including public auction or private treaty and to apply the proceeds in or towards the satisfaction of such sum or sums due as aforesaid.

26.3. After the completion of the works, the Contractor shall remove from the site under the direction of the Purchaser/Consultant the materials such as construction equipment, erection tools and tackles, scaffolding, etc. with the written permission of the Purchaser / Consultant. If the Contractor fails to remove such materials, within 30 (thirty) days of issue of a notice by the Purchaser/Consultant to do so, then the Purchaser/Consultant shall have the liberty to dispose of such materials as detailed under Clause 16.4 above and credit the proceeds to the account of the Contractor.

26.4. On completion of the work, all rubbish, kilns, vats, tanks materials and temporary structures of any sort or kind used for the purpose or connected with the construction/erection work are to be removed by the Contractor and all pits and excavations filled up and the site handed over in a tidy and workmanlike condition and no final payment or settlement of the account for the said work shall held or due shall be made to the Contractor till such site clearance shall have been effected by him and such clearance shall be made by the Purchaser at the expense of the Contractor in the event of his failure to comply with this provision within 7 (seven) days after receiving notice in writing from the Purchaser to that effect. If it becomes necessary for the Purchaser to have the site cleared as indicated above at the expense of the Contractor, the Purchaser shall under no circumstances be held liable for any losses of damages to such of Contractors property as may be on such site due to such removal there from, which removal may be effected by means of public sale of such materials and property in such a way as deemed fit and convenient to the Purchaser.

26.5. The Contractor must take sufficient care in moving his construction/erection plant and equipment from one place to another so that they may not cause any damage to the property of the Purchaser, particularly of the existing structures and overhead and underground services and in the event of the Contractors failure to do so, the cost of such damages shall be borne by the Contractor.

## **27. Protection of Property And Contractor's Liability**

27.1. The Contractor shall be responsible for any damage resulting from his operations. He shall also be responsible for protection of all persons including members of public and employees of the Purchaser and the Purchaser/Consultant and the employees of other Contractors and Sub-Contractors and all public and private property including structures, buildings, other plants and equipment and utilities either above or below the ground.

27.2. The Contractor will ensure provision of necessary safety equipment such as barriers, signboards, warning lights and alarms, etc. to provide adequate protection to persons and property. The Contractor shall be responsible to give reasonable notice to the Purchaser/Consultant and the Owner of public or private property and utilities when such property and utilities are likely to get damaged or injured during the performance of his 'Works' and shall make all necessary arrangements with such owners, related to removal and/or replacement or protection of such property and utilities.

## **28. Painting**

28.1. All exposed metal parts of the equipment including pipings, structures, railings, etc. after installation, unless otherwise surface protected, shall be first painted with at least one coat of suitable primer which matches the shop primer paint used, after thoroughly cleaning all such parts of all dirt, rust, scales, greases, oils and other foreign materials by wire brushing, scraping or sand blasting, and the same being inspected and approved by the Purchaser for painting. Afterwards, the above parts shall be finished with two coats of machinery enamel paints. The quality of the finish paint shall be as per the standards of ISI or equivalent and to be of the colour as approved by the Purchaser/Consultant.

## **29. Insurance**

Refer Clause – Insurance under Section – 10 of Volume – IB

## **30. Unfavorable Working Conditions**

30.1. The Contractor shall confine all his field operations to those works which can be performed without subjecting the equipment and materials to adverse effects, during inclement weather conditions, like monsoon, storms, etc. and during other unfavourable construction conditions. No field activities shall be performed by the Contractor under conditions which might adversely affect the quality and efficiency thereof, unless special precautions or

measures are taken by the Contractor in a proper and satisfactory manner in the performance of such works and with the concurrence of the Purchaser/Consultant. Such unfavourable construction conditions will in no way relieve the Contractor of his responsibility to perform the 'Works' as per the schedule.

### **31. Protection of Monuments And Reference Points**

31.1. The Contractor shall ensure that any finds such as relic, antiquity, coins, fossils, etc. which he may come across during the course of performance of 'Works' either during excavation or elsewhere are properly protected and handed over to the Purchaser/Consultant. Contractor will be entitled for extension of time and cost compensation in case any work performed in relation to the monument, relic. coins, fossils under this provision.

31.2. Similarly the Contractor shall ensure that the bench marks, reference points, etc., which are marked out either with the help of Purchaser/Consultant or by the Purchaser/Consultant shall not be disturbed in any way during the performance of his 'Works'. If any work is to be performed which may disturb such references, the same shall be done only after these are transferred to other suitable locations under the direction of the Purchaser/Consultant. The Contractor shall provide all necessary materials and assistance for such relocation of reference points, etc.

### **32. Work & Safety Regulations**

Refer Technical Specification and also Annexure-XVIII of this Volume- IB, Draft Contract.

### **33. Electrical Safety Regulations**

Refer Technical Specification and also Annexure-XVIII of this Volume -IB, Draft Contract.

### **34. Electrical Safety Regulations**

Refer Section-7 of this Volume-IB, Draft Contract.

### **35. Purchaser's Instructions**

The Purchaser/Consultant may, in his absolute discretion, from time to time, issue further drawings and/or written instructions, details, directions and explanations, which are collectively referred to as "Purchaser's Instructions", in regard to:

1. Any additional drawings and explanations to exhibit or illustrate details.
2. The variation or modification of the design, quality or quantity of work or the additions or omission or substitution of any work.

3. Any discrepancy in the drawings or between the Schedule of Quantities and/or specification.
4. The removal from the site of any materials brought thereon by the Contractor and the substitution of other materials thereof.
5. The removal and/or re-execution of any work executed by the Contractor.
6. The dismissal from the work of any persons employed thereupon.
7. The opening up for inspection of any work covered up.
8. The amending and making good of any defects.
9. The Contractor shall comply with and duly execute any work covered in such 'Purchaser's Instructions' provided always that verbal instructions, directions, and explanations given to the Contractor or his foreman upon the work by the Purchaser/Consultant shall, if involving a variation, be confirmed in writing by the Purchaser/Consultant within 7 (seven) days.
10. If compliance with the 'Purchaser's Instructions' as aforesaid involves work and scope beyond that contemplated by the 'Contract', unless the same were issued owing to some breach of this 'Contract' by the Contractor, the Purchaser shall pay to the Contractor the price of the said work as hereinafter provided.
11. If the Contractor after receipt of written notice from the Purchaser/Consultant requiring compliance, with such further drawings and/or 'Purchaser's Instructions' fails to comply with the same within 15 (fifteen) days the Purchaser may employ and pay other agencies to execute any such work whatsoever, as may be necessary to give effect thereto, and all costs incurred in connections therewith shall be recoverable from the Contractor by the Purchaser on a certificate by the Consultant as a debt or may be deducted by the Purchaser from any money that may become due to the Contractor.

## **36. Rights Of The Purchaser/Consultant**

### **36.1 Right to Illustrate and Explain Plans**

36.1.1 The various parts of the 'Contract' are intended to be complementary to each other but should any discrepancy appear or any misunderstanding arise as to the import of anything contained therein, the explanation of the Purchaser/Consultant shall be final and binding.

36.1.2 The correction of any errors or omissions of the Drawings and Specifications may be made by the Purchaser / Consultant, when such correction is necessary to bring out clearly

the intention which is indicated by the reasonable interpretation of the Drawings and Specifications as a whole.

36.1.3 Whenever in the Specifications or on the Drawings which are a part of the 'Contract' or which may be furnished to the Contractor for directing this work, the terms and descriptions of various qualities of workmanship, material, structures, processes, plant or other features of the 'Contract' are described in general terms, the meaning or fulfillment of which must depend upon individual Judgement, then in all such cases the question of fulfillment of such specifications or requirements shall be decided by the Purchaser / Consultant and said material shall be furnished, said work shall be done, and said structure, process, plant or feature shall be constructed, furnished or carried on in full and complete accordance with his interpretation of the same and to his full satisfaction and approval, provided such interpretation is not in direct conflict with the Drawings and Specifications and generally accepted good engineering practice.

36.1.4 Details shown either on the Drawings or in the Specifications shall be done and furnished as if shown in both except where expressly except either in the Specifications or on the Drawings. Figured dimensions shall in all cases be taken in preference to scale measurements and detailed drawings consistent with general drawings shall be taken in preference to the general drawings of the same part of the work.

36.1.5 The Purchaser / Consultant may, from time to time, prepare for his own use estimates of quantities or bills of materials required for the work. Copies of such estimates or bills of materials which may be given to the Contractor for his convenience, or any lists, weights or quantities of materials or structures which may appear on the drawings may not be considered as finally correct, sufficiently complete or accurately covering any portion or all of the work to be done under

the 'Contract'. Such bills or estimates may be carefully assembled and prepared but their accuracy is not guaranteed. They may not be accurate as to any particular details and are given only as the best information available at the time of issue of the information. It is understood that any such lists or estimates are furnished to the Contractor for his convenience only and not as lists or estimates of work to be done, and many necessary items of work might have been omitted.

36.1.6. Additional drawings and explanations to exhibit or illustrate details may be provided by the Purchaser / Consultant whenever necessary and if so provided, and if consistent with the Drawings and Specifications, it shall be binding upon the Contractor to take cognizance of the same. The written decision of the Purchaser / Consultant as to the true construction and meaning of the Drawings and Specifications and of such additional drawings and explanations shall be binding upon the Contractor.

## 36.2. Right to Direct Work

36.2.1. The Purchaser / Consultant shall have the right to direct the manner in which all work under this Contract shall be conducted, in so far as it may be necessary to secure the safe and proper progress and the specified quality of the work, and all work shall be done and all material shall be furnished to the satisfaction and approval of the Purchaser / Consultant.

36.2.2. Whenever, in the opinion of the Purchaser / Consultant, the Contractor has made marked departures from the schedule of completion laid down in the Contract or when untoward circumstances force a departure from the said schedule, the Purchaser / Consultant, in order to assure the compliance with the schedule and the provisions of the 'Contract', shall direct the order, pace and method of conducting the work, which shall be adhered to by the Contractor.

36.2.3. If, in the Judgement of the Purchaser / Consultant, it becomes necessary at any time to accelerate the overall plant erection work, the Contractor, when ordered and directed by the Purchaser / Consultant, shall cease work at any particular point and transfer his men to such other point or points, and execute such portion of his work, as may be required, to enable others to hasten and properly engage and carry on their work, all as directed by the Purchaser / Consultant.

36.2.4. Night work will be permitted only with prior approval of the Purchaser / Consultant. The Purchaser / Consultant may also direct the Contractor to operate extra shifts over and above normal day shift for the completion of 'Contract' on schedule if, in his opinion, such work is required.

### 36.3. Right to Order Modifications of Methods and Equipment

36.3.1. If at any time the Contractor's methods, materials or equipment appear to the Purchaser / Consultant to be unsafe, inefficient or inadequate for securing the safety of the workmen or the public, the quality of work or the rate of progress required, he may order the Contractor to ensure their safety and increase their efficiency and adequacy, and the Contractor shall promptly comply with such orders. If at any time, the Contractor's working force and equipment are in the opinion of the Purchaser / Consultant, inadequate for securing the necessary progress, as herein stipulated, the Contractor shall, if so directed, increase the working force and equipment to such an extent as to give reasonable assurance of compliance with the schedule of completion. The absence of such demands from the Purchaser / Consultant shall not relieve the Contractor of his obligations to secure the quality, the safe conducting of the work, and the rate of progress required by the Contract, and the Contractor alone shall be and remain liable and responsible for the safety, efficiency and adequacy of his methods, materials, working force and equipment, irrespective of whether or not he makes any change as a result of any order or orders received from the Purchaser/ Consultant.

### 36.4. Right to Perform

36.4.1. The Purchaser reserves the right to perform or have performed in and about the works during the time when the Contractor is performing his work hereunder, such other work as the Purchaser desires, and the Contractor shall make all reasonable effort to perform his work hereunder in such a manner as will enable such other work to be performed without hindrance and shall make no claim for damage against the Purchaser arising out of such other work to be performed against hindrance and shall make no claim for damage against the Purchaser arising out of such other work or interference there from. The Contractor shall work in harmony with such other Contractor's regardless of race, religion, colour or national origin and any dispute between Contractors shall be arbitrated by the Purchaser / Consultant.

### **37. Measurement of Work And Progress Payments**

37.1. The Purchaser / Consultant may, from time to time, intimate the Contractor that he requires the works to be measured and the Contractor shall attend or send a qualified agent to assist the Purchaser / Consultant or its representative in taking such measurements and calculations and to furnish all particulars as may be required.

37.2. Where the erection of equipment, vessels and structural steel is involved, the basis of such measurements and progress evaluation shall be weights specified in the shipping documents or invoices or drawings as decided by the Purchaser / Consultant. Should the Contractor not attend or neglect or omit to send such agents, then the measurement taken by the Purchaser / Consultant or approved by him shall be taken to be the correct measurements of the work. The Contractor or its Agent may, at the time of measurement, take such notes of measurements as it may deem fit.

37.3. When measurements are effected by conditions already established, the Contractor shall take field measurements notwithstanding scale or dimensions shown on the drawings.

37.4. The measurements so taken and certified correct by the Purchaser / Consultant shall be the basis for the progress payment to the Contractor. Where the break-up of 'Contract on unit basis Price' is difficult to arrive at, the Purchaser / Consultant and the Contractor shall work out at the commencement of the 'Contract', the weightages or the cost or the cost break-ups to arrive at a mutually agreeable basis for computation of the progress estimates.

37.5. To the value so arrived at on the basis of the Contractor's monthly progress evaluated, shall be added the amounts earned by the Contractor under supplemental Contracts and orders if any, till date of the progress estimate. From the total thus computed, all previous payments plus any amounts due to the Purchaser in accordance with the terms of this Contract shall be deducted. The remainder shall be paid by the Purchaser to the Contractor under Interim Certificates from the Consultant.

37.6. In case work is nearly suspended or in case only unimportant progress is being made, or in case it is apparent that Contractor is about to forfeit his 'Contract' or that the money yet



due to him shall not complete his 'Contract', the Purchaser may at his discretion withhold any payment which may be due to the Contractor.

37.7. The Purchaser may withhold part or whole of any payment for erection claimed by the Contractor, which in opinion of the Purchaser, is necessary to protect himself from loss on account of :

- a) Defective work not remedied or guarantees not met.
- b) Claims filed against the Contractor.
- c) Failure of the Contractor to make due payment for materials supplied or labour employed by him.
- d) Damage to other Contractor's Purchaser's or Other's property.
- e) Failure to meet the mutually agreed schedules.
- f) When the grounds for withholding payments are removed, payments of the amount due to the Contractor shall be made by the Purchaser within a reasonable period.
- g) The Contractor shall not demand nor be entitled to receive payment for the work of portion thereof, except in the manner set forth in this 'Contract' and only after the Purchaser / Consultant shall have given a certificate for such payment.

### **38. Adherence to Manufacturer's Instruction**

Adherence to instructions of the Manufacturer's supervisory Consultants, is compulsory. The Contractor shall work under the guidance of the Manufacturer's supervisors to ensure that erection procedures adopted by the Contractor as well as completed erection of equipment is such as not to interfere with or prevent equipment from functioning as intended, as well as to the entire satisfaction of the Manufacturer's supervisor / Purchaser / Consultant. The Contractor shall also permit and provide all facilities for the Manufacturer's erection supervisors to carry out all checks that they may wish to, and approve any erection procedure and/or final setting and alignment of components, in order to satisfy themselves that erection has not been carried out as intended by them. This shall, however, in no way relieve the Contractor of his responsibility for providing adequate and competent supervision and quality workmanship.

### **39. Modifications**

The Contractor shall carry out all modifications at site as directed by the Purchaser / Consultant to complete the work covered in the Contract. It is the responsibility of the Contractor to get the prior approval for such modifications from the Purchaser / Consultant before such works are taken up. The Contractor shall also get the estimates and the actual time sheets certified by the Purchaser/Consultant, and these certified time sheets will be the basis for pro-

cessing his bills for such modification works which are required to be carried out for no fault of the Contractor.

#### **40. Defective Work**

If the work or any portion thereof shall be damaged in any way excepting by the acts of the Purchaser or if defects not readily detected by prior inspection shall develop before the final completion and acceptance of the whole work, the Contractor shall forthwith make good, without compensation, such damage or defects in a manner satisfactorily to the Purchaser / Consultant. In no case shall defective or imperfect work be retained.

#### **41. Work of Others**

If any part of the Contractor's work depends, for proper execution, upon the work of any other Contractor, the Contractor shall inspect and promptly report in writing to the Purchaser / Consultant any defect in such work of other Contractors that render it unsuitable for proper execution of the work under the Contract. His failure to so inspect and report shall constitute an acceptance of the other Contractor's work as fit and proper for the reception of his work, except as to defects which may develop in the work of other Contractors after the proper execution of the work. To ensure proper execution of his subsequent work, the Contractor shall inspect work already in place and shall at once report to the Purchaser / Consultant any discrepancy between the executed work and the drawings.

This clause comes into effect only in the case of interferences between the Contractor and Purchaser's other Contractors. In such a case the Purchaser / Consultant will discuss with all the parties concerned to reach a consensus in the overall interest of the Project.

### **GENERAL CONDITIONS FOR CIVIL WORKS**

1. The Contractor shall make its own arrangement for all labour, construction equipment, tools and tackles and construction materials. All temporary approach roads to the site for carrying out construction work shall be constructed and maintained by the Contractor at its own cost.
2. The Contractor shall take all necessary precautions to avoid damage to any property of the Purchaser or any third party. The Contractor shall also ensure that the progress of work of other Contractors in the adjoining areas is not hindered.
3. The Contractor shall take all precautions during execution, especially while excavating to avoid interference with or, damage to underground works, such as cables, pipe lines, drains etc. and provide all possible protection to these works and in case they are damaged, rebuild/divert them at his own cost.

4. The Contractor shall carry out necessary precision survey to set out and check the setting of all works including foundation & anchor bolts etc. to required tolerances using the grid reference points available in the plant site. The Contractor shall make and maintain proper bench mark and reference points and check lines and levels periodically.
5. Materials brought to the site shall not be removed from the site without the written consent of the Purchaser. The Contractor shall submit well in advance for approval, all samples and specimens as the Purchaser may demand from time to time. Any material brought to site and rejected by the Purchaser shall be removed by the Contractor from the site of work immediately within the time limit specified by the Purchaser. In case, a Contractor is not removing the rejected materials, the same will be removed by the Purchaser and cost there for shall be recovered from the bills of the Contractor.
6. The Purchaser may during the progress of work, order the removal of part or whole of the work executed, found not in accordance with the approved drawings/ specifications/ written instructions. No extra claims shall be entertained for removal & re-execution of such work.
7. No work shall be covered up or put out of view without the approval of the Purchaser. In the event of failing to do so, the Contractor shall uncover any part of the work or make openings in or through the works as the Purchaser may direct and they shall be made good with materials approved by the Purchaser and should match with workmanship of the surrounding work.
8. The Contractor shall dismantle and remove the stagings and other temporary facilities like stores, offices, etc. on completion of work, clear and clean the site where such temporary facilities were built and restore the same to original condition at his own cost.
9. The Contractor shall provide all necessary storage. At the site in specified areas for all materials such as timber, cement, lime and such other materials which are likely to deteriorate by the action of sun, winds, rain, coastal conditions or other natural cause due to exposure in the open in such manner that all such materials shall be duly -protected from damage by weather or any other cause. All such stores shall be cleared away and the whole site left in good order on completion of the contract. All materials, shall be stacked in such a manner as to facilitate rapid and easy checking of such materials. The Contractor will not be permitted to store any of his material in the buildings under construction or already constructed by him without prior approval of the Purchaser.

10. After completion of work, the Contractor shall carry out micro-levelling of the site within battery limit ensuring proper grades and slopes to achieve efficient drainage of the site. The Contractor shall remove all debris, surplus earth etc. and dump the same at places/place as directed by the Purchaser within a distance of 25 km from the site.
11. The Contractor shall be held responsible for proper performance for buildings and structures including all other civil work during the guarantee period. Any defect found during this period will be made good by the Contractor at his own cost failing which the Purchaser reserves the right to take remedial measures at the Contractor's risk and cost.
12. All excavated materials shall remain the property of the Purchaser. In case the Contractor wishes to utilise the boulders excavated by him during the excavation work at the site, the same may be issued to him at prevailing rates on cost recovery basis. Percentage of voids on stack measurement shall be mutually agreed. Contractor shall have to account for all excavated hard rock.
13. In respect of any portion of works which is to be embedded or covered up by other works, the Contractor shall submit them to Purchaser for technical inspection and have the necessary clearance certificates duly signed by the Purchaser and Contractor before letting such portion to be embedded or covered.
14. Wherever works are to be carried out in proximity or within existing facilities, contractor may have to adopt special methodology of construction suited to prevailing conditions. He shall make necessary schemes in advance and finalise the same with the approval of the Purchaser/Consultant.
15. On progressive completion of work, the Contractor shall submit to the Purchaser the following documents for the passing of the work:
  - a) Certificate on control checking.
  - b) A copy of each of the concerned working drawings showing thereon all approved additions and alterations, if any, in the process of execution.
  - c) Clearance certificates for embedded/covered up works.
  - d) Manufacturer's certificates, guarantees and test certificates, as relevant.
16. The Contractor shall carry out structural load check with structure test, ultrasonic test for foundation & pedestal at locations specified by the Purchaser in ac-

cordance with the agreed QAP on any part of the building/structure at its own cost if so directed by the Purchaser.

17. As the works under the contract are to be carried out within the protected area, the Contractor shall abide by all the security regulations promulgated from time to time by the Purchaser/other concerned authorities.

18. Blasting with explosives or other means is not allowed at site. If required it shall be done with prior approval of Purchaser without any extra cost.

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# **COAL LIGNITE URJA VIKAS PRIVATE LIMITED**

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## **Domestic Competitive Bidding (DCB)**

**Tender No.: CLUVPL/ PMC/ SECL/ 01**

**TENDER DOCUMENT**

**FOR**

**Setting up of 40MW (AC) Ground Mounted Grid Connected Solar PV  
Power Project for SECL at Bishrampur & Bhatgaon in Surajpur District,  
Chhattisgarh State under EPC mode and 10 years O & M.**

**VOLUME – II**

**TECHNICAL SPECIFICATION**

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## SECTION 1.0 INTRODUCTION

### 1.1. BRIEF DETAILS:

This technical specification is for Setting up of 40MW (AC) Ground Mounted & Grid Connected Solar PV Power Projects (SPP) at Bishrampur&Bhatgaon in Surajpur District, Chhattisgarh State under EPC mode. The Project Site Location Maps are furnished in Section 27 - Attachments.

### 1.2. SCOPE OF WORK:

The scope of work includes Design, Engineering, Site development, Manufacture, Inspection at supplier's works, Supply, Insurance, Transport, Storage, Erection, Testing & Commissioning and Provisional take over of total capacity of 40 MW(AC) SPP along with power evacuation system at 33KV voltage level up to and including new 33KV bay extension works at the designated SECL's Substations near each location.

**1.2.1.** The scope also includes Ten years Operation and Maintenance (O&M) of the solar PV plant, transmission lines, UG cables and 33KV bay extensions at designated SECL's substation near each location, one year Warranty period and Performance Guarantee Test.

**1.2.2.** The detailed scope of work covers the following activities and services in respect of all the equipment & works specified and covered under the specifications.

**1.2.3. Details of Scope:** All equipment, materials and services whether explicitly stated or otherwise and that are necessary for the satisfactory operation of the Solar PV system and its integration as described in the specification shall be deemed to be included in the scope of work of the Contractor and shall not be limited to the following:

- i) Site preparation like vegetation cleaning, soil grading, filling and leveling (if applicable) of the identified area.
- ii) Conducting Topographical survey, Geo-Technical investigation and Soil Resistivity test in all the site locations.
- iii) Detailed design and Engineering of all the equipment and equipment system(s) including civil works.
- iv) Submitting the engineering drawings, data sheets, process calculations, test certificates and reports, structural design calculations, Equipment layout, Civil structural/architectural Drawings, for Review and approval by CLUVPL/SECL.
- v) Submitting the Performance Guarantee Test procedure, Operation & Maintenance/ instruction manuals, As-built drawings and other information.
- vi) Finalization of sub-vendors, manufacturing quality plans and Field quality plans.
- vii) Packing and transportation from the manufacturer's works to the site including customs clearance & port clearance, port charges, (if any).



- viii) Receipt, storage, preservation and conservation of equipment at the site.
- ix) Fabrication, pre-assembly, (if any), erection, testing, pre-commissioning and commissioning and putting into satisfactory operation all the equipment including successful completion of initial operation
- x) Arrangement of construction facilities including Water and construction power supply for each location.
- xi) Supply, erection and commissioning of Transmission system from solar plant till Designated SECL's Substation including HT bay and bus extension, as applicable.
- xii) Works related to filing of petitions (if any) and appearing for the petitions on behalf of SECL before Hon'ble Regulatory Commission/Court pertaining to the Project shall be carried out by the Contractor.
- xiii) Successful completion of Performance Guarantee Test (90 days) after provisional take-over of the plant and within the First year.
- xiv) The Contractor shall carry out the activities related to approval from Electricity authorities for connectivity for the project under captive use.
- xv) Obtaining necessary approvals, permits, clearances, etc., including land usage (if any from Central/State Government authorities), banking and wheeling, scheduling of power, grid connectivity required for injection of solar power, provision of necessary infrastructure at metering & drawal points during the execution of project shall be the responsibility of Contractor.
- xvi) Settlement of any disputes with public/statutory bodies / local authorities state authorities etc. shall rest with Contractor in all the matters related to the project.

**1.3. NET ENERGY EXPORT TARGET (NEET) VALUES:**

A minimum DC/AC Ratio of 1:1 at each inverter level shall be maintained.

The total capacity of 40 MW(AC) SPP at Bishrampur and Bhatgaon sites shall be designed to deliver the cumulative minimum Annual Net Energy Export Target value as indicated below using the Average GHI values derived from GHI values (Meteonorm) of all the sites. The Joint Meter Readings measured at the metering points at respective SECL Sub Stations shall be the performance monitoring parameter for each site. The NEET Values of each site shall be subjected to corrections with respect to the GHI measured at each site as specified in Section 24 for evaluation of performance of each site.

TABLE-1: Cumulative minimum Annual Net Energy Export Target values as per design for all the sites using average GHI values of Meteonorm

Year	Annual NEET in MU
1 <sup>st</sup> Year**	65.00

2 <sup>nd</sup> year	64.01
3rd Year	63.57
4th Year	63.12
5th Year	62.68
6th Year	62.24
7th Year	61.80
8th Year	61.37
9th Year	60.94
10th Year	60.52

**\*\* Note: First Year warranty period O & M** shall start from the Provisional Take Over of 40 MW Solar Power Plants (SPP). The Contractor shall carry out O&M activities to achieve the above Annual Net Energy Export Target Values corrected with actual measured GHI values in the 10 years O&M period.

PG Test shall be for a period of three months and shall be completed successfully within the first year. PG test for individual Locations at Bhatgaon (20MW AC), Gorakhnathpur (10MW AC) and Shivnandanpur (10MW AC) shall be conducted concurrently / individually.

#### **1.4. POWER EVACUATION & CONNECTIVITY WITH THE GRID**

- 1.4.1.** The project is envisaged under captive scheme using the existing infrastructure of designated SECL 33KV/11KV SS in various locations in Bishrampur and Bhatgaon for solar power evacuation.
- 1.4.2.** Depending on the approval obtained from the Electricity Authorities, the Electrical SLD shall be finalized by the Contractor and submitted for approval from CLUVPL during detailed Engineering.
- 1.4.3.** If any additional infrastructure of dedicated transmission lines and Sub Station is required and insisted by CSPTCL/CSPDCL/Electricity authorities for power evacuation during connectivity approval, the same shall be completed by the Contractor within the agreed project time schedule. Separate price schedule is included in the NIT for this scope of work to develop additional power evacuation infrastructure of dedicated

transmission lines and Sub Station and this price schedule will be operated, if such additional infrastructure is developed by the Contractor.

- 1.4.4.** No project delay is acceptable on the account of delay in obtaining approval and developing additional infrastructure by the Contractor.
- 1.4.5.** Metering point for measuring the net energy export to meet the contractual obligations shall be as per the approval of the electricity authorities.
- 1.4.6. Power Evacuation for BISHRAMPUR sites:** The generated Solar Power from both the locations of Goraknathpur and Shivnandanpur shall be evacuated through the nearby designated SECL's 33KV substation respectively. The contractor shall erect adequate capacity Transmission lines/ UG cables to evacuate the power from each site to the designated SECL's substation. Connectivity approval in this regard shall be obtained by the contractor from CSPDCL/ Electricity authorities for interconnection of each 10 MW/20 MW Solar PV power plant. Approval if any required for Long Term Open Access (LTOA) agreement with banking facility for captive use of SECL connected Sub Station loads shall be arranged by the Contractor for export of power from the solar PV power plant to the designated delivery points of SECL.
- 1.4.7. Power Evacuation for BHATGAON sites:** Since both the sites at Bhatgaon are in contiguous, the generated Solar Power from both the sites of Bhatgaon-I and Bhatgaon-II shall be combined and evacuated through the nearby SECL 33KV substation. The Contractor shall erect adequate capacity Transmission lines/ UG cables to evacuate the power to designated SECL's Substation. Connectivity approval shall be obtained from CSPDCL/Electricity Authorities for interconnection of 20MW (AC) Solar PV power plant. Long Term Open Access(LTOA) agreement with banking facility shall be arranged by the Contractor for export of power from solar PV power plant to the designated delivery points of SECL at Bhatgaon.

**1.5. TIME SCHEDULE OF THE PROJECT**

Time schedule for commissioning of all the Solar Power Projectsshall be 9 months and provisional take over of 40 MW Solar Power Projects is 12 months from the date of LoA as defined in the Commercial Volume.

**1.6. GENERAL CONDITIONS**

- 1.6.1.** The entire work shall be executed on lump sum turnkey basis under "Engineering Procurement and Construction" (EPC) mode by the successful bidder herein after referred as Contractor. Any item(s) not included in the specification / schedule but required for completion of the work shall have to be carried out/supplied without any extra cost. Such works, not listed in the schedule of works but elaborately described to perform or to facilitate particular operation(s) required for completion of the project shall be deemed to have been included in the scope of this work and the Contractor shall supply, install the same without any extra cost to the SECL.



- 1.6.2.** The work shall be executed in conformity with the relevant standards of Bureau of Indian standards (or equivalent International Standard), Indian Electricity Rules, 1956 (as amended up to date), Indian Electricity Act 2003(as amended up to date), BARC/DAE Rules, Explosive Act 1948, Petroleum Act 1934, National Building Code and relevant Rules in vogue at the time of execution including operation & maintenance period.
- 1.6.3.** The Contractor shall comply with all applicable laws or ordinances, codes, approved standards, rules, and regulations and shall obtain all necessary permits, approvals, licenses, clearances required from Central, State Governments and local bodies etc. for setting up and operating the Project including connectivity (and land registration as applicable) shall be in the scope of the Contractor.
- 1.6.4.** All sub systems / components shall conform to the relevant international and national standards for electrical safety besides that for Quality required for ensuring Expected service life and Weather resistance.
- 1.6.5.** This specifications document is not exhaustive and the Contractor shall be responsible not only for the requirements specified herein but for the correct choice of materials, for proper fabrication and for the conformity to codes, regulations and legal requirements and for supplying all the documentation of these materials.
- 1.6.6.** Any preparatory works of the site for meeting the requirement of the bid is under the scope of the Contractor. Arrangements, if any, for all the other infrastructure requirements for installing the solar Projects including the power evacuation scheme shall be made by the Contractor. Preparation of the lands required for Construction Storage, fabrication, labour colony etc. are to be arranged by the Contractor. All support infrastructure for the above shall form part of the offer and no separate amount shall be payable on this account. Necessary Security arrangements against thefts and pilferages shall be made by Contractor during entire contract period till the completion of O&M period.
- 1.6.7.** The Contractor shall provide a latest rigid insulated portable Container Office Cabin of size not less than 20'x8'x8.5' with door & windows at suitable location of each site to carry out and monitor the progress of site activities, conduct review meetings, study of drawings etc. The cabin shall be furnished with all necessary provisions including Project In charge office (with Executive table, executive chair, 4 visitor chairs, one desktop PC (latest configuration & laser printer), 2 Sets of Working Table Provisions each with a desktop PC (latest configuration) & one laser printer, a revolving chair & 2 visitors chairs. Further, the Cabin shall be complete with 3 Filing cabinets, Split ACs of suitable Capacities, wall mounting fans, LED electrical fittings with wiring, water dispenser etc. In addition, Temporary Hygienic Wash room facilities in sufficient numbers shall also be provided. All running and maintenance charges including charges for energy and consumables required for smooth functioning of the Container Office Cabin and the Washrooms shall be on the account of the Contractor. After the provisional takeover of the project by SECL and after the permanent Office rooms at site buildings are ready, the Contractor shall take back this container at his possession and shall hand over to SECL



the 3 Personal Computers with the Data stored during the Erection and Commissioning, the 2 Printers and the 3 Filing Cabinets with the hard copy drawings and documents.





## SECTION 2.0 DESIGN BASIS

### 2.1. SALIENT POINTS

- 2.1.1.** The General design of the Solar Power Project (SPP) is briefed below for basic compliance. However, detailed respective technical specification of individual Equipment and Systems as per relevant chapters shall be applicable.
- 2.1.2.** Ground mounted and Grid Interactive Solar Power Project shall be designed to meet the Annual Net Energy Export Target in line with the Tender Requirement with the capability to supply dynamically varying reactive power support, so as to maintain power factor in the range of 0.95 Lag to 0.95 Lead and exports net energy at the SECL Sub Stations for the entire period of the contract. The peak of capacity shall not exceed the rated capacity to ensure compliance with grid requirement.
- 2.1.3.** The Contractor shall design the Solar Power Station in order to demonstrate the Net Energy Export at the SECL Sub Stations in line with the Tender Requirement with the corrections considered as below during the PG period and the entire O&M period commencing from PAC.
- 2.1.4.** The performance of the Solar Power Project shall be assessed with Corrections proportional to the actual Global Horizontal Irradiance values and Off take constraints like CSPDCL /CSPTCL Transmission System unavailability, Grid unavailability and Back down that are not attributable to the Contractor and shall be considered as specified in **Section 24** of this specification. The Contractor shall not appeal to consider the module degradation due to any delay in any of the project activities and it is the responsibility of the Contractor to strictly adhere to the Time Schedule.
- 2.2. PV MODULES:** The solar PV Modules to be used in the project shall be of Mono/Poly/PERC Silicon Crystalline technology with the basic design of Flat Plate Construction, Mono Facial/Bi Facial and terrestrial mounted type. Capacity Rating of individual module should not be less than 340 Wp for Poly Mono Facial Modules and 380 Wp for the other technology modules (Bi-faciality Factor shall be minimum 0.7 for Bifacial Modules) (under Standard Test Conditions), with only positive tolerance, having minimum 72 cells with minimum 5BB, maximum system voltage of 1500 V.
- 2.3. PV ARRAY:** The Solar Module Arrays layout shall be designed for Fixed Tilt configuration, for optimal usage of space, material and labour complete with access roads, proper lighting etc. and shall be free from shadows. The arrays shall be Protected from Lightning strikes and provided with CCTV monitoring systems to avoid theft of materials. The arrays in each location shall preferably be laid in optimal Capacity (AC) Blocks.
- 2.3.1.** Optional Provision of tracking of Solar PV Modules, for the entire or partial Capacity and its associated auxiliary power feeding arrangements is left to the design of the Contractor, without additional requirement of land and cost.

- 2.3.2.** The solar PV modules of same type and rating shall be maintained at each inverter level so as to minimize the mismatch loss. Contractor should design the array yard such that module mismatch loss should be less than 1 % of system DC capacity.
- 2.3.3.** The type and rating of solar PV modules at the respective inverter level will be finalized during detailed engineering.
- 2.3.4.** Contractor shall carefully design and accommodate in the available land the requisite number of modules to achieve the Net Energy Export Target at the SECL Sub Stations in line with the Tender Requirement.
- 2.3.5.** Array tables shall be arranged in such a way to facilitate cleaning of the modules by an appropriate Wet/Dry Cleaning System. The inter row distance between solar PV arrays shall be sufficient for easy movement of men / materials for panel cleaning, maintenance works, etc.
- 2.3.6.** The Layout of the PV array area of the plant shall be designed in such a way with sufficient space reserved for future repowering of the project at Inverter level. The layout considering the future repowering will be finalized during detailed engineering.
- 2.4. INVERTERS:** The DC power generated in the photo voltaic arrays shall be fed through String Combiner & Monitoring Units and then fed to Indoor (Minimum IP2X)/Outdoor (Minimum IP65)/ Containerized (Minimum IP54) Type Central Inverter Units to suit system requirements and rated for UPF at an ambient of 50<sup>0</sup> C at the rated Nominal AC voltage and designed with capability to supply dynamically varying reactive power support, so as to maintain power factor in the range of 0.95 Lag to 0.95 Lead. The inverters transform the DC power to 3 phase AC, 50Hz of suitable voltage.
- 2.5. INVERTER DUTY TRANSFORMERS (IDT):** AC power from the inverter output side shall be taken to the Inverter duty Power Transformer rated as per system requirement and to match the Total Solar Power Plant Capacity at UPF. Multi winding (up to 5) Transformers are also accepted. The IDTs shall be located optimally near the Inverter and the HT Switchgear. The high voltage side of the transformers shall be minimum 33 KV and connected to HT Switchgear. The IDTs shall be effectively designed with minimum core and copper losses, with liberal use of active materials namely core and copper. The design shall also feature use of such techniques and other methods to minimize stray losses.
- 2.6. POWER CABLING / OH TRANSMISSION LINE:** Power Cabling size selection and methods of laying shall be adopted in such a way to maximize the quantum of power exported. The losses shall be kept to the bare minimum, by adopting high efficiency design of Power cables and cabling for collection & transmission of both DC and AC Power. Over Head Transmission Lines from Power Collection Substation (**PCSS**) to Power Export Substation (**PESS**) also shall be allowed. The Contractor shall Design OH transmission System in such a way to avoid shadows falling on PV Module array and submit Route Layout and Design Documents for approval of CLUVPL during detailed Engineering.



**2.7. POWER COLLECTION SUB STATION (PCSS):** PCSS is the Sub Station for collecting power from the IDT at a minimum HT voltage of 33KV and to transfer it to PESS. It shall be located in a suitable location and shall comprise of one incoming and one Outgoing (ICOG) indoor/PCOB type HT Switchgear with suitable control, Protection and metering.

The PCSS Building/Pre-Engineered Building (PEB), shall be as specified in "Civil works and Structural Steel works" Section. It shall accommodate Indoor HT Switchgear ICOG Panels/C&R panels, Indoor Inverters, Equipment for SCADA, Auxiliary DC and AC (UPS) control power equipment, communication system, fire alarm panel and Wash rooms etc. as applicable and in line with system requirements.

**2.8. POWER EXPORT SUB STATION (PESS):** PESS is the HT Sub Station to combine the AC power from all PCSS and to export the Power to the SECL Sub Stations for captive use. It shall be located in a suitable location and shall comprise of necessary numbers of incoming, Outgoing (including one Auxiliary supply feeder) indoor / PCOB HT switchgears as per system requirement, all with suitable control, protection and metering. The Auxiliary Power Supply System for PESS shall have another source from one of the windings of the nearest installed IDT with suitably rated Auxiliary transformer.

In the PESS Building, in addition to the HT Switch gear Panels, C&R Panels for PCOB type Switchgears as applicable, Equipment for SCADA, Operator Work Stations, Auxiliary DC and AC (UPS) control power equipment, communication system, fire alarm panel, Office, Stores, Pantry and Wash rooms etc. shall be installed in line with system requirements.

Option to combine the PCSS and PESS at each 10 MW/ 20 MW Solar Power Project and exporting the power to respective SECL Sub- Stations for captive use shall be allowed and the arrangement shall be finalized during detailed engineering.

**2.9. SCADA SYSTEM:** With inputs from measuring devices incorporated in the equipment installed in Solar Power Plant, the performance of the total Power Project shall be Monitored continuously by the SCADA system in each site and the critical equipment as specified shall be operated in each site from the SCADA system Operator Work Stations.

**2.10. OTHER POINTS:** The design of the system shall aim for a fully automated Power Project requiring minimum operator intervention, with daily automatic startup and shutdowns, optimized power generation features, grid monitored safety functions, data management, remote function capabilities and appropriate Module Cleaning Systems.

**2.10.1.** Design basis report (including Project details, PV Syst Reports, Shadow analysis, Performance Ratio Estimation etc.), Soil test reports, Earth Resistance Test Reports, Power Evacuation Scheme up to the SECL Sub Stations etc., shall be submitted by the Contractor during detailed engineering for verification.

**2.10.2.** The Design of the SPP shall be done with PV Syst software Version 7 or above (herein after referred as PV Syst).

**2.10.3.** Workmanship and finish shall be in accordance with the best and latest engineering practices. All materials used for the manufacture of equipment by the Contractor or his



sub-suppliers or sub-vendors and the workmanship shall be of good quality and acceptable, as per Indian Standards or other relevant International standards.

- 2.11. ELECTRICAL SYSTEM PARAMETERS:** The following power system parameters for designing the power distribution system shall be followed by the Contractor. All parameters designed shall be as per the requirements of respective standards and Central Electricity Authorities.

**POWER SYSTEM PARAMETERS FOR DESIGN OF EQUIPMENT**

System Parameters	Auxiliary LT System	Power Collection System
Nominal system voltage (KV)	0.440	33
Highest system voltage (KV)	0.484	36
System frequency (Hz)	50	50
System Earthing	Earthed	Earthed
Fault level (3 phase Symmetrical) MVA	36	1500
Short time current rating in KA (For Bus & Breakers)	50	25 KA for 3 Sec
Short time current rating in KA (For Other Equipment)	As specified in respective section.	
Power frequency withstand voltage (KV)	1.1	70
Impulse withstand voltage (KV)	2.5	170
Number of Phases	3	3

**2.12. SITE CONDITIONS**

Following design conditions applicable for the project site shall be furnished in Design basis Document during detailed Engineering:

- 1) Mean annual rainfall in mm.
- 2) Maximum wind speed as per Latest BIS 875 Part III
- 3) Seismic condition of site defined in BIS: 1893
- 4) Maximum Ambient temperature in degree C.
- 5) Maximum Relative humidity in%
- 6) Wind loads for outdoor structures shall be as per Latest BIS 875 Part III.  
(Basic wind speed and diagonal wind loads as applicable need to be considered in the design of outdoor structures)
- 7) Barometric pressure in mbar

**2.13. DETAILED ENGINEERING AND DRAWINGS.**

The detailed Engineering and Review of Drawings will be carried out by CLUVPL. The Contractor shall submit the Master Drawing List (MDL) within 15 days from the date of

issue of LOA by SECL. Categorization of the Drawings according to the priority for approval in line with the Project Time Schedule shall be done by assigning Target Date of first Submission. On approval of MDL, the Soft copy of individual Drawings / Design Calculations / Vendor Documents etc. prepared to meet the requirements of Specifications, safety and statutory regulations of the relevant authority, shall be uploaded, giving priority to the critical System Drawings to the Central Contracts Management System (CCMS) Portal of CLUVPL as applicable, for which access will be given by CLUVPL. Further, Hard Copies of the Drawing/ Documents for each revision shall be handed over to CLUVPL Engineering Department (one copy) and for CLUVPL Site Engineer (one copy). CLUVPL Engineering Department will review the Drawings /Documents and approve /approve with notes/return with comments for the submitted drawings /documents. The hard copies submission shall be followed till the Drawing/ Document is getting approved by the CLUVPL Engineering Department. After approval of each Drawing/ Document, within one week, 6 Hard Copies shall be submitted for Stamping by CLUVPL. The Stamped hard copies shall be distributed by the Contractor without any delay as below.

3 copies to CLUVPL Site Engineers

2 copies to the Contractor

1 copy for CLUVPL Engineering Department Records.

This review and / or approval of the drawings by CLUVPL shall not relieve the Contractor from any of his responsibilities under this contract. On completion of site activities, 'As built Drawings' shall be submitted by the Contractor to the CLUVPL Site Engineer and approval stamping shall be obtained from the CLUVPL Site Engineer and the same shall be uploaded in CCMS of CLUVPL. 2 sets of approved and stamped 'As built Drawings' in Hard Copy along with 3 sets of Soft Copies, each set stored in External Hard Drives of minimum 1 TB, shall be submitted to the CLUVPL Site Engineer.

#### **2.14. STANDARDS**

The Project equipment and systems shall be designed, manufactured, assembled, tested, shipped, installed and commissioned according to the applicable local codes, standards and regulations. The design and installation shall be fully in conformity with the relevant standards and codes as applicable in general and with the standards and codes as specified in the respective Sections. Latest standards and nationally or internationally recognized codes and standards, which meet or exceed the qualities specified in this specification shall be used. It is Contractor's responsibility to ensure the coherence of the codes and standards chosen as reference.

In case of conflict between this specification and the Standards / Codes specified or referred, this specification shall prevail.

#### **2.15. DRAWINGS & DOCUMENTS:**

During Detailed Engineering, the Drawings and Documents pertaining to the Basic Design shall be submitted for approval by CLUVPL but not limited to the following list.



1. Design Basis Report
2. System Parameters & Fault Calculation Report
3. Soil Resistivity Report
4. DC SLD
5. AC SLD up to SECL Sub Stations



**SECTION 3.0**  
**SOLAR PV MODULES**  
**TECHNICAL SPECIFICATION FOR CELLS AND MODULES**

**3.1** The solar PV Modules to be used in the project shall be of Mono/Poly/PERC Silicon Crystalline technology with the basic design of Flat Plate Construction, Mono Facial/Bi Facial and terrestrial mounted type. Capacity Rating of individual module should not be less than 340 Wp for Poly Mono Facial Modules and 380 Wp for the other technology modules (Bi-faciality Factor shall be minimum 0.7 for Bifacial Modules) (under Standard Test Conditions), with only positive tolerance, having minimum 72 cells with minimum 5BB, maximum system voltage of 1500 V. Modules of different types with ratings are acceptable for this solar Project. The contractor is allowed to procure from maximum five makes including from their own manufacturing, as applicable. However, the total types (type means same make, cell technology, Wp and voltage) will be restricted to a maximum of seven only. This section specifies general requirement of Solar PV modules based on Mono/Poly/PERC Silicon Crystalline technologies. Any specific and additional requirements pertaining to the respective Technology shall be finalized during detailed engineering.

The number of solar PV modules to be maintained by the contractor as Mandatory spares shall be 0.2% of module capacity with respect to each type and the “Number” to be supplied will be rounded off to the higher integer in each case.

**3.2** The contractor shall be responsible for design, manufacture/assembly, testing and supply of Solar PV modules to the site. All process steps and quality control measures involved in the manufacture of the offered Modules from cell assembling to module manufacturing or black wafers to modules manufacturing shall be carried out at the works of PV manufacturers.

**3.3** All the quantity of solar PV modules ordered shall be preferably manufactured / assembled in the same factory. In case of manufacturing/assembling to take place in more than one factory, bidder shall furnish all the required documentation in respect of each such PV module manufacturing facilities, including BIS requirements, during Detailed Engineering

**3.4 Standards & Type Test Certificates (TTC):** The modules shall be designed and manufactured conforming to the following standards. The Type Test Certificates and the Detailed Test Reports Conforming to the Latest revisions of respective Standards as listed below shall be submitted with the Bid/during detailed engineering for Technical Evaluation.

Standard	Description	Type Test Certificates
IEC 61215	Crystalline silicon terrestrial PV Modules - Design Qualification and Type approval	Type Test Certificates and Detailed Test Reports for Design and Type approval including the

		Constructional Data Form (CDF).
IEC 61730	PV systems - Module safety Qualification Part -I: Requirement for Construction, Part - II: Requirement for Testing	IEC 61730 Type Test Certificate and test reports for safety qualification and testing for offered PV modules at 1500V DC.
IEC 61701	Salt Mist Corrosion Testing of PV Modules	IEC 61701 type test certificate and test reports for corrosion testing for the offered PV modules.
IEC 62804	PV Modules - Testing Methods for the detection of Potential Induced Degradation - Part -1: Crystalline Silicon	IEC: 62804 Type Test Certificate and test reports for Potential Induced Degradation of photovoltaic (PV) modules.

### 3.5 Minimum Guaranteed Technical Particulars for Photovoltaic (PV) Modules

Contractor shall furnish GTP in the following format with relevant details during detailed Engineering for approval. The parameters which are having tolerance values, shall be specified with the value along with the range and shall meet with the requirements specified Minimum / Maximum values as applicable. The requirement values wherever not specified shall be as per/in line with, relevant standards. This Minimum Guaranteed Technical Particulars for Photovoltaic (PV) Modules are indicative only. Any other technical particulars to fulfill the supply of modules also shall be furnished.

Particular	Unit	Requirement
<b>I. General &amp; Permissible Operating Conditions</b>		
Manufacturer / Brand Name		
Manufacturer's Address		
Type Name or Model Number		
System Voltage	V <sub>DC</sub>	1500 V
Rated Maximum Power, W <sub>p</sub>	W	
Tolerance of Rating	W	0 to + 4.99
Nominal Module Operating Temperature (NMOT)	°C	As per Manufacturer's design and in line with relevant standards
Rated Ambient Temperature range	°C	0 to + 50
Rated relative humidity range	%	As Per IEC 61215
Maximum wind speed on the surface	Km/Hr	As per latest BIS 875 Part III
Temperature Coefficient of short circuit Current, α	%/°K	As per Manufacturer's design and in line with relevant standards
Temperature Coefficient of Open circuit voltage, β	%/°K	As per Manufacturer's design and in line with relevant standards
Temperature Coefficient of Rated Power, γ	%/°K	Better than or equal to -0.41 Test certificate shall be furnished to

		support $\gamma$ value
Type Test certificate for $\gamma$ is enclosed		Yes
Application class (IEC 61730)		A or better
Protection Safety class		II or better
Number of Solar Cells		72
Cells per Bypass diode		$\leq 24$
No. of Schottky type bypass Diodes		Minimum 3
Superstrate (Glass) minimum thickness	mm	3.2
Superstrate (Glass) Transmittance	%	$\geq 93$
Iron content	ppm	$< 120$
Encapsulate Material (if, EVA) Thickness	mm	0.450 to 0.600
Encapsulate Material gel content	%	75 to 95
Frame Material		Anodized Aluminium Alloy 6063-T5 or Better / Corrosion resistant Material
Frame Height	mm	$\geq 35$
Anodizing Coating Thickness	$\mu\text{m}$	$\geq 15$
Back Sheet Structure		3 layered
Back Sheet layer Thickness	mm	$\geq 0.300$
Back Sheet inner layer (cell side)		PVDF film or Primer
Back Sheet middle layer		PET
Back Sheet outer layer (air side)		PVF or PVDF
Back Sheet Water Vapour Transmission Rate at 38°C at 90% RH	$\text{g}/\text{m}^2/\text{day}$	$< 2.0$
Back Sheet Voltage Tolerance	V	$\geq 1500$
Junction Box IP		67 or Better
DC Cable		Cu, FRLS, UV resistant, EBC, flexible
Size DC Cable	$\text{mm}^2$	$\geq 4$
Length of the DC Cable	m	$\geq 1.2$ for each polarity
Termination Connectors IP		67 or Better
<b>II. Electrical Data of Modules: At STC [Module Temperature 25°C, AMI 1.5 according to EN 60904-3 and Irradiance 1000 W/m<sup>2</sup>]</b>		
Rated Open Circuit Voltage, $V_{oc}$	V	As per Manufacturer's design and in line with IEC 61853-1 standards
Rated Short Circuit Current, $I_{sc}$	A	As per Manufacturer's design and in line with IEC 61853-1 standards
Maximum Power Point Voltage, $V_{mpp}$	V	As per Manufacturer's design and in line with IEC 61853-1 standards

Maximum Power Point Current, $I_{mpp}$	A	As per Manufacturer's design and in line with IEC 61853-1 standards
Fill Factor of Modules	%	>70
Efficiency of Modules	%	>16% and as per Manufacturer's design and in line with relevant standards
<b>III. Electrical Data of Modules: At NMOT as specified in IEC 61215 standard; Test report for NMOT values, from NABL accredited lab shall be enclosed during detailed engineering.</b>		
Rated Maximum Power, $W_p$	W	As per Manufacturer's design and in line with IEC standards
$V_{oc}$	V	As per Manufacturer's design and in line with IEC standards
$I_{sc}$	A	As per Manufacturer's design and in line with IEC standards
$V_{mpp}$	V	As per Manufacturer's design and in line with IEC standards
$I_{mpp}$	A	As per Manufacturer's design and in line with IEC standards
Fill Factor of modules	%	As per Manufacturer's design and in line with IEC standards
Efficiency of Module	%	As per Manufacturer's design and in line with IEC standards

<b>IV. Electrical Data of cells: At STC [cell Temperature 25°C, AMI 1.5 according to EN 60904-3 and Irradiance 1000 W/m<sup>2</sup>]</b>		
Rated Open Circuit Voltage, $V_{oc}$	V	As per Manufacturer's design and in line with relevant standards
Rated Short Circuit Current, $I_{sc}$	A	As per Manufacturer's design and in line with relevant standards
Maximum Power Point Voltage, $V_{mpp}$	V	As per Manufacturer's design and in line with relevant standards
Maximum Power Point Current, $I_{mpp}$	A	As per Manufacturer's design and in line with relevant standards
Fill Factor of cell	%	As per Manufacturer's design and in line with relevant standards
Efficiency of Cell for size of 156.75 sq mm	%	>18.7
Efficiency of other Cell size, if offered (specify cell size and efficiency)	%	must be proportional to the above

**Other Relevant Parameters for Photovoltaic (PV) Modules:**

Parameter	Unit	
Maximum reverse current protection Fuse rating	A	As per Manufacturer's design and in line with relevant standards
Ratio of Module efficiency at @ 25°C, @ AM 1.5, Under 200 W/m <sup>2</sup> Solar Spectrum to Module efficiency at STC	%	As per Manufacturer's design and in line with relevant standards
Solar cell Type (Mono, Poly)		As per Manufacturer's design and in line with relevant standards
Solar cell Size (L X W)		As per Manufacturer's design and in line with relevant standards
Total Cell Area		As per Manufacturer's design and in line with relevant standards
<b>Mechanical Data</b>		
Module Length (L)	mm	As per Manufacturer's design and in line with relevant standards
Module Width (W)	mm	As per Manufacturer's design and in line with relevant standards
Module Height (H)	mm	As per Manufacturer's design and in line with relevant standards
Module Area	m <sup>2</sup>	As per Manufacturer's design and in line with relevant standards
Module weight	Kg	As per Manufacturer's design and in line with relevant standards
Minimum creepage Distance	mm	As per Manufacturer's design and in line with relevant standards
Distance between Mounting Holes	mm	As per Manufacturer's design and in line with relevant standards
Mounting hole size [ Elliptical]	mm	As per Manufacturer's design and in line with relevant standards
Number of Earthing Holes	Nos	As per Manufacturer's design and in line with relevant standards
Size of Earthing Holes and recommended fixtures	mm	As per Manufacturer's design and in line with relevant standards
<b>Packing Information</b>		
Modules / Pallet		As per Manufacturer's design and in line with relevant standards
Container Size		As per Manufacturer's design and in line with relevant standards
Pallets / Container		As per Manufacturer's design and in line with relevant standards



Modules / Container		As per Manufacturer's design and in line with relevant standards
<b>Any other technical particulars</b>		
<b>ALMM details, BIS certification and IEC certificates and other particulars</b>		To be provided by the contractor during detailed engineering

### 3.6 Raw Materials

A brief summary and only indicative requirements of the raw materials are specified here. All materials used in the Solar PV module shall have a proven history of reliability, safety and stable operation in external applications so as to ensure the satisfactory performance of the PV modules.

The Bidder shall submit, along with a detailed Bill of Material (BoM) elaborating on the properties (as applicable), such as, dimension, material composition, electrical and mechanical properties etc. of the major components of the module which shall be same as per the type tested and approved CDF.

- 3.6.1 **PV cells:** Only top-grade PV cells shall be used in the offered modules. The Solar PV Cells offered for this project shall be tested as per testing standards or manufacturers standards in case of no testing standards available, for its characteristics, surface condition, surface profiling, thickness shape, flatness measurements, etc. and report for the same shall be submitted during detailed engineering/one week before in process inspection call. For other details, CLUVPL GTP and MQP shall be referred.
- 3.6.2 **Glass:** Transmittance and thick of the front glass used to make the modules shall be as per attached GTP above and value of Transmittance shall be chosen such that it gives high encapsulation gain. It shall be made up of impact resistant and toughened, plain or patterned glass with AR coating. The module shall not be subjected to any point load during transportation, handling and erection and complete care has to be taken to avoid any undue loading on either side of the module. For other details, CLUVPL GTP and MQP shall be referred.
- 3.6.3 **Encapsulate:** Encapsulation material (EVA) used in the modules shall have less yellowing property due to harsh weather (heat and humid) and thermal cycles prevalent at site and the material shall also have the properties of UV resistant and faster curing. The interconnected cells shall be laminated in vacuum to withstand adverse environmental conditions. The arrangement and the material of encapsulation shall be compatible with the thermal expansion properties of the Silicon cells and the module framing arrangement/material. The encapsulation arrangement shall ensure complete moisture proofing during the whole life of the solar modules. For other details, CLUVPL GTP and MQP shall be referred.

- 3.6.4 **Back sheet:** The back sheet used in the modules shall have the properties of UV resistant, oxygen blocking properties (OTR) and weather durability. It should have 3 layered structure. For other details, CLUVPL GTP and MQP shall be referred.
- 3.6.5 **Sealant:** The sealant used for edge sealing of PV modules shall have excellent moisture blocking and water ingress protection with good electrical insulation and with good adhesion strength. For other details, CLUVPL GTP and MQP shall be referred.
- 3.6.6 **Frame:** The module frame shall be made of anodized Aluminium or corrosion resistant material, which shall be electrically & chemically compatible with the structural material used for mounting the modules. The Frame should resist Marine environments and should have better mechanical strength. In case of metal frames, it shall have less electrical resistance and provision for earthing to connect it to the earthing grid. For other details, CLUVPL GTP and MQP shall be referred.
- 3.6.7 **Junction box:** Junction box fitted at the back side of module should have Outdoor Weather proof and UV resistant enclosure and lid and designed for wiring of solar DC cables with bypass diodes. For other details, CLUVPL GTP and MQP shall be referred.
- 3.6.8 **DC cable & Connectors:** Output solar DC cable shall have EN 50618 certification. Terminations of the DC cables shall be made with UV resistant, Outdoor Weather proof, DC rated, MC type or compatible connectors (both male and female), IP 67 or better and the same shall be certified with IEC 62852. Type test certificates and reports for cable and connectors shall be furnished during detailed engineering/ during in-process inspection. For other details, CLUVPL GTP and MQP shall be referred.

### 3.7 Identification and Traceability

- 3.7.1 **Back Label:** All individual modules shall be provided with Name label at the back of module which shall provide the information as indicated in the relevant IEC/BIS standards. They shall be clearly visible and shall not be hidden by equipment wiring. Type of labels and fixing of labels shall be such that they are not likely to peel off/ fall off during the life of the panel. In addition to the requirements indicated in the standards, back label shall have CLUVPL name and its Logo on the top corner of each Module.
- 3.7.2 **RFID Tag:** Each PV module used in solar power project must use an RF identification (RFID) tag. The following information must be mentioned in the RFID used on each module.
- 1) Name of the manufacturer of Solar cells
  - 2) Name of the manufacturer of PV Module
  - 3) Month and year of the manufacture (separately for solar cells and modules)
  - 4) Country of origin (separately for solar cells and module)
  - 5) I-V curve for the module
  - 6) Wattage,  $I_m$ ,  $V_m$  and FF for the module
  - 7) Unique Serial No. and Model No of the module

- 8) Date and year of obtaining IEC PV module qualification certificate
- 9) Name of the test lab issuing IEC certificate
- 10) Other relevant information on traceability of solar cells and module as per ISO 9000.

3.7.3 The RFID label shall be placed either inside or outside the laminate and must be able to withstand environmental conditions and last the life time of the solar module as per MNRE Norms. 1 Numbers of RFID readers shall be supplied along with modules.

### 3.8 Manufacturing:

3.8.1 Manufacturing of the modules shall be as per the approved Manufacturing Quality Plan. The offered modules shall have only positive tolerance for Wp capacity, without considering uncertainty of the Testing Equipment available at manufacturing facility. The range of positive tolerance shall be mentioned in back label.

3.8.2 Minimum 3 stage Current binning with the interval of 150 mA shall be followed for sorting of modules (within allowed 4.99Wp band) and clear identification of the same shall be provided in the packing label for sorting of modules at site.

3.8.3 All materials used in the Solar PV module shall have a proven history of reliability, safety and stable operation in external applications.

3.8.4 **Quality Assurance:** Quality Assurance of the modules shall be as per the approved Manufacturing Quality Plan. Requirements of the attached Manufacturing Quality Plan (MQP) for PV modules shall be furnished in the given format during detailed engineering for approval. For further details, Notes of MQP shall be referred.

3.8.5 **In Process Inspection:** To ensure the quality of modules, In process Inspection during the manufacturing of the planned lot of modules shall be carried out which will be witnessed by CLUVPL or by a third party Inspection Agency authorized by CLUVPL, as applicable. A consolidated Shift wise Inspection report for the batch of inspected modules along with the Proof of procurement (mentioning manufacturer name, manufacturing date) and relevant test certificates of the major components used in the batch as listed below shall be submitted during detailed engineering.

- 1) Cell
- 2) Ribbon and conductors
- 3) Flux
- 4) Lamination material
- 5) Glass
- 6) Back sheet
- 7) Frames
- 8) Sealant
- 9) Junction Box
- 10) Cables, Terminals & Connector
- 11) Other components

3.8.6 **Factory Acceptance Test:** The mandatory acceptance tests as per relevant IEC standards shall be conducted at factory (FAT), in line with the approved Manufacturing Quality Plan on random samples selected by CLUVPL in line with ISO 2859. The flash test of the modules for the sample modules during FAT (at low and standard irradiances) shall be performed with Sun Simulator of Triple A plus grade. The result of test for Wp capacity of such selected sample modules shall comply to the Back Label Nominal Power Rating, **without considering the uncertainty of factory Test equipment.**

3.8.7 **Third Party Tests:** Random PV module(s) selected by CLUVPL during FAT shall be tested for Wp capacity and EL tests by one of the NABL accredited Test Centres at the sampling rate of 1module per Inspection lot or 1 module per 2MW, whichever is higher. safe transport to the Test Centre and back to site and testing are under the scope of Manufacturer/Contractor.

The result of tests for Wp capacity and EL of such selected sample modules shall comply to the approved MQP conditions. (Reliability Inspection).

3.8.8 Contractor shall submit the schedule of manufacturing and FAT to CLUVPL, 21 days in advance, to enable travel planning for the In process and FAT inspection.

### 3.9 **MNRE Requirements:**

**Compulsory Registration:** As per the Solar Photovoltaic Systems Devices and Components Goods (Requirements for Compulsory Registration by Govt of India) Order, 2017/latest, PV Modules used in the grid connected solar power projects shall be registered with BIS and bear the Standard Mark as notified by the Bureau of Indian Standards. Further, PV Modules and cells should have been included in the ALMM under Approved Models and Manufacturers of Solar Photovoltaic Modules (Requirements for Compulsory Registration by MNRE) Order, 2019/ latest, as applicable, and necessary document shall be submitted as in the regulation/as per the requirement of MNRE.

3.10 **Documents to be submitted for acceptance of the Inspected modules:** The Bidder shall furnish after the FAT inspection or earlier as applicable, the following documents for acceptance of the inspected PV modules.

- 1) Consolidated Shift wise In-process Inspection report.
- 2) MoM of the Inspection with the FAT test reports.
- 3) Packaging Information.
- 4) The NABL accredited 3rd party validated PAN file of the solar modules.

3.11 Searchable soft copy files of Flash Test Report with IV curve and EL images for all modules. **Documents to be submitted during Detailed Engineering:** The Contractor shall furnish during detailed Engineering, the following for the offered PV cells (as applicable) and modules with relevant Technical Parameters for approval.

- 1) Guaranteed Technical Parameters GTP: Filled up CLUVPL GTP and other required information for the fulfillment of supply of modules

- 2) Manufacturing Quality Plan:
  - a) Filled up module MQP in the attached format of 'Typical MQP - Solar PV Modules' at the end of this Section.
  - b) Visual inspection criteria of manufacturer.
  - c) EL inspection criteria of manufacturer.
- 3) Current-voltage (I-V) & Power-Voltage (P-V) performance curves at 200, 400, 600, 800 & 1000 W/m<sup>2</sup> of irradiances at 15<sup>0</sup>, 25<sup>0</sup>& 50<sup>0</sup>C and at AM 1.5.
- 4) GA, Cross Section Drawings
- 5) Type test certificates and reports, as indicated in "Standards & Type Test Certificates (TTC)" of this spec
- 6) Detailed Bill of Material (BoM complying CDF of all the relevant IEC reports (mentioned in TTC above). Make & Specification (as applicable) like dimension, material composition, electrical and mechanical properties, any other important parameter to comply this spec for each component mentioned in Raw material section of this spec.
- 7) Back label Design.
- 8) Documents for MNRE requirements, as per this spec
- 9) Installation & O&M Manual containing Standard / Special Installation Procedures and Standard Operating Procedures for operation& Maintenance of the modules to fulfil the warranty conditions.

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<b>Typical Manufacturing Quality Plan (MQP) - Solar PV Modules</b>	
	<b>Notes:</b>
1	The PV module Manufacturer's data, wherever requested shall be furnished in this Manufacturing Quality Plan (MQP) in the below given format. Shortcomings in the purchaser's requirements of the MQP shall result in rejection of the bid. Additional requirements & FATs are to be proposed by the bidder to fulfil the safety and quality as per Indian/International standards shall be indicated in each section of the MQP.
2	All materials used in the Solar PV module shall have a proven history of reliability, safety and stable operation in external applications so as to ensure the satisfactory performance of the PV modules. All materials shall perform satisfactorily in harsh climate condition of Neyveli with relative humidity up to 100%, Atmospheric Temperatures up to + 50° C and gust as per Latest IS 875 Part III on the surface of the panel. Solar PV Cells offered for this project shall be tested for its electrical and thermal characteristics, surface condition, surface profiling, thickness, dimension (≥ (156.75 mm x 156.75 mm)), flatness measurements, etc and detailed Certificate of Compliance shall be furnished along with the bid. Similarly, all the other major components as Bill of Materials (BOM), not limiting to listed materials in the MQP shall be tested as per the applicable standards/norms and relevant test certificates or reports shall be furnished before process inspection.
5	In process Inspection during the manufacturing of each lot of modules will be carried out and critical parameters of manufacturing process as per approved MQP will be verified. A consolidated Shift wise Inspection report for the batch of inspected modules along with the Proof of procurement of raw materials (mentioning manufacturer name, manufacturing date) used in the batch not limiting to the list in Section-I below, shall be submitted as per specification requirement.
6	The flash test of the modules for the sample modules during routine tests and FAT shall be performed with Sun Simulator of Triple A plus grade. Capacity of modules with only positive tolerance with respect to the back label rating (without considering the uncertainty of factory equipment) with band width of 0 to 4.99 Wp will be accepted. Relevant valid document(s) for grade of the flasher shall be furnished during inspection.
7	The mandatory acceptance tests as per approved MQP in line with relevant IEC standards shall be conducted at factory (FAT) not limiting to the tests mentioned in this MQP and the same will be witnessed by NLCIL and/or NLCIL deputed third party Inspection Agency and NLCIL authorised contractor, as applicable. The random samples selected by NLCIL as per the approved Manufacturing Quality Plan.
8	<b>Third Party Tests:</b> Random PV module(s) selected by NLCIL during FAT as per sampling of this MQP and tested, by one of the NABL accredited Test Centres of 3rd party, at the sampling rate of 1 module per inspection lot or 1 module per 2MW, whichever is higher. The result of the tests shall comply to the MQP requirements. The Lab shall declare the results of tests indicating the condition of the modules as "Pass or Fail" with values, as applicable.
9	Successful bidder shall submit the schedule of manufacturing and FAT, to NLCIL, 21 days in advance, to enable travel planning for the In process and FAT inspection. FAT test procedures with acceptance norms as per approved MQP and reference documents shall be furnished 10 days before inprocess inspection.
10	Documents to be submitted for acceptance of the Inspected modules: The Bidder shall furnish the following documents for acceptance of the inspected PV modules after the FAT inspection as early as applicable, 1) Consolidated Shift wise In-process Inspection report. 2) MoM of the Inspection with the FAT test reports. 3) Packaging Information. 4) PAN file of the modules, Validated by NABL accredited Agency, as per relevant IEC standards. 5) Searchable soft copy files of Flash Test Report with IV curve and EL images for all modules. 6) Any other documents to fulfill the quality requirements of modules
11	MQP for Solar PV Modules furnished below is the typical Format. Bidder has to submit separate MQP, providing relevant data/details of manufacturer inline with this typical one covering all the items listed under "Component/Operation/Test" along with the bid.
12	Acceptance criteria for EL and Visual checking shall be submitted along with the bid/ during detailed engineering.
13	All IEC/BIS standards mentioned in this MQP refers only the latest revision (even if "latest" is not specified)
14	While submitting the bid, bidder must specify the "acceptance norms clearly" wherever it is not specified in the MQP format.



MQP typical Format for Solar PV Modules											
Sampling plan as per ISO 2859/IS 10673 and AQL (0,1) means: if 0 defect found, the lot will be Accepted, if 1 defect found, the lot will be Rejected											
Section I - Raw Materials / Boughtout Items											
Sr. No	Component / Operation / Test	Characteristics	Class	Type of Check	Sampling	Reference Document (Manufacturer shall specify the "Reference document clearly, whether it is IEC/IS/QC")	Acceptance Norms (Manufacturer shall specify the "acceptance norms clearly, in line with IEC/BIS/QC")	Role of Agency		Format of Record	Remarks
								Manufacturer	NLCIL/NLCIL authorised agency/contractor		
1	Glass	Length	Major	Measurement	Inspection Level: S-3 AQL: 2.5	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission with tolerance in the dimension	Perform	Review & witness, as applicable	Manufacturer's Inspection Reports and raw material manufacturer's Test certificates / test reports, type test certificates etc. (During in-process inspection, the above said documents shall be reviewed by NLCIL/NLCIL deputed 3rd party Agency/Contractor)	
		Width	Major	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission with tolerance in the dimension	Perform	Review & witness, as applicable		
		Thickness	Major	Measurement			As per GTP requirement of NLCIL or thicker: to be specified during bid submission with tolerance in the dimension	Perform	Review & witness, as applicable		
		Fragmentation	Major	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	TC/perform	Review & witness, as applicable		
		Bow, scratches, bubbles	Major	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	Perform	Review & witness, as applicable		
		Transmittance	Major	Indirect Measurement			>= 93%	TC/perform	Review & witness, as applicable		
		Hardness	Minor	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	TC/perform	Review & witness, as applicable		
		Tempering Degree	Minor	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	TC/perform	Review & witness, as applicable		
		AR Coating film Quality	Major	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	TC/perform	Review & witness, as applicable		

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								Manufacturer	NLCIL/NLICIL authorised agency/contractor			
2	EVA	Bending	Major	Measurement	1 pcs/batch/lot	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	0.3 % or better as per IEC / IS or any agreed standard	TC/perform	Review & witness, as applicable	do		
		Iron content	Major	Testing			<120ppm	TC/perform	Review & witness, as applicable			
		Impact-resistant	Major	Testing			As per IEC / IS or any agreed standard; if no specific standards available then as per glass Manufacturer's QC: to be specified during bid submission	TC/perform	Review & witness, as applicable			
		Thickness	Major	Measurement	Inspection Level: S-3 AQL: 2.5		0.45 to 0.6 mm or better as per relevant IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission with tolerance in the dimension	Perform	Review & witness, as applicable			
		Dimensions & Date of production	Major	Measurement/visual			(i) Tolerance of the dimension shall be specified. (ii) EVA shall be used in Module Production within 6 months from the date of manufacture	Perform	Review & witness, as applicable			
		Expiry Date	Major	Visual			As per manufacturer's Criteria	Perform	Review & witness, as applicable			
		Gel content	Major	Testing			75% - 95%	TC/perform	Review & witness, as applicable			
		Peel strength between Glass with EVA	Critical	Testing			1 roll/batch	≥60N/cm	TC/perform		Review & witness, as applicable	
		Peel strength between EVA with Back Sheet	Critical	Testing			1 roll/batch	≥40N/cm	TC/perform		Review & witness, as applicable	
		Shrinking	Major	Testing			1 roll/batch	TD < 2%, MD < 5%	TC/perform		Review & witness, as applicable	
Tensile strength	Major	Testing	As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	TC/perform	Review & witness, as applicable							



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								Manufacturer	NLCIL/NLCIL authorised agency/contractor		
		Volume Resistivity	Major	Testing			≥6x10e14 Ω-cm	TC/perform	Review & witness, as applicable		
		Apperance	Minor	Visual	Inspection Level: S-3 AQL: 2.5		No dust and other foreign material, no breakage, no stain, white in color	Perform	Review & witness, as applicable		
3	Backsheet	Layer details	Major	Measurement	1 roll/batch	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	NLCIL spec and as per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission. (Manufacturer shall provide the details of layers used (material & thickness etc. and acceptance norms during submission of bid).	TC/perform	Review & witness, as applicable	do	
		Width	Major	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	Perform	Review & witness, as applicable		
		Elongation	minor	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	TC/perform	Review & witness, as applicable		
		Expiry Date	Major	Visual			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	Perform	Review & witness, as applicable		
		Thickness	Major	Measurement	As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission with tolerance in the dimension		Perform	Review & witness, as applicable			
		Peel strength between EVA to back sheet	critical	Testing	1 roll/batch		≥40 N/cm	TC/perform	Review & witness, as applicable		
		Water Vapour Transmission Rate	critical	Testing	1 Pc/lot		less than 2.0g/m2/day (at 38°C at 90% RH)	TC/perform	Review & witness, as applicable		
		Friction performance	Major	Testing	1 roll/batch		Area 1*5 cm, wipe repeatedly for 100 time, surface free from scratch	Perform	Review & witness, as applicable		

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								Manufacturer	NLCIL/NLCIL authorised agency/contractor		
4		Thermal stability	Major	Testing	Inspection Level: S-3 AQL: 2.5		TD < 1 % and MD < 1 %	TC/perform	Review & witness, as applicable		
		Appearance	Major	Visual			No rinkle, dirty, delamination, bump, white in color	Perform	Review & witness, as applicable		
		PD	Major	Testing	1 roll/batch		Relevant IEC/Technical Spec (color: white TUV certified for partial discharge test for system voltage >=1500 V DC)	TC/perform	Review & witness, as applicable		
	Cells	Thickness	Major	Measurement	Inspection Level: S-4 AQL: 2.5	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	Perform	Review & witness, as applicable	do	
		Length	Major	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per NLCIL spec: to be specified during bid submission with tolerance in dimension	Perform	Review & witness, as applicable		
		Width	Major	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per NLCIL spec: to be specified during bid submission with tolerance in dimension	Perform	Review & witness, as applicable		
		Back busbar width	Major	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission with tolerance in the dimension	Perform	Review & witness, as applicable		
		Front busbar width	Major	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission with tolerance in the dimension	Perform	Review & witness, as applicable		
		AI-BSF Adhesive AI-BSF Weldability	Major	Testing			≥1.5 N/cm	Perform	Review & witness, as applicable		
Power		Critical	Measurement	As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC. Only positive tolerance is allowed.	Perform/TC		Review & witness, as applicable				
Electrical Characteristics	Critical	Measurement	As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC at STC and at other conditions, as applicable.	Perform/TC	Review & witness, as applicable						

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								Manufacturer	NLCIL/NLICIL authorised agency/contractor		
		Efficiency	Critical	Measurement	Inspection Level: I AQL: 1.0		>18.7 ( >18.7 % corresponding to 330 Wp module with cell size of 156.75 mm2. If the capacity of the module and dimension of the cell increased then efficiency of the cell shall be calculated accordingly.)	Perform/TC	Review & witness, as applicable		
		Fill factor	Critical	Measurement			>70%	Perform/TC	Review & witness, as applicable		
		Appearance	Major	Visual			No visible cells crack, cells broken, any extended V shape notch are not allowed	Perform	Review & witness, as applicable		
		LID	Major	Measurement	1 pc/lot		As per IEC 61215-2: 2016.	Perform/TC	Review & witness, as applicable		
		Temperature coefficient of Power	Major	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	TC/Certificate of Compliance	Review & witness, as applicable		
		(i) The performance of PID and (ii) reverse leakage current	Major	Measurement	3 pcs		(i) As per MNRE Guide lines at maximum system voltage. Degradation of power after PID shall be less than or equal to 5% of Pmax. (ii) As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	TC/perform	Review & witness, as applicable		
		5	Ribbon	Thickness	Major		Measurement	10 pcs/batch	IEC / IS or any agreed standard; if no specific		
Width	Major			Measurement	10 pcs/batch	As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	Perform	Review & witness, as applicable			
Soldering Strength	Critical			Testing	Inspection Level: S-3 AQL: 2.5	≥1.00 N/mm of BB or ribbon width, whichever is lesser	Perform/TC	Review & witness, as applicable			

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								Manufacturer	NLCIL/NLICIL authorised agency/contractor		
		Coating thickness & mechanical properties	Major	Visual (check the report provided by Ribbon manufacturer)	10 pcs/batch	standards available then as per Manufacturer's QC	As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	Perform/TC	Review & witness, as applicable		
		Resistivity, tensile strength	Major	Visual (check the report provided by Manufacturer)	10 pcs/batch		As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	Perform/TC	Review & witness, as applicable		
		Appearance	Major	Visual	10 pcs/batch		Flatness, no stain, no deformation, no crystal, no coating missing	Perform	Review & witness, as applicable		
6	Anodized Aluminium Frame	Width	Major	Measurement	20 pcs/batch	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	Perform	Review & witness, as applicable	do	
		Length	Major	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	Perform	Review & witness, as applicable		
		Height	Major	Measurement			Min 35mm	Perform	Review & witness, as applicable		
		Mounting hole pitch	Critical	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	Perform	Review & witness, as applicable		
		Drain hole distance	Major	Measurement			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	Perform	Review & witness, as applicable		
		Angle	Major	Measurement			45° ± 0.25°	Perform	Review & witness, as applicable		
		Hardness	Major	Measurement			≥ 8 hw	Perform/TC	Review & witness, as applicable		
		Coating thickness	Major	Measurement			≥ 15 um	Perform/TC	Review & witness, as applicable		

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								Manufacturer	NLCIL/NLCIL authorised agency/contractor		
		Frame Material	Major	TC			Anodized Aluminum Alloy 6063-T5 or Better / Corrosion resistant Material	TC	Review & witness, as applicable		
		Appearance	Major	Visual			Same color, smooth hand flat, no water stain, oil stain, contamination, scratch, coating film, breakage	Perform	Review & witness, as applicable		
7	Junction Box	Cable Length	Major	Measurement	Inspection Level: S-3 AQL: 2.5	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	Actual length ± 10mm (min actual length 1.2m per polarity)	Perform	Review & witness, as applicable	do	
		Cable size and type(min 4sqmm, 1.5kV, Cu, EBC, FRLS, UV resistant)	Major	Measurement/TC			As per EN standard and refer NLCIL spec	Perform/TC	Review & witness, as applicable		
		Terminations	Major	Measurement/TC			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	Perform/TC	Review & witness, as applicable		
		Dimensions	Major	Measurement			According to Manufacturers drawings	Perform	Review & witness, as applicable		
		Electrical Performance	Major	Measurement			Contact resistance ≤10 mohms Forward voltage drop; As per diode manufacturer's datasheet	Perform	Review & witness, as applicable		
		UV resistant Enclosure	Major	TC			As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC: to be specified during bid submission	TC	Review & witness, as applicable		
		Diodes type, numbers	Major	Visual & TC			NLCIL spec	Visual & TC	Review & witness, as applicable		
		IP Rating	Major	Measurement			67 or better	TC	Review & witness, as applicable		
		Appearance	Major	Visual			1.Diode polarity, type, quantity is right, terminal should be completed 2. No damage Cable Connector size Type, Gland thickness	Perform	Review & witness, as applicable		
		Manufactured date	Major	Visual					Within 12 months after manufacturing, storage temperature:16 deg C to 28 deg C		Perform

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								Manufacturer	NLCIL/NLCIL authorised agency/contractor		
8	Sealant	Skin Overtime, Cure depth, Hardness, Density	Minor	Visual (check the report provided by Manufacturer)	3 pcs/batch	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	As per IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	Perform/TC	Review & witness, as applicable	do	
		Expiry Date	Major	Visual			12 months	Perform	Review & witness, as applicable		
		Batch No	Major	Visual			Within 12 months after manufacturing	Perform	Review & witness, as applicable		
		Appearance	Major	Visual			No bubble, smooth, thick liquid, no damage package	Perform	Review & witness, as applicable		
9	Flux	Manufactured date	Major	Visual	3 pcs/batch	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	Within 6 months after manufacturing	Perform	Review & witness, as applicable	do	
		Expiry Date	Major	Visual			6 months	Perform	Review & witness, as applicable		
		Batch No	Major	Visual			Within 6 months after manufacturing	Perform	Review & witness, as applicable		
		Appearance	Major	Visual			Transparent, colorless	Perform	Review & witness, as applicable		
10	Back Label	Label Parameters	Major	Visual	1 pcs/1000 pcs	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	Module type, Pmpp, Voc, Isc, Vmpp, Imp, Series Fuse Rating, Tolerance of Pmpp, Weight, Dimension, STC, measuring uncertainty of power., TUV certificate number, module application and fire safety class, by pass diode, date and place of manufacturing, year of make, rfid tags, NLCIL name and logo and compliance of IEC/BIS stds and NLCIL spec (Back label shall have the positive tolerance details)	Perform	Review & witness, as applicable	do	
11	Pallet	Dimensions	Major	Measurement	Inspection Level: S-3 AQL: 0.01	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	Tolerance- 5-10 mm	Perform	Review &	As per manufacturer's design	
		Appearance	Major	Visual			No flaw, mildew, dirty, delamination, hole Obvious defect by naked eye not allowed.	Perform	Review & witness, as applicable		



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								Manufacturer	NLCIL/NLCIL authorised agency/contractor		
12	Package	Dimensions	Major	Measurement	Inspection Level: S-3 AQL: 2.5		Tolerance- 5-10 mm	Perform	Review & witness, as applicable	As per manufacturer's design	
<b>Section II: In process inspection: Acceptance norms are only generic. Any change in the norms shall be specified clearly; Module manufacturing done through Higher level of automated in-process line will be preferred to ensure quality.</b>											
1	Sorting Solar cell	Appearance,voltage,current	Major	Visual	2 box/shift	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	Colour conformity, no Jumping colour in one module, No north, No V-tpe defect, No crack, No broken the same level of Power, efficiency, Voltage, Current	Perform	Review & witness, as applicable	Sampling inspection record- material preparation	
2	EVA and Back Sheet Cutting EVA	EVA Manufacturer	Major	Visual	Check before every shift	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	According to the BOM of production plan Manufacturer and Type are right 6 months Not allowed EVA: +5mm Backsheet: ±1mm	Perform	Witness	Sampling inprocess inspection record and material preparation record	
		EVA Expiry date	Major	Visual				Perform	Witness		
		Uneven cutting	Major	Visual				Perform	Witness		
		Length of the EVA & Backsheet	Major	Measurement				Perform	Witness		
3	Cell Assembling	Check materials	Major	Visual	5 pcs/time 3 times/shift	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	According to the BOM of production plan Manufacturer and Type are right 6 months As per agreed data sheet Tolerance: ±0.5mm (length and width) 3.2mm ±0.2mm	Perform	Witness	Sampling inprocess- inspection record and material preparation record (heating temp, soldering temp, iron cleaning freq, air pressure of sucker,	
		Cells Manufacturer	Major	Visual				Perform	Witness		
		Flux Manufacturer	Major	Visual				Perform	Witness		
		Expiry date of flux	Major	Visual				Perform	Witness		
		RFID label affixing	Major	Visual				Perform	Witness		
		Glass size	Major	Measurement				Perform	Witness		
		Ribbon adhesion with busbar and	Major	Measurement	Automatic line : 4pcs/machine at the beginning of every shift (A side 2pcs, 1 for backside 1 for frontside and B side 2 pcs,1 for backside 1 for frontside)		Ribbon adhesion with busbar ≥1 N/mm of BB or ribbon width, whichever is lesser	Perform	Witness	Sampling inprocess- inspection record and material preparation record, Peel strength record between Ribbon and Busbar,soldering temp, spacing between cells,	
		Tin covering area	Major	Measurement	do	IEC / IS or any agreed	Tin covering area ≥ 85 %	Perform	Witness		

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								Manufacturer	NLCIL/NLCIL authorised agency/contractor		
4	Soldering	Iron Temperature	Major	Measurement	3 times/shift	standard; if no specific standards available then as per Manufacturer's QC	As per manufacturer's process guide and other technical parametres. To be filled by the manufacturer, during bid submission	Perform	Witness	misalignment of ribbon, visual, soldering quality & cleaning, Iron cleaning sponge, air pressure of sucker	
		Automatic soldering temperature	Major	Visual (check the setting temperature with standard temperature)	2 times/shift		As per manufacturer's process guide and other technical parametres. To be filled by the manufacturer, during bid submission	Perform	Witness		
5	Ribbon	Check interconnector (connect the cells) material as BOM	Major	Visual	Checking before every shift	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	According to the BOM of production plan; Manufacturer and size is right	Perform	Witness	Sampling inprocess-inspection record and material preparation record	
		Check the crossconnector (connect the termination)	Major	Visual			According to the BOM of production plan; Manufacturer and size is right	Perform	Witness		
		Appearance	Major	Visual			Flatness, no stain, no deformation, no crystal, no coating missing	Perform	Witness		
6	Lay-Up	String misaligned	Major	Measurement	1 pcs/time 3 times/shift	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	≤±1.0mm	Perform	Witness	Sampling inprocess-inspection record and material preparation record	
		Foreign materials	Major	Visual	Not allowed		Perform	Witness			
		EL Test	Major	Testing	100%		According to the EL inspection standard	Perform	Witness		
7	Lamination	Bubbles	Major	Visual	2 pcs/laminator/shift	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	Not allowed	Perform	Witness	Sampling inprocess-inspection record and material preparation record	
		String merged	Major	Visual			Not allowed	Perform	Witness		
		Delamination	Major	Visual			Not allowed	Perform	Witness		
		Foreign materials	Major	Visual			Not allowed	Perform	Witness		
		Temperature	Major	Testing	Tolerance ±5 degrees according to EVA property		Perform	Witness			
		Vaccume time, laminating time, laminating temperature, degassing time and trimming	Major	Testing	once/laminator/shift		<-99.5kpa	Perform	Witness		
		Gel content	Major	Testing	Each laminator 1 time for day/laminator		75% - 95%	Perform/TC	Review & witness, as applicable		
Peel strength test	Major	Testing	Glass with EVA ≥60 N/cm Backsheet with EVA ≥40 N/cm	Perform/TC		Review & witness, as applicable					
8	Framing and Crimping	Corner Gap	Major	Visual	3 pcs/time 4 times/shift	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	≤0.5mm	Perform	Witness	Sampling inprocess-inspection record and material preparation record	
		Verical Gap	Major	Visual			≤0.5mm	Perform	Witness		
		Diagonal difference	Major	Visual			Diagonal ≤1m, Diagonal difference ≤2mm Diagonal >1m, Diagonal difference ≤3mm	Perform	Witness		
		Corner crimping	Major	Visual			Smooth and Polished	Perform	Witness		



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								Manufacturer	NLCIL/NLCIL authorised agency/contractor		
9	JB fixing	Check junction box fixing	Major	Visual	once/shift	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	Manufacturer and type are right	Perform	Witness	Sampling inprocess-inspection record and material preparation record	
10	Cleaning & RFID fixing	Appearance	Major	Visual	100%	IEC / IS or any agreed standard; if no specific standards available then as per Manufacturer's QC	According to the Inspection standard for Modules & Data sheet RFID will be affixed at Lay-up Stage & laminated inside	Perform	Witness	Sampling inprocess-inspection record and material preparation record	
11	Sorting of Modules	Current sorting	Major	Testing	100%	Minimum 3 binning with 16mA interval	As per NLCIL spec	Perform	Witness	Packing report	
12	Traceability	Module traceability	Major	Identification	100%	As per rating label and RFID	As per NLCIL spec	Perform	Witness	Flash report	
<b>Section III: Routine Tests</b>											
1	Hi-pot	Hi-pot test	Major	Testing	100%	IEC / IS or any agreed standard	Dielectric withstand test to be performed and verifier values as per latest IEC 61215/61730 acceptance criteria; To be specified by Manufacturer during bid submission.	Perform	Review	Sampling record	
2	Insulation checking	insulation resistance	Major	Testing	100%	IEC / IS or any agreed standard	as per latest IEC 61215/61730 to be specified by Manufacturer during bid submission.	Perform	Review	Insulation record	
3	Flash test and IV data measurement @ STC and @ lower irradiances as mentioned NLCIL GTP	Electrical Data Measurement of Vmp, Imp, Pmax, Voc, Isc, ff, shunt resistance, series resistance, etc. at STC.	Major	Testing	100%	IEC / IS or any agreed standard	<u>STC: Pass Criteria:</u> As per NLCIL specifications: +ve tolerance (0W - +4.99W) only. Measurement uncertainty should not be considered. <u>Lower irradiance: Pass Criteria:</u> As per manufacturers design (to be specified during submission of bid)	Perform	Review	Flash Report	
4	EL Testing	Brightness, Black finger, cross crack, Shadow, Black Area, invalid cell, irregular crack concentration, material pollution, wrong cell printing	Major	Testing	100%	As per manufacturer EL Criteria	As per manufacturer's EL Criteria	Perform	Review	EL Image	
5	Final Visual Inspection	Color of cell, defect of solar cell, snail trails, placement, bubble, foreign material, serial number, back sheet, glass, frame, junction box.	Minor	Visual	100%	As per manufacturer visual Criteria	As per IEC 61215 latest standard's criteria and Visual criteria of manufacturer	Perform	Review	Inprocess record	

Sr. No	Component / Operation / Test	Characteristics	Class	Type of Check	Sampling	Reference Document (Manufacturer shall specify the "Reference document clearly, whether it is IEC/IS/QC")	Acceptance Norms (Manufacturer shall specify the "acceptance norms clearly, in line with IEC/BIS/QC")	Role of Agency		Format of Record	Remarks
								Manufacturer	NLCIL/NLCIL authorised agency/contractor		
6	Wet leakage	Insulation resistance measurement at 1500 V	Major	Testing	one per lot of JB receipt AQL: 0.25 (0,1)	As per IEC 61215 / IEC 61730	As per latest IEC 61215 / IEC 61730; To be specified by Manufacturer during bid submission.	Perform	Review	Incoming inspection record	
7	<b>Section IV: Factory Acceptance Tests</b>										
1	Appearance	Color of cell and module  Defect of solar cell, snail trails, placement, bubble, foreign material, serial number, back sheet, glass, frame, junction box.	Minor  Major	Visual, viewing distance 1 meter	Minor Sampling S4 AQL 4.0  Major ISO 2859 sampling S4 AQL (0,1)	IEC / IS or any agreed standard & As per Manufacturer's Visual Criteria (Viewing distance 1 meter)	a) No broken, cracked, or torn external surfaces, including superstrates, substrates, frames and junction boxes; b) No bent or misaligned external surfaces, including superstrates, substrates, frames and junction boxes to the extent that the installation and/or operation of the module would be impaired; c) No voids in, or visible corrosion of any of the thin film layers of the active circuitry of the module, extending over more than 10% of any cell; d) No bubbles or delaminations forming a continuous path between any part of the electrical circuit and edge of the module; e) No loss of mechanical integrity, to the extent that the installation and/or operation of the module would be impaired; f) Module markings (label) is no longer attached or the information is unreadable.	Perform	Witness	Visual full inspection record	
2	Dimensions	Length, width and diagonal difference, label fixing	Major	Measurement	ISO 2859 sampling S4 AQL (0,1)	IEC / IS or any agreed standard	Length, Width $\pm 1$ mm Diagonal $\leq 1$ m, Diagonal difference $\leq 2$ mm Diagonal $> 1$ m, Diagonal difference $\leq 3$ mm	Perform	Witness	Dimensional inspection record	
3	Insulation checking	Insulation resistance	Major	Testing	ISO 2859 sampling S4 AQL (0,1)	IEC / IS or any agreed standard	As per latest IEC 61215 / IEC 61730; To be specified by Manufacturer during bid submission.	Perform	Witness	Insulation record	
4	Hi-pot	Hi-pot test	Major	Testing	ISO 2859 sampling S4 AQL (0,1)	IEC / IS or any agreed standard	As per latest IEC 61215 / IEC 61730; To be specified by Manufacturer during bid submission.	Perform	Witness	hi-pot record	
5	Flash test and IV data measurement @ STC and @ lower irradiances as mentioned NLCIL GTP	Electrical Data Measurement of $V_{mp}$ , $I_{mp}$ , $P_{max}$ , $V_{oc}$ , $I_{sc}$ , $\beta$ , shunt resistance, series resistance, etc. at STC.	Major	Testing	ISO 2859 sampling S4 AQL (0,1)	IEC / IS or any agreed standard	<u>STC: Pass Criteria:</u> As per NLCIL specifications: +ve tolerance (0W to +4.99W) only. Measurement uncertainty should not be considered. <u>Lower irradiance: Pass Criteria:</u> As per manufacturer's design (to be specified during submission of bid)	Perform	Witness	Flash report	

Sr. No	Component / Operation / Test	Characteristics	Class	Type of Check	Sampling	Reference Document (Manufacturer shall specify the "Reference document clearly, whether it is IEC/IS/QC")	Acceptance Norms (Manufacturer shall specify the "acceptance norms clearly, in line with IEC/BIS/QC")	Role of Agency		Format of Record	Remarks
								Manufacturer	NLCIL/NLCIL authorised agency/contractor		
6	EL Testing	Brightness, Black finger, cross crack, Shadow, Black Area, invalid cell, irregular crack concentration, material pollution, wrong cell printing	Major	Testing	ISO 2859 Major - Sampling S4 AQL 0.25 (0,1) Minor Sampling S4 AQL 4.0	As per Manufacturer's EL Criteria	As per Manufacturer's EL Criteria	Perform	Witness	EL image	
7	Wet leakage	insulation resistance measurement	Major	Testing	1 pc per lot AQL (0,1)	As per IEC 61215	As per latest IEC 61215 / IEC 61730; To be specified by Manufacturer during bid submission.	Perform	Witness	FAT Report	
8	JB Pull Test	IV measurement and insulation resistance measurement	Major	Testing	1 pc per lot AQL (0,1)	As per IEC 61215	As per IEC 61215, IEC 60068-2-21; To be specified by Manufacturer during bid submission.	Perform	Witness	FAT Report	
9	Mechanical Load Test	IV measurement	Major	Testing	1 pc per lot AQL (0,1)	As per IEC 61215	Test method and pass criteria as per IEC 61215 and 61730. Applicable load: 2400 Pa	Perform	Witness	FAT Report	After conducting this test, module has to be replaced with new one.
10	Ground Continuity	Ground continuity measurement	Major	Testing	ISO 2859 sampling S4 AQL (0,1)	IEC / IS or any agreed standard	As per IEC 61215 and 61730 standards To be specified by Manufacturer during bid submission.	Perform	Witness	hi-pot record	
11	RFID and Back Label	As per data sheet	Major	Testing	ISO 2859 sampling Level II AQL (0, 1)	As per technical specification of NLCIL	All the parameters to be present Perfect readability	Perform	Witness	FAT Report	
12	Packing & Marking	Package	Major	Visual	ISO 2859 sampling Level II AQL 2.5	As per actual packing and marking scheme	Road and sea worthy packaging as applicable	Perform	Witness	Shipment sampling record	
13	Label for current binning	Current range: Minimum 5 binning with 100mA interval	Major	Visual	ISO 2859 sampling Level II AQL 2.5	As per actual packing and marking scheme	Label shall be affixed on each pallet, which should be clearly legible.	Perform	Witness	FAT Report	
14	Dispatch	Dispatch clearance shall be obtained from the client after submitting all the reports and test certificates as per approved MQP and after getting material dispatch clearance certificate, the materials shall be dispatched.									

Sr. No	Component / Operation / Test	Characteristics	Class	Type of Check	Sampling	Reference Document (Manufacturer shall specify the "Reference document clearly, whether it is IEC/IS/QC")	Acceptance Norms (Manufacturer shall specify the "acceptance norms clearly, in line with IEC/BIS/QC")	Role of Agency		Format of Record	Remarks
								Manufacturer	NLCIL/NLCIL authorised agency/contractor		
<b>Section V: Reliability Inspection</b>											
1	Performance Tests in NABL Lab India	Electrical Data Measurement of Vmp, Imp, Pmax, Voc, Isc, ff, shunt resistance, series resistance, etc. at STC.	Major	Testing	1 module per Inspection lot or 1 module per 2MW, whichever is higher AQL(0,1)	IEC / IS or any agreed standard.	Module Wp capacity measurements at STC Conditions: For individual sample module Pmax = Pnom ± uncertainty value of the third party lab equipment(s) and for entire module samples Pavg > Pnom.	To be Performed and declared by NABL lab	Verify	Lab test report (From any NABL accredited Lab of 3rd party in India)	
2	EL Testing in NABL accredited Lab in India	Brightness, Black finger, cross crack, Shadow, Black Area, invalid cell, irregular crack concentration, material pollution, wrong cell printing	Major	Testing	1 module per Inspection lot or 1 module per 2MW, whichever is higher Major - defect AQL (0,1) Minor - defect AQL (1,2)	Any ageed standards/As per manufacturer's EL Criteria	1. As per EL Criteria of manufacturer 2. The Lab shall compare EL image criteria furnished by manufacturer with actual image sample(s) and declare the results indicating the condition of the modules as Pass or Fail.	To be Performed and declared by NABL lab	Verify	Lab test report (From any NABL accredited Lab of 3rd party in India)	The manufacturer shall furnish EL image criteria during bid/detailed engineering.

## SECTION 4.0 STRING COMBINER & MONITORING BOX

### 4.1. General Requirements & Enclosure Details

String Combiner & Monitoring Box (SCMB) shall be provided on the DC power side to combine the electrical power from the strings. String Monitoring Units (SMU) shall be provided for monitoring the DC power generation and other parameters at Single or Double strings level. The String Combiner Box and the String Monitoring unit shall be integrated into a single box enclosure as intelligent String Combiner & Monitoring Box (SCMB) and shall be of a standalone unit Design erected nearer to the module mounting structures at an optimized distance to reduce the DC losses.

The box enclosure for String Combiner & Monitoring Box shall be dust, vermin and water proof, impact resistant and made of Metallic/Polycarbonate/Thermo set Fiberglass which should be sunlight/UV resistant as well as fire retardant. The box must have minimum protection to IP 65 degree of enclosure and Protection Class II.

The other components like vent plugs, String Cable connectors, Cable Glands/Cable Seals for all the other Power and Communication Cables including Antenna cables if any shall meet out the requirement of IP 65 degree of enclosure after erection. The manufacturer of SCMB shall furnish a certificate to this effect and recommend the list of such connectors and Cable glands to satisfy the IP requirement. The SCMB shall have suitable arrangement for the following.

All the components of SCMB shall be rated with the DC System Voltage of 1500V, type tested for 1500V and shall be designed to satisfactorily work in a temperature range of 0-65 Deg C. The current carrying parts of SCMB shall be suitable with adequate safety factor for connecting the strings of Solar PV array to the Inverter.

*The SCMB shall have the following features:*

- i. Shall Combine a cluster or group of modules into independent charging string at Single or Double strings level that will be wired through the String Monitoring Unit.
- ii. DC Isolator of suitable rating for disconnection at the outgoing.
- iii. Test points for each sub-group for quick fault location.
- iv. Means to measure currents of individual DC inputs, voltage of the Combined DC, On board temperature, means to indicate the status of DC Isolator&CLUVPL, means to measure a randomly selected PV Module Temperature and the Ambient air Temperature prevailing near the SCMB.
- v. Enclosure shall have a mechanical impact resistance of IK 07 or better. Design of enclosure shall make sure that the temperature rise inside shall not cross 12<sup>0</sup> C above the ambient temperature of 50<sup>0</sup> C. All other components inside SCMB shall function satisfactorily under these conditions.

- vi. In case, SCMB is proposed to be mounted on structure in open, it has to be protected from top, suitable canopy/rain shed shall be provided on top of SCMB extending minimum 150 mm from all four sides. Design and dimensions of SCMB structure must be such that minimum 0.6 meter of ground clearance is available below SCB at site for repair and maintenance. All the erection hardware and mounting accessories shall be of galvanized steel.
- vii. If metallic hinge is being used with enclosure cover, it shall be made of SS 304 and shall be rust proof. Enclosure shall be provided with captive screws so that it's screws don't fall off when cover is opened. Screw shall be made of corrosion free material. Suitable non-conducting protection cover shall be provided for any metallic hinge/screw/fastener to avoid contact with live part of the assembly.
- viii. Mounting plate inside the SCMB for mounting/fixing of devices shall be made of FRP/GRP or equivalent non-conducting material.

#### **4.2. String Combiner Section**

- 4.2.1.** The terminals inside the SCMB shall be connected to Tinned copper bus-bar arrangement of proper sizes. The current carrying parts of SCMB shall be suitable with adequate safety factor for connecting the strings of Solar PV array to the Inverter. The SCMB shall have suitable cable entry points fitted with cable glands/Cable sealing of appropriate sizes for both incoming and outgoing cables. Suitable markings shall be provided on the bus-bars for easy identification and cable ferrules will be fitted at the cable termination points for identification. Number of inputs in each SCMB shall be decided during detailed Engineering.
- 4.2.2.** A suitably rated On load DC isolator, shall be provided to Make / Break the combined DC output circuit.
- 4.2.3.** The SCMB shall have suitable Surge Protection Device (SPD) and shall consist of Metal Oxide Varistors (MOV) which shall be provided between positive and negative conductor and earthing ground. The Surge Protection Device shall have following minimum specifications.

Repetitive Surges x15(8/20  $\mu$ S) In : 20kA

Surge Current (8/20  $\mu$ S) I<sub>max</sub> : 40kA

During earth fault and failure of MOV, the SPD shall be capable of safely disconnecting the healthy system. SPD shall have thermal disconnecter to interrupt the surge current arising from internal and external faults. In order to avoid the fire hazard due to possible DC arcing in the SPD due to operation of thermal disconnecter, the SPD shall be capable of extinguishing the arc by itself. SPD shall have proper D/Os for indicating the status at local as well as at remote work station.

- 4.2.4.** DC photovoltaic fuses for positive side at Single or Double strings level shall be provided. Rating of fuses shall be 15A or 30 A (for Double string level). On negative side, fuses shall be provided based on the recommendation of Inverter Manufacturer.



- 4.2.5.** Sufficient clearance shall be provided between Positive Section and Negative Section with a separator. Preference shall be given for termination of strings inputs in separate compartments for positive and negative string inputs.

In each SCMB, 5% (rounded off to next higher integer) spare terminals and connectors for String Cable Connections shall be provided.

**4.3. String Monitoring Unit (SMU)**

- 4.3.1.** The String Monitoring Units along with the Communication Hardware shall be self powered, Intelligent, multichannel, industrial grade, reliable, field proven microprocessor-based unit.

- 4.3.2.** The SMU shall be capable of monitoring the parameters like Voltage, Current, Power for each string/Double strings, status of DC Isolator, SPD& fuses, Module Temperature and Ambient Air Temperature.

- 4.3.3.** Data Transmission to the respective RTU at PCSS / PESS shall be through the Optical Fiber Cable (OFC)/ Wi-Fi based wireless communication. Optical Fiber Cable (OFC)/RS485 cable can be used for interconnecting SCB to SCB, as required by SCADA and finalized during Detailed Engineering. The communication network shall be chosen such that the latency of data communication is avoided.

- 4.3.4.** The SMU unit shall be of RTU type to acquire data on continuous basis and transmit the data to the SCADA for further processing with provision of seamless Data interface means. The data of SMU shall have logical capabilities to perform any interlocking and protection logics as per the process requirement.

**4.4. Drawings & Documents, Standards & Type Test Reports:**

- 4.4.1.** During Detailed Engineering the following details of the SCMB shall be submitted for approval by CLUVPL.

- 1) GTP, GA, Schematic Diagrams, vendor document and Type Test Certificates
- 2) MQP
- 3) Design & details of Foundation, Mounting Structure of SCMB along with Canopy/rain shed.

- 4.4.2.** The SCMB and Components used shall conform to the latest edition of IEC/Equivalent Standards as specified below and the respective Type Test Certificates and Reports shall be submitted during Detailed Engineering.

**Enclosure:**

1. UL 94V: Standard for Safety of Flammability of Plastic Materials for Parts in Devices and Appliances testing. (Flammability Test)
2. UL 746C: Standard for Polymeric Materials - Use in Electrical Equipment Evaluations (UV Resistance Test)
3. IEC 62262/EN 50102: Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts -IK code. (Mechanical Impact Test)
4. BIS 2147/IEC 60529: Degrees of Protection Provided by Enclosures for Low Voltage Switchgear and Control gear (IP Conformity)

5. IEC 62208: Empty enclosures for low-voltage switchgear and control gear assemblies - General requirements.
6. IEC 60068: Environmental Testing of Electronic Equipment (Ageing Test)

**SPD:**

7. IEC 61643-11: Low-voltage surge protective devices - Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods

**DC Isolator:**

8. IEC 60947-3: Low-voltage switchgear and control gear - Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units.

**DC Fuses:**

9. IEC 60269-1,6/UL 2579: Low-voltage fuses with high breaking capacity for industrial and similar purposes - Part 1: General requirements Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems.





## SECTION 5.0 SOLAR INVERTER

### 5.1. General Requirements of Inverter

The Inverter or Power Conditioning Units (PCU) shall consist of solid-state electronic switch along with all associated control, protection, measuring instruments and data logging devices. The Inverter shall be Indoor / Outdoor type Grid connected Central Inverter designed for solar applications. The system shall incorporate a unidirectional Inverter and shall be designed to supply the 3 phase AC power to the grid at load end. The Inverter output shall always follow the grid voltage & frequency by sensing the grid voltage and Phase and the Inverter shall always remain synchronized with the grid. The Inverter shall have the capability to supply dynamically varying reactive power support, so as to maintain power factor in the range of 0.95 Lag to 0.95 Lead during normal operating conditions. All the three phases shall be supervised with respect to rise/fall in programmable threshold values of frequency.

- 5.1.1. The Inverter Design shall be of self commutated with Pulse width modulation technology.
- 5.1.2. The Inverter shall have suitably rated DC Contactors/Circuit Breakers to allow safe start up and shut down of the system in the DC side of Inverter.
- 5.1.3. The Central Inverter shall have suitably rated in built AC Circuit Breakers to isolate the PV system from grid during abnormal conditions. AC Breaker shall have inbuilt with CT protection for each phase and earth fault protection. The AC Breaker shall be equipped with adequate protection relays, fuses, annunciations and remote operating and controlling facility through SCADA from the PESS.
- 5.1.4. Inverter shall have emergency stop push button for tripping of inverter with complete DC & AC electric isolation.
- 5.1.5. The central Inverter shall be transformer less design with necessary provision for connecting to a external Inverter Grade Transformer for galvanic isolation.
- 5.1.6. Each solid-state electronic device shall have to be protected to ensure long life of the Inverter as well as smooth functioning of the Inverter.
- 5.1.7. Complete inverter along with cooling system shall be of proven design.
- 5.1.8. Internal Surge Protection Device (SPD) shall be provided in the Inverter on DC and AC side. It shall consist of Metal Oxide Varister (MOV) type arrestors. The discharge capability of the SOD shall be at least 12.5kA at 8/20 micro second wave.
- 5.1.9. The Inverter shall have maximum power point tracker (MPPT) for operating at its maximum power point. Modular system design may be adopted in a view to harness optimum solar power during lesser irradiation conditions and to maintain equal aging of Inverter Power modules.
- 5.1.10. The Inverter shall have the feature to work in tandem with other similar Inverters.
- 5.1.11. The Inverter front panel shall be provided with a display (LCD or equivalent) of all-important parameters such as DC input voltage, DC input current, AC output voltage, AC output current, AC output power, power factor, frequency etc. Display should be simple

and self explanatory to show all the relevant parameter relating to Inverter operational data and fault condition. Display shall have local keypad for system control, monitoring instantaneous system data, event logs, data logs and changing set points.

**5.1.12.** The Inverter shall be connected to the Supervisory Control And Data Acquisition System, (SCADA) for monitoring and controlling from the Operating Stations installed at the Control Room at PESS.

**5.1.13.** The Inverter shall be earthed as per manufacturer recommendation.

**5.1.14.** The efficiency of the Inverter shall be equal to or more than 98 % at 75% load as per IEC 61683. Contractor shall submit the conversion efficiency curves on partial output powers for the Inverter.

**5.1.15.** The Inverter enclosure and internals including nuts, bolts etc shall have to be adequately protected, taking into consideration the atmosphere and weather prevailing in the area.

## **5.2. Control & Protective Requirements of Inverter**

**5.2.1.** The Inverter shall be complying to Statutory norms, CEA regulation and SLDC requirements. The Inverter shall be capable of supplying reactive power as per grid requirement, during solar generation hours. The Inverter shall support load PF from 0.85 Lag to 0.85 Lead. Inverter shall have Active Power limit control, Reactive Power and Power Factor control feature. Plant operator shall be able to start and stop the inverter and shall have the control to set Active power, Reactive power and Power factor limit set points through SCADA HMI and Local Control Display Unit.

**5.2.2.** The Inverter shall have internal protection arrangement against any sustained fault in the feeder line and against lightning in the feeder line. Protection against short circuit, Internal Surge, loss of synchronization, over temperature, DC bus over voltage, DC reverse voltage, cooling fan failure and, earth leakage faults and any sustained fault in the feeder line.

**5.2.3.** Inverter system shall also include negative sequence protection such that if the balancing of 3 Phase system failed, the protection shall envisage isolation of the Inverter from the circuit.

**5.2.4.** The Inverter shall have self protective and self diagnostic feature to protect itself and the PV array from damage in the event of Inverter component failure or from parameters beyond the Inverter's safe operating range due to internal or external causes.

**5.2.5.** The Inverter shall have special safety features like active Anti Islanding Detection and Isolation facility.

**5.2.6.** In case of grid failure, the Inverter shall be re-synchronized automatically with grid, on revival of power supply after ensuring the stability of the Grid.

**5.2.7.** The design and operation of Inverter shall be such as to limit the individual and total harmonic distortions (THD) within the limits as per IEEE 519.

### **5.2.8. Fault Ride Through Functions:**

#### **1. Low/High Voltage Ride-Through (LHVRT) Function:**

The Inverter should not get tripped in the event of voltage drop for a pre determined time as per regulatory norms and the Inverter need not stay in grid

after this predetermined time if the voltage does not develop to a certain percentage of rated value as per regulatory norms.

## 2. **Low/High Frequency Ride-Through (LHFRT) Function:**

Immediate disconnection when momentary frequency disturbances should not occur. LHFRT function shall allow Inverters to stay connected if such frequency excursions are for short time durations and operate as per regulatory norm limits.

## 3. **Power-frequency droop Function:**

Inverters shall not switch off abruptly. Inverters shall be required to stay connected incase of Over-frequency transients occurs in the grid. The Power-frequency function requires that the inverter reduces the output power according to a preconfigured droop.

### 5.3. **Operating Modes of Inverter**

**5.3.1. Standby Mode** - The inverter is powered and it is waiting for a start command. The power-up initialization routine is performed and the inverter unit is ready. There are no active faults. The DC and AC contactors are open.

**5.3.2. Basic System Operation (Full Auto Mode)** - The start command is active and all start conditions including the conditions such as sufficient solar irradiance and the grid voltage and frequency are in range. The inverter synchronizes and connects to the grid. After the grid connection, the DC contactors will be closed. The system shall automatically begin to export power to the Grid. The maximum power point tracker (MPPT) state is the normal operation state of the inverter when the inverter is feeding power to the grid. The inverter is producing maximal power under available conditions.

**Maximum Power Point Tracker (MPPT)** – The microprocessor based MPPT shall incorporate suitable control algorithm to adjust the voltage of the SPV array to optimize energy fed into the grid. Maximum power point tracker shall be integrated in the Inverter to maximize energy drawn from the Solar PV array at all seasons and in varying solar insolation conditions. The details of working mechanism of MPPT shall be furnished by the Contractor. Multi MPPT Configuration and Master slave configuration shall also be considered as applicable.

**5.3.3. Sleep Mode** - Automatic “sleep” mode shall be provided so that unnecessary losses are minimized at night. The start command is active but the inverter is waiting for all start conditions to be filled. The start conditions includes a sufficient DC voltage level and corresponding time delay as well as wake up signals.

### 5.4. **Technical Requirements of Inverter:**

#### 5.4.1. **Basic Technical Requirements:**

1. Service : Outdoor/ Outdoor Containerized / Indoor type Grid tied Central Inverter
2. Nominal Output Power in KW at : As per System Requirement.

Unity PF and at Nominal rated voltage of the inverter at an Ambient Temperature of 50° C	Note: This Capacity shall be the basis for arriving at the Total AC Power Capacity of the Solar Plant.
3. Operating Output AC voltage range	: +/-10 % Nominal Rated AC Voltage.
4. Minimum Efficiency at 75 % load	: ≥ 98% as per IEC 61683.
5. Output frequency Range	: 50 Hz, +4% and -5 %
6. Power Factor Range (Adjustable)	: 0.85 Lead to 0.85 Lag
7. Maximum Input voltage	: 1500 V DC
8. Total Harmonic Distortion of Current (THDi)	: Less than 3 % at nominal power.
9. Humidity	: 15%-95%, non- condensing
10. Enclosure Ingress Protection	: IP65 for Out Door type IP54 for Out Door containerized type IP2X for Indoor Type
11. Maximum Noise at nominal power for Indoor type	: <90 dbA (at one meter distance)
12. Communication Port Type	: Modbus/TCP, Ethernet

**5.4.2. Additional Technical Requirements:** The Inverter shall have the following features:

- a) No load loss < 1% of rated power and maximum loss in sleep mode shall be less than 0.05%.
- b) Sinusoidal current modulation with excellent dynamic response.
- c) Dynamic VAR controller with Set point pre-selection.
- d) Unit wise and integrated data logging.
- e) Power regulation in the event of thermal overloading
- f) Night VAR Compensation.
- g) Bus communication and connectivity conforming to IEC 60870-5-104 or IEC 61850 (Ethernet) for integration. Alternatively MODBUS, TCP/IP, Power line carrier communication (PLCC) are also acceptable.
- h) DC side Operating point diagnosis using I-V curve to evaluate the PV array performance.
- i) Integrated protection in the DC and three phase system
- j) Insulation monitoring of the PV array.
- k) PID monitoring if applicable.
- l) Earth Fault Protection – With Ground Fault Detector Interrupter (GFDI) to detect both AC and DC ground faults or any other suitable device.

**5.4.3. Special requirement for Outdoor Inverters with metallic enclosure of any type (Containerized Type).** In such case, in addition to the compliance to all the type tests and

technical parameters specified, the Inverter assembly must satisfy the following conditions

- i. If the Inverters are housed in the enclosure in more than two rows, there shall be easy access for all Inverters and it's components and at least 500 mm corridor in between the rows.
- ii. The enclosure shall be of proven design in such a way to withstand the harsh environmental conditions for complete life of plant. The Contractor shall submit valid documentary proof for the same.
- iii. The Inverters shall be placed on a raised masonry / concrete platform of minimum 1 Mt height from FGL. The user platform around the inverter shall be of minimum one meter wide.

#### 5.5. Requirements of Standards and Test Certificates:

The Central Inverter shall conform to the latest edition of IEC / equivalent Standards as specified below, and the Type test certificates and Reports for the same shall be submitted for CLUVPL approval.

1. Efficiency Measurements : IEC 61683.
2. Environmental Testing : IEC 60068 -2-1,2,6,14,27,30.
3. EM Compatibility (EMC) : IEC 61000-6-2, IEC 61000-6-4 & other relevant parts of IEC 61000.
4. Electrical safety : IEC 62109-1&2.
5. Anti-Islanding Protection : IEC 62116.
6. Ingress Protection : IEC 60529.
7. Overall efficiency of Grid connected PV power systems : EN 50530.
8. Harmonic Measurements : IEEE 519.
9. Grid Connectivity : Relevant latest CEA Regulations and latest Grid Code as amended and revised from time to time.

#### 5.6. Drawings & Documents:

Contractor shall submit the following documents for CLUVPL approval during Detailed Engineering.

1. GTP, GA, Schematic diagrams, BoM, MPPT algorithms & control schemes, Type test Reports and Installation and O & M Manual.
2. Manufacturing Quality Plan.





## SECTION 6.0 INVERTER DUTY TRANSFORMER

### 6.1. Multi Winding Inverter Duty Transformer

The design, engineering, manufacture and testing of the oil cooled multi winding (up to 5) Inverter duty Power Transformer in each block and its related equipment shall be carried out as per the latest Indian /International standards, Indian electricity rules, relevant code of practices and requirement of Central Electricity Authority/Chief Electrical Inspectorate of the respective state. Salient standards and code of practices are given below:

- |   |   |                                 |
|---|---|---------------------------------|
| 1. Power transformers   | : | BIS 2026, BS 171 &<br>IEC 60076 |
| 2. Guide for loading of oil immersed transformers                 | : | BIS 6600 / IEC 354              |
| 3. Tap changer  | : | IEC 60542                       |
| 4. Fittings and accessories                                       | : | BIS 3639                        |
| 5. Insulating oil for transformer                                 | : | BIS 335                         |
| 6. Bushings for alternating voltages above 1000 volts             | : | BIS 2099                        |
| 7. Dimensions for porcelain Transformer Bushings                  | : | BIS 3347                        |
| 8. Recommended practice for hot dip galvanizing of iron and steel | : | BIS 2629                        |
| 9. Methods of testing of coating of zinc coated items             | : | BIS 2633                        |
| 10. Colour for ready mixed paints and Enamels                     | : | BIS 5                           |

Except where specified otherwise herein, all material, equipment and construction shall confirm to all the acts, rules and standards indicated.

### 6.2. Technical Particulars

The transformer offered shall meet the following technical particulars:

- |  |   |  |
|--|---|--|
| 1. Service   | : | Outdoor  |
| 2. Capacity  | : | As in Section 2 - Design Basis   |
| 3. Cooling   | : | ONAN   |
| 4. Voltage ratio   | : | To suit the System Requirement   |
| 5. Number of phases  | : | 3  |
| 6. Primary Voltage   | : | To suit the System Requirement   |
| 7. Secondary Voltage   | : | To suit the System Requirement   |
| 8. Winding connection - HV & Multi Wdg LVs & Vector Group          | : | As per recommendation from inverter manufacturer                                   |
| 9. Impedance voltage HV to LV Windings and LV to Other LV Windings | : | As per recommendation from inverter manufacturer & To suit the System Requirement. |
| 10. Rated frequency  | : | 50 Hz  |
| 11. HT short circuit level   | : | As per system requirement & Standards  |

12. System earthing at HV : As per system requirement & Standards
13. System earthing at LV : Recommendation from inverter manufacturer
14. Highest system voltage : 36 KV
15. Insulation level:
  - HV power frequency : 70 KV
  - Impulse : 170 KV
16. Tap changers and Tapping : Off circuit type, with +/-2.5 % and +/- 5% taps. (5 Positions)
17. Temperature rise:
  - Top oil, by thermometer : 45° C
  - Winding, by resistance : 55° C
18. Terminal arrangement:
  - HV Side : Cable box or Outdoor HV bushing type
  - LV Side : Cable box
19. Neutral : As per Recommendation from inverter manufacturer & System requirement
20. Shield Winding : Shall be copper shield and as per Recommendation from inverter manufacturer & System requirement
21. Transformer total losses : Not more than 1% of capacity
22. Fixed loss : Not more than 0.1% of capacity
23. Load loss : Not more than 0.9% of capacity

**6.3.** The transformer shall be of proven design and robust maintenance free construction, featuring liberal use of active materials viz. core, iron and copper to keep down losses at low levels and consequently the operating temperature well within the limits of oil cooled transformers.

**6.4. Constructional Features**

**6.4.1.** The transformer shall be designed to withstand the extremes of all magnetic, electrical, mechanical and thermal stresses and gas pressures which may be encountered during its normal and abnormal operating conditions.

**6.4.2.** The transformer shall be capable of withstanding the short circuit stresses due to a terminal fault on any one winding with full voltage maintained on the other windings for minimum period for three (3) seconds and verification methods shall be as in BIS 2026.

**6.4.3.** The transformer shall be capable of working at high efficiency in both the directions of power flow.

**6.4.4.** All materials used shall be new and of tested quality conforming to applicable national/International standards and Indian Electricity Acts/rules and the details of same shall be furnished in the MQP and verified during detailed engineering. Equipment shall be transportable and capable of installation at site with ease and without damage. It shall give continuous reliable operation over long periods under worst specified site conditions. All similar parts shall be interchangeable.



## **6.5. Tanks**

**6.5.1.** Tanks shall be welded construction and fabricated from tested quality commercial grade carbon sheet steel of adequate thickness. The transformer tank top shall be provided with detachable cover with bolted flanged gasket joint. Lifting lugs shall be provided for removing the cover with core and coil assembly. Tank covers shall be welded from tested MS flats adequately reinforced externally by structural steel stiffeners. Two side walls of the tank shall be provided with extended finned tubes to act as a radiator.

**6.5.2.** All seams flanges, lifting lugs, braces and permanent parts attached to tank shall be double welded. Joints which may have to be opened for inspection and/or repairs shall be machined surface and be made oil tight with renewable oil resistant gaskets and seals. Guides shall be welded to the inner side of the tank to facilitate tanking and un-tanking. Tank shall be suitable for full vacuum required during drying out for oil filling and shall withstand the required pressure.

**6.5.3.** All removable covers shall be provided with weather proof, hot oil resistant, resilient gaskets. The openings for all removable covers shall be made on suitably elevated bosses/contour frames. The design shall be such as to prevent any leakage of water into or oil from the tank. Adequate space shall be provided at the bottom of tank for collection of sediments. After fabrication and welding of cooling fins, tank and its fittings with respective valves shall be pressure tested with transformer oil to withstand specified pressure as stipulated in BIS 2026. No valve shall drip and no weld or joint shall sweat.

**6.5.4.** All gasket joints shall be perfectly oil tight under all conditions of operations. Gaskets shall be of neoprene or approved oil resistant material and so placed that they will not be exposed to weather. Damaged gaskets shall not find way into the tank.

## **6.6. Core**

**6.6.1.** The core shall be constructed from M4 grade (or better), cold rolled, non-aging, grain oriented, silicon steel laminations complied to BS:601. Core, its supporting steel and insulation shall be of such design, material and construction that harmful changes in electrical or physical properties shall not occur during the life of transformer. Limbs and yoke shall have similar section to minimize effects of transverse flux. Butt joints between yoke and limbs shall not be made. Generous cooling ducts shall be provided for core heat dissipation.

**6.6.2.** Core and winding shall be strongly braced to prevent displacement or distortion during transportation or abnormal electrical conditions in service. The core and coil assembly shall be securely fixed in position so that no shifting or deformation occurs during movement of transformer or under short circuit stresses.

**6.6.3.** Each core bolt and parts of core clamping framework shall be insulated from the core laminations and tested after assembly of core to withstand 2 kV RMS for one (1) minute. Preference shall be given to such construction of core, which does not involve use of core bolts. The core design shall be such as to limit the flux density to 1.6 Tesla.

## **6.7. Windings**

**6.7.1.** Each coil shall be wound of paper insulated, continuous smooth, high grade, electrolytic copper conductor, without sharp corners or bends and shall be adequately transposed to



minimize eddy current losses and equalize current and temperature distribution. Successive coils may be smoothly brazed or welded in an accessible location. Abrasive damage and high dielectric stresses in insulation shall not occur. Similar coils shall be interchangeable. Liberal ducts shall be provided for oil circulation and prevention of 'hot spots' that may affect insulation life. Insulation of windings and other live parts should be adequate to sustain 110% of rated operating voltage continuously and proposed inverter's ramp up voltage. Current density of windings shall be not more than 3A/mm<sup>2</sup>.

**6.7.2.** An earthed screen shall be installed between the primary and secondary windings to capacitively decouple primary and secondary windings and eliminate the effects of high frequency transients on the other winding

**6.7.3.** The coils shall be manufactured from electrolytic copper conductor. The materials used in the insulation and assembly of the windings shall be insoluble, non-catalytic and chemically in-active in the hot transformer oil and shall not soften or otherwise be affected under the worst operating conditions. Insulating material shall be of proven design, Coils shall be so insulated that impulse and power frequency voltage stresses are minimum

**6.7.4.** Coil supports shall be by permanently secured, highly compressed and dried, regularly spaced insulating spacers. Coil clamping rings, if made of steel shall each be earthed by connection to core clamping structure and shall otherwise be of insulating material built up from flat laminations.

**6.7.5.** Coil assembly shall be suitably supported between adjacent sections by insulating spacers and barriers. Bracings and other insulation used in assembly of winding shall be arranged to ensure free circulation of oil and to reduce the hot-spot of winding.

**6.8. Fasteners**

Clamping bolts for current carrying parts inside oil shall be of oil acidity resistant material. Terminal screws, studs, nuts and bolts shall be of non-ferrous material, threaded to BIS. All fasteners exposed to weather shall either be nonferrous or hot dip galvanized or electroplated conforming to relevant BIS.

**6.9. Cooling**

The transformer shall be provided with finned tube radiator panels on two sides to cool the oil. The finned tubes shall be of heavy gauge, corrosion resistant steel construction. All internal surfaces of the tubes shall be pickled, free of all rust and scale and passivated. External surfaces shall be sand blasted and several coats of weather proof paint applied so as to prevent rusting.

**6.10. Bushings**

**6.10.1.** Oil communicating type porcelain bushing and its terminal fittings shall carry full rated current continuously without exceeding temperature of any component beyond 70°C. These shall operate satisfactorily in heavy sand storms, rain with lightning and other site atmospheric conditions. Freedom from corona and radio interference shall be ensured. Bushing shall be wet process porcelain with uniformly brown external shell. All bushings

shall be designed or equipped to withstand arcing or flashover without damage to seals or any vital part. Terminal bushing shall be oriented for the minimum clear distances in air as per CBIP stipulation. Minimum distance between terminals of two windings of different voltage shall equal the phase-to-phase distance of the HV winding.

**6.10.2.** Bushing location shall provide adequate phase and ground clearances. Bushings shall be suitable for surrounding atmosphere and shall have creepage distance.

**6.11. Cable box and disconnecting chamber**

**6.11.1.** On the HV side, weather proof cable box with disconnecting chamber shall be provided for disconnecting and moving away the transformer without unsealing the cables or draining oil from the main tank. The disconnecting chamber shall be air insulated, removable links and removable covers shall be provided for this purpose.

**6.11.2.** The HV cable box shall be of steel plate construction and shall have other accessories including air vent, drain plug etc. and provision for terminating Aluminium XLPE cables/conductor to suit system requirements. The box shall be suitable for heat shrinkable type/push on type/tapex type termination kits of proven design against short circuit levels as per - standards and system requirements for one second with a peak value.

**6.11.3.** The HV cable box shall be suitable for terminating required Cable size & runs of XLPE, Aluminum conductor cable(s).

**6.11.4.** Cable box and disconnecting chamber shall have proper earthing arrangement and suitable external support.

**6.11.5.** Phase to phase and phase to ground clearances within the chamber shall be such as to meet standard/statutory requirements. Clearances shall be subject to approval by CLUVPL during detailed Engineering.

**6.11.6.** LV cable boxes shall be of steel plate construction, with disconnecting chamber, weather proof type complete and shall have other accessories including air vent, drain plug etc and provision for terminating Aluminium XLPE cables to suit system requirements. The bottom plate shall be of non -magnetic stainless steel, brass or aluminum. Phase to phase and phase to ground clearances within the chamber shall be such as to meet standard/statutory requirements. Clearances shall be subject to approval by CLUVPL during Detailed Engineering.

**6.12. Marshaling box**

The marshaling box shall be corrosion resistant sheet steel, weather proof, dust and vermin proof construction conforming to degree of protection IP55 with 16 SWG thick sheet steel water tight hinged and padlocked doors, fully wired, for terminating all wiring for control, protection and alarm circuits of the transformer. All wiring shall be of 1100V grade, oil and fire resistant, multi core copper cables. All devices and terminal blocks within the marshaling box shall be identified by symbols corresponding to those used in applicable schematic or wiring diagram.

**6.13. Insulating Oil**

Transformer shall be filled with mineral insulating oil conforming to BIS: 335. Material in contact with the oil shall be such as not to contribute to the formation of acid in oil.

#### **6.14. OFF Circuit Tap Changers**

OFF circuit tap changers suitable for variation of secondary (constant flux voltage variation) shall be provided on the primary Windings. The range of taps shall be as specified. The transformer shall be capable of operation at its rated KVA on any tap provided the voltage does not vary by more than  $\pm 10\%$  of the rated voltage corresponding to the tap. The winding including the tapping arrangement shall be designed to maintain electromagnetic balance between two primary and one secondary windings at all voltage ratios. The tap switches shall be of robust construction, of adequate rating, capable of repeated operation and of withstanding short-circuit forces. All contacts shall have ample area and shall be held in position under strong contact pressure to avoid contact pitting.

#### **6.15. Grounding**

Two grounding pads, located on the opposite sides of the transformer tank, shall be provided for connection to station ground mat. The core coil assembly shall be directly connected to this ground bus by removable bolted link for effective grounding. Ground terminals shall be provided on marshaling box, cable end box etc. to ensure its effective earthing. For continuity of earth connection, all gasket joints shall be provided with minimum two numbers braided copper conductor jumpers of adequate size.

#### **6.16. Fittings and Accessories**

The transformer shall be complete with oil for first filling and all standard fittings and accessories as per BIS 2026 including the following:

- (1) First fill of oil as per IS2026 with 10% extra oil
- (2) Oil conservator with filling hole, cap, and air cell separator for the main and OLTC oil compartments.
- (3) Drain plug for conservator
- (4) Magnetic oil level gauge with alarm contacts
- (5) Prismatic oil level indicator
- (6) Silica gel breather for conservator
- (7) Double float Buchholz relay with alarm and trip contact
- (8) Shut off valve for Buchholz relay on both sides
- (9) Dial type oil temperature indicator with alarm, trip contacts and maximum temperature indicator
- (10) Dial type CT operated winding temperature indicator with alarm, trip contacts and maximum temperature indicator
- (11) Thermometer pockets
- (12) Pressure relief valve with trip and alarm contacts
- (13) Air release vent, drain plug for radiators.
- (14) Flanged filter valve at top and bottom
- (15) Lifting lug and jacking pads
- (16) Rating and terminal marking plate
- (17) Bi-directional flanged wheels

(18) Detachable radiators complete with top and bottom valves

**6.17. Paint and Finish**

All surfaces to be painted including interior and exteriors of tanks, mechanisms and enclosures and other metal parts. These shall be shot or sand blasted or chemically treated to remove all rust, scale, grease and other adhering foreign matters. All steel surfaces in contact with hot insulating oil, as far as possible, shall be painted with not less than two (2) coats of heat resistant and oil insoluble paint. Steel surfaces, exposed to weather shall be given two (2) coats of zinc chromate and two (2) coats of finishing paint light grey No. 631 of BIS:5 with glossy finish except for panels which shall have matt finish. The final finished thickness of paint film on steel shall not be less than 100 microns and shall not be more than 150 microns

**6.18. Tests and Inspection**

The transformer shall be designed and manufactured to national and international standards. After manufacture, it shall be subjected to inspection and testing in the manufacturers' works which should have meters and testing equipment Calibrated by the NABL accredited Agency. The tests shall be carried out as per approved MQP in the presence of the CLUVPL Engineer. The various tests to be carried out shall be as follows:

- (1) Assembly inspection
- (2) Measurement of winding resistance
- (3) Measurement of voltage ratio
- (4) Check of vector group
- (5) Measurement of impedance voltage, short circuit impedance and load loss
- (6) Measurement of no load loss and no load current
- (7) Temperature rise test
- (8) Separate source voltage withstand test
- (9) Induced over voltage withstand test

The contractor shall submit Type Test Reports of the transformer for CLUVPL approval during Detailed Engineering for short circuit and impulse voltage. In respect of short circuit test, submission of type test report for the similar transformer with relevant calculations for the offered transformer is also acceptable and Type Test Report of similar transformer will be evaluated as per Annexure B of IEC 60076-5, 2006.

**6.19. NIFPS.**

All inverter Duty transformer having oil capacity more than 2000 litres shall be provided with NIFPS.

**6.20. Protection**

Transformer protection facility shall be as per relevant CEA regulation with latest amendment.

**6.21. Drawings & Documents to be submitted During Detailed Engineering:**

1. IDT - GTP, GA, Type Test certificates. (With the following List of documents)
  - a. GTP of transformer as per BIS 2026

- b.** Calculations for conductor current density, core flux density, radiator sizing, tank & cover wall thickness sizing, losses, WTICT burden calculation
  - c.** Rating and diagram plate of transformer
  - d.** Diagram plate for Valve schematic diagram
  - e.** Oil filling instruction plate
  - f.** GA of transformer and core coil assembly including shield winding
  - g.** GA of HV & LV cable boxes including bushings and marshalling boxes
  - h.** Detailed BOM with vendor details
  - i.** Schematic, wiring and terminal Diagrams of marshalling box
  - j.** Foundation and rail arrangement
- 2.** IDT - MQP
- 3.** IDT - Vendor Documents of Auxiliaries including NIFPS



## SECTION 7.0 POWER COLLECTION SUB STATION

- 7.1.** The Contractor shall establish Power Collection Sub Stations (PCSS) to collect the power generated from the PV modules. If required, Sub Stations to combine a group of PCSS and/or integration of PCSS into PESS may also be considered.
- 7.2.** The PCSS shall consist of a Pre Engineered Building (PEB) or conventional concrete Building to accommodate the indoor equipment.
- 1) Indoor / Outdoor Containerized Central Inverter(s)
  - 2) Outdoor type Oil cooled, (Multi Winding) Inverter Duty Transformer(s) including NIFPS
  - 3) Indoor / Outdoor, HT switch gear(s) with metering and protective relays
  - 4) Cables, Earthing Systems & Lightning Protection Systems.
  - 5) Battery with charger & DCDB
  - 6) UPS
  - 7) Auxiliary transformer & ACDB, Lighting System
  - 8) RIO / CMU for SCADA
  - 9) Fire Alarm System and Firefighting Equipment.
  - 10) Voice communication system.
  - 11) Other Equipment as per the system requirement.
- Detailed specifications of the above equipment are furnished in their respective Sections.
- 7.3.** The location of each PCSS shall be selected in such a way to minimize cable losses. Each PCSS shall be capable for collecting power from the IDT at a minimum HT voltage of 33KV and to transfer it to Power Export Sub Station (PESS) through Underground cable or through Overhead lines. PCSS shall be located in a suitable location and shall comprise of one incoming and one Outgoing (ICOG) indoor/PCOB type HT Switchgear with suitable control, Protection and metering.
- 7.4.** The overall Layout of PCSS Indoor / Outdoor equipment along with sufficient and statutorily required space allotted for each equipment shall be furnished for approval by CLUVPL, during detailed engineering based on the system requirements.
- 7.5.** The oil cooled Inverter duty transformer (IDT) which steps up LT power to HT power shall be an outdoor installation in a fenced area.
- 7.6.** The HT Switchgear for PCSS shall be of Incoming Outgoing (ICOG) configuration and either  
Indoor Switch Board Type  
or  
Outdoor Type with PCOB and other outdoor accessories mounted on suitable H Pole Structures and with Indoor C&R Panel. The detailed requirement of outdoor equipments for designing 33 kV switchyard of ICOG Bay for PCSS are furnished under Section:20.0(Power Evacuation Scheme) of this technical specification.

- 7.7. All power, control and Communication cables shall be laid and dressed properly on cable trays or in trenches. Proper Lightning Protection System & Earthing System shall be incorporated as per Standards / Specificationn.
- 7.8. A suitable capacity of indoor 110 V DC system shall be provided for meeting the power requirement of HT switchgears, Emergency lights, RTU's, etc. The battery together with the charger and DCDB shall be suitable to meet the DC load. The Positioning and facilities required for the normal safe operation of Battery System shall be complied as per the Battery Manufacturer's recommendation.
- 7.9. Each PCSS shall be provided with suitable capacity of indoor Industrial type UPS System for meeting the Main / Redundant power requirement of applicable equipment. The Positioning and facilities required for the normal safe operation of UPS Battery System shall be complied as per the Battery Manufacturer's recommendation.
- 7.10. Auxiliary Power System at 415 V, 3 Phase, 50 HZ shall be provided in PCSS to power up the auxiliary loads like 110 V DC system battery chargers, UPS, lighting, ventilation fans, Pumps and other system loads.
- 7.11. RIOs / CMUs and other related devices shall be installed to handle inputs / Outputs & interface between all the equipment and SCADA as per Architecture of SCADA.
- 7.12. Fire Alarm System, Fire fighting Equipment, Voice Communication gadgets, CCTV devises and other equipment required as per System Design shall be suitably installed.
- 7.13. **Drawings & Documents:** During Detailed Engineering the following details of the PCSS shall be submitted for approval by CLUVPL.

1. PCSS Equipment Layout.





**SECTION 8.0  
CABLES & CABLING**

**8.1 Introduction:**

**8.1.1** This section intends to specify the technical requirements of the cables as identified and their cabling procedures that are used in various schemes of the Solar Power plant and the Standards that they have to conform as listed below. If, for 220 kV Power Evacuation Scheme, UG cabling is considered by the Contractor, then the same shall be in compliance of relevant BIS/IEC Standards.

Cable & Service	Standards (Latest Version)
<b>DC Cables</b>	
<b>Solar EBC Cables - Modules to SCMB</b>	<b>EN 50618:</b> Electric Cables for Photovoltaic Systems <b>BS EN 60228:</b> Conductors of Insulated Cables <b>IEC 62852:</b> Connectors for DC-application in photovoltaic systems - Safety requirements and tests
<b>DC Power Cables -SCMB to Inverter</b>	<b>BIS 7098 (Part 2):</b> Cross – linked Polyethylene PVC sheathed cables. <b>BIS 5831:</b> PVC insulation and sheath of electric cables
<b>Control Cables – DC Control Circuits &amp; AC Control Circuits</b>	<b>BIS 1554 Part 1:</b> Specification forPVC Insulated (Heavy Duty) Electric Cables - Part 1: For Working Voltages Up to And Including 1100 V
<b>AC Cables</b>	
<b>HT AC Power cables - IDT to PESS Aux Trafo to PESS PESS to PSS</b>	<b>BIS 7098 (Part 2 and 3):</b> Cross linked Polyethylene PVC sheathed cables. <b>BIS 8130:</b> Conductors for Insulated Electric Cables and Flexible Cords - Specification <b>BIS 5831:</b> PVC insulation and sheath of electric cables
<b>LV Power Cables- Inverter to IDT &amp; Other LV Power Cables - Auxiliary Supply system</b>	<b>BIS 3975:</b> Mild Steel Wires, Formed Wires and Tapes for Armouring of Cables <b>BIS 1255:</b> Code of practice for Installation and maintenance of power cables up to and including 33 kV rating
<b>Wiring Cables – Small Power</b>	<b>BIS 8130:</b> Conductors for Insulated Electric Cables and Flexible Cords - Specification <b>BIS 694:</b> PVC insulated unsheathed and sheathed cables/cords with rigid and flexible conductor for rated voltages up to and including 450/750 V.

**8.1.2 Basic Design requirements:**

**8.1.2.1 DC Cables:**



- 1) The size of both solar EBC cable and DC power cables shall be finalized during detailed engineering and the same shall be designed such that, the maximum voltage drop calculated at conductor resistance corresponds to at 75°C from the first PV module to inverter should be less than 2%. Short circuit current for the cable sizing shall be as per system requirement and fault clearing time shall be considered for actual system fault clearing time.
- 2) Along with other standard markings on the outer sheath, CLUVPL marking shall be provided on regular 1 meter interval for both solar EBC cable and DC power cable and both cables shall have (+) and (-) colour identification.

#### **8.1.2.2 AC Cables:**

- 1) AC Cables shall be designed such a way that voltage drop does not exceed 3% between Inverter Output to Point of Common Coupling (PCC), where Tariff Metering System is installed (NTS SS-2) at full load condition. Short circuit current for the cable sizing shall be as per system parameters furnished in Section 2.0 and fault clearing time shall be considered minimum 0.5 sec for cables from PCSS to PESS.
- 2) Manufacturer's identification mark, CLUVPL mark along with ISI certification mark shall be printed on the outer sheath (at 1 meter interval of the cable), as stipulated in latest BIS 7098 part 2.

#### **8.1.2.3 Sizing and drop calculations:**

The calculation of arriving at the sizing of cables considering the above requirements shall be submitted during detailed Engineering for CLUVPL approval.

**8.1.2.4 Sampling during Factory Acceptance Test: Sample** selection for final acceptance test for Solar EBC cables shall be as per **BIS 7098 P1**:Cross inked Polyethylene Insulated Thermoplastics Sheathed Cables - Specification. For other cables the criteria shall be as per their respective standards and the same shall be incorporated in MQP to be submitted for approval.

**8.1.2.5 General Requirements:** The clauses for Packing, installation procedures for cables at site and the Equipment & Accessories for installation are furnished commonly at the end of this Section and are valid for all the cables as applicable.

## **8.2 DC CABLES**

### **8.2.1 Solar EBC Cables and trenches:**

**8.2.1.1** DC cables (Electron Beam Cross linked) used for interconnecting PV modules, string to Y connector and Y connector to string combiner and monitoring boxes (SCMB) shall be suitable for 1.5KV DC system voltage, conforming to latest revision of EN 50618 and generally indicated as Solar EBC Cables. The cable shall have Tinned Copper Fine Stranded Wire Conductors (according to BS EN 60228, class 5) and cross linked insulation and sheath, fulfilling all the requirements of latest revision of EN 50618.

**8.2.1.2** Type test, routine test, acceptance tests for the cables shall be, as per the standard requirement. Type test certificate & report issued by NABL/ILAC accredited agency, GTP, cable cross section drawing, sizing and voltage drop calculation, derating details, cable schedule etc. shall be furnished during detailed engineering for approval by CLUVPL.

- 8.2.1.3** Cables for inter connection of modules shall be fixed to non-moving module mounting structure / column with adequate looping for allowing tilt of the module frame. Bunching of cables and tying to module frame with cable ties shall be not adopted as temperature rise of module frame tend to increase cable power loss and reduce cable life.
- 8.2.1.4** All the connectors used for the connecting solar EBC cables including Inter connecting PV modules, interconnecting rows, row interconnection to String Combiner & Monitoring Boxes and Cable to Cable to connections shall be done through Connectors / Multi-way Connectors, rated for 1500 V, conforming to latest IEC 62852 (no cable joint is allowed) and the certificate and report shall be submitted and all the connectors used should be of same make and type.
- 8.2.1.5** Solar EBC Cables from Y connector to (SCMB) shall be laid in HDPE Pipe (as applicable) of required thickness & diameter such that fill factor of the pipe should not be more than 40%. Both ends of the pipe and pipe joints, if any, shall be packed properly with suitable cable/Pipe sealing compounds / arrangements.
- 8.2.1.6** Procedure and depth of cable laying shall be as per BIS 1255 and details in this regard in relevant drawings shall be furnished during detailed engineering for approval by CLUVPL.
- 8.2.2 DC power cables:**
- 8.2.2.1** DC cables used for connecting String Combiner & Monitoring Boxes (SCMB) and Inverters and generally indicated as DC power cable, shall be suitable for 1.5 KV DC system voltage conforming to BIS:7098 P2 and shall have compacted, stranded copper/aluminium conductors (H4 grade, conforming to BIS 8130), XLPE insulation (conforming to BIS 7098 P2), galvanized steel armour (conforming to BIS 3975 & the minimum area of coverage of armouring shall be 90%), ST2FRLSH PVC outer sheath (conforming to BIS 5831).
- 8.2.2.2** Type test, routine test, acceptance tests requirements for the cables shall be as per the requirements of latest edition of BIS:7098 P2 and type test certificate and report issued by NABL/ILAC accredited agency, GTP, cable cross section drawing, sizing and voltage drop calculation, derating details, cable schedule etc. shall be furnished during detailed engineering.
- 8.3 AC CABLES**
- 8.3.1 HT AC Cables:**
- 8.3.1.1** The HT cables used for connecting IDTs, Auxiliary Transformer, PCSS to PESS shall be suitable for operating as per system requirement, conforming to latest BIS:7098 P2 or relevant BIS and of 3 core configuration. However, for tower line connectivity, single-core HT cable conforming to latest BIS:7098 P2 or relevant BIS, also shall be accepted and shall be finalized during detailed engineering.
- 8.3.1.2** The cable shall have multi-stranded, compacted circular, aluminium conductors (H4 grade, conforming to BIS 8130) and the insulation shall be of high quality XLPE material, conforming to BIS 7098 P2. The insulation shall be applied through an extrusion process and cross linked by chemical or better process. The conductor screen and insulation screen shall both be of extruded semiconducting compound and shall be applied along with the XLPE insulation in a single operation of triple extrusion process. The cable shall be shielded with copper tape over the extruded semi-conducting shield with minimum

overlap of 20% and the copper screen shall be suitable for carrying the system earth fault current.

**8.3.1.3** The cores shall be identified either by colour tape along the insulated core or running a number tape along the conductor. The cable shall be provided with an extruded ST2 PVC inner sheath, conforming to BIS 5831 with suitable fillers. Over the inner sheath, armour made up of galvanized flat steel strips or steel wire conforming to BIS 3975 (the minimum area of coverage of armouring shall be 90%) and ST2FRLSH PVC extruded outer sheath (conforming to BIS 5831) of preferably orange colour or black.

**8.3.1.4** Type tests, routine tests and acceptance tests for the cables shall be as per the requirements of latest edition of BIS:7098 P2 and type test certificate and report issued by NABL/ILAC accredited agency, GTP, cable cross section drawing, sizing and voltage drop calculation, derating details, cable schedule etc. shall be furnished during detailed engineering for approval by CLUVPL.

### **8.3.2 Inverter AC power cable and other LV Auxiliary Power System Cables**

**8.3.2.1** LV power cables used between inverter and transformer shall be of single core cable configuration, 3.3KV Grade, conforming to BIS:7098 P2). The cable shall have compacted, stranded copper/aluminium conductors (H4 grade, conforming to BIS 8130), XLPE insulation (conforming to BIS 7098 P2), aluminium armour (meeting requirement of BIS 3975 & the minimum area of coverage of armouring shall be 90%), ST2FRLSH and UV resistance PVC outer sheath (conforming to BIS 5831).

**8.3.2.2** Type test, routine test, acceptance tests requirements for the cables shall be as per the requirements of latest edition of BIS:7098 P2 and type test certificate and report issued by NABL/ ILAC accredited agency, GTP, cable cross section drawing, sizing and voltage drop calculation, derating details, cable schedule etc. shall be furnished during detailed engineering for approval by CLUVPL.

**8.3.2.3** All the other Auxiliary power cables used in the Solar Power Plant shall be copper/aluminium conductor cable, flat steel or steel wire armoured cables, XLPE insulated of 1100 V Grade (unless otherwise specified) and complying to latest BIS: 7098-part I. However, below 10 Sq mm, all the other LV power cables shall have copper conductor only and the minimum conductor size is 2.5 sq.mm.

**8.3.2.4** Type test, routine test, acceptance tests requirements for the cables shall be as per the requirements of latest edition of BIS BIS:7098 P1 and type test certificates and reports issued by NABL/ILAC accredited agency (for all the cables with size 50 sq. mm and above), GTP, cable cross section drawing, sizing and voltage drop calculation, derating details, cable schedule etc. shall be furnished during detailed engineering for approval by CLUVPL.

**8.3.2.5** All LT cables used in the project shall be as far as possible purchased from one manufacturer only.

### **8.3.3 Cables for Wiring works:**

**8.3.3.1** The wiring cables/Insulated Wires, generally used for wiring for the Electrical Schemes of the buildings such as Lighting, Ventilation/Heating, Air-conditioning, Power outlets etc, shall be PVC/XLPE insulated single core, colour coded, stranded Copper conductor rated for 450/750 V and conforming to BIS 694. The cable shall have FRLSH property and shall

have standard markings on outer surface at required interval, as per standards. Details on cable size selection and wiring layout shall be furnished during detailed engineering for CLUVPL approval.

- 8.3.3.2** Conductor strands, diameter and resistance of the conductor shall be in conformity with BIS: 8130. The stranded conductor shall be made of thin strands of electrolytic copper not less than 0.25mm. The number of strands shall be suitable for the size of the cable. However, the minimum number of strands shall be as follows:

SNo	Size of the wire	Thickness of the conductor	No. of Strands.
1	1.5 Sq. mm	0.25 or 0.3 mm	32 or 22
2	2.5 Sq. mm	0.25 or 0.3 mm	50 or 36
3	4.0 Sq. mm	0.3 mm	56
4	6.0 Sq. mm	0.3 mm	84

- 8.3.3.3** All wiring for connecting various services shall be through Concealed /Open type PVC / Steel conduits as applicable of reputed make and shall be decided during detailed engineering.

#### **8.3.4 Control Cables**

- 8.3.4.1** Control cables shall be 1.1 kV grade, minimum 2.5 sq mm multi strand copper conductor, PVC/XLPE insulated, multi core, PVC inner sheathed, armoured and overall FRLSH PVC sheathed conforming to BIS: 1554. The control cables shall have a minimum of 10% sparecores. The cable shall have standard markings on outer surface at required interval, as per standards. Details on cable size selection shall be furnished during detailed engineering.

- 8.3.4.2** The cables shall be suitable for laying on racks, in ducts, trenches, conduits and direct buried installation.

- 8.3.4.3** Control cable design with drawings shall be submitted during detailed engineering for CLUVPL approval.

### **8.4 GENERAL REQUIREMENTS**

#### **8.4.1 Packing of cables**

- 8.4.1.1** Cables shall be supplied in non-returnable wooden or steel drums of heavy construction and the surface of the drum and the outer most cable layer shall be covered with water proof cover. Both the ends of the cables shall be properly sealed with heat shrinkable PVC/ rubber caps secured by 'U' nails so as to eliminate ingress of water during transportation, storage and erection.

- 8.4.1.2** Each drum shall carry manufacturer's name, purchaser's name, address and contract number, item number and type, size and length of cable and net gross weight stenciled on both sides of the drum. A tag containing same information shall be attached to the leading end of the cable.

- 8.4.1.3** All cable wound in drums shall be from manufacturer and unwound cables delivered shall not be approved for installation.

## 8.4.2 Cable Installation

**8.4.2.1** All the works pertaining to fabricating/providing cable ducting/conduit/direct burial/tray arrangement/built up trenches and covering on trench, cross sectional details on of the said arrangement, drainage arrangement in built up trenches, duct banks, pull-pits and, cable laying, depth of cable laying, terminations and sealing etc. of all the cables (solar EBC, DC power cable, AC HT and LT power cables, wiring cables and control cables) shall be carried out as per latest BIS 1255/IE rules/statutory norms/relevant international standards.

**8.4.2.2** Details on fabricating / providing cable ducting / conduit / direct burial / tray arrangement / built up trenches and covering on trench, cross sectional details on of the said arrangement, drainage arrangement in built up trenches, duct banks, pull-pits and, cable laying, depth of cable laying, terminations and sealing etc. of all the cables shall be furnished during detailed engineering.

## 8.4.3 Details of cabling equipment

**8.4.3.1 Cable trays, Fittings & Accessories:** Cable trays shall be ladder/perforated type and it shall be ladder type for power & control cables and perforated for instrumentation cables. Cable trays, fittings and accessories shall be fabricated out of rolled mild steel sheets and hot dip galvanized as per relevant BIS. Cable trays shall have standard width and lengths. Thickness of mild steel sheets used for fabrication of cable trays and fittings shall be finalized during detailed engineering. Branching out cables from main cable route shall be done through suitable Cable troughs and the same and shall be hot dip galvanized as per relevant BIS.

**8.4.3.2 Support System for Cable Trays:** Cable tray support system shall be pre-fabricated type and design details will be finalized during detailed engineering. The system shall be designed such that it allows easy assembly at site by using bolting. All cable supporting steel work, hard wares fittings and accessories shall be prefabricated factory galvanized. All steel components, accessories, fittings and hardware shall be hot dip galvanized.

**8.4.3.3 PIPES, FITTINGS & ACCESSORIES:** The size of the pipe shall be selected on the basis of maximum 40% fill criteria. GI Pipes shall be of medium duty as per BIS:1239. Duct banks shall be High Density PE pipes encased in PCC (10% spare of each size, subject to minimum one) with suitable water-proof manholes. Hume pipes shall be NP3 type as per BIS 458.

**8.4.3.4 Terminations & Straight through Joints:** Termination and jointing kits for 33/66kV and 3.3 kV grade XLPE insulated cables shall be of proven design and make which have already been extensively used and type tested. Termination kits and jointing kits shall be pre-moulded type, taped type or preferably heat shrinkable type. 33/66kV grade joints and terminations shall be type tested as per BIS:13573 and 3.3kV grade joints and terminations shall be type tested as per VDE0278. Critical components used in cable accessories shall be of tested and proven quality as per relevant product specification/ESI specification. Kit contents shall be supplied from the same source as were used for type testing. The kit shall be complete with the aluminium solderless crimping type cable lugs & ferrule as per DIN standard. Straight through joint and termination shall be capable of withstanding the fault level for the system.

- 8.4.3.5 Cable glands:** Cable shall be terminated using double compression type cable glands. Cable glands shall conform to BS:6121 and be of robust construction capable of clamping cable and cable armour (for armoured cables) firmly without injury to insulation. Cable glands shall be made of heavy duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 microns. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable glands shall be suitable for the sizes of cable supplied/erected.
- 8.4.3.6 Cable lugs/ferrules:** Cable lugs/ferrules for power cables shall be tinned copper solderless crimping type suitable for aluminium compacted conductor cables. Cable lugs and ferrules for control cables shall be tinned copper type. The cable lugs for control cables shall be provided with insulating sleeve and shall suit the type of terminals provided on the equipment. Cable lugs and ferrule shall conform to relevant standard.
- 8.4.3.7 Trefoil clamps:** Trefoil clamps for single core cables shall be pressure die cast aluminum or Fiber glass or nylon and shall include necessary fixing accessories like G.I. nuts, bolts, washers, etc. Trefoil clamps shall have adequate mechanical strength to withstand the forces generated by the peak value of maximum system short circuit current.
- 8.4.3.8 Cable Clamps & Straps:** The cable clamps required to clamp multicore cables on vertical run shall be made up of Aluminium strip of 25x3 mm size. For clamping the multicore cables, self-locking, de-interlocking type nylon clamps/straps shall be used. The clamps/straps shall have sufficient strength and shall not get affected by direct exposure to sun rays and outdoor environment.
- 8.4.3.9 Galvanizing:** Galvanizing of steel components and accessories shall conform to BIS:2629, IS4759 & BIS:2633. Galvanizing shall be uniform, clean smooth, continuous and free from acid spots. The amount of zinc deposit over threaded portion of bolts, nuts, screws and washers shall be as per BIS:1367. The removal of extra zinc on threaded portion of components shall be carefully done to ensure that the threads shall have the required zinc coating on them as specified.
- 8.4.3.10 Welding:** The welding shall be carried out in accordance with BIS:9595. All welding procedures and welders qualification shall also be followed strictly in line with BIS:9595.

## **8.5 INSTALLATION REQUIREMENTS OF CABLES:**

### **8.5.1 Cable tray and Support System Installation**

- 8.5.1.1** Cables shall run in cable trays mounted horizontally or vertically on cable tray support system which in turn shall be supported from floor, ceiling, overhead structures, trestles, pipe racks, trenches or other building structures.
- 8.5.1.2** Horizontally running cable trays shall be clamped by bolting to cantilever arms and vertically running cable trays shall be bolted to main support channel by suitable bracket/clamps on both top and bottom side rails at an interval of 2000 mm in general. For vertical cable risers/shafts cable trays shall be supported at an interval of 1000mm in general. Fixing of cable trays to cantilever arms or main support channel by welding shall not be accepted. Cable tray installation shall generally be carried out as per the approved



guidelines/ drawings. Contractor shall design the support system along with tray, spacing etc in line with relevant standard.

- 8.5.1.3** The cantilever arms shall be positioned on the main support channel with a minimum vertical spacing of 300 mm unless otherwise indicated. The Contractor shall fix the brackets/ clamps/ insert plates using anchor fasteners. Minimum size of anchor fasteners shall be M 8 X 50 and material shall be stainless steel grade 316 or better. Anchor fastener shall be fixed as recommended by manufacturer and as approved by site engineer. For brick wall suitable anchor fasteners shall be used as per the recommendations of manufacturer. Make of anchor fasteners subject to QA approval.
- 8.5.1.4** All cable way sections shall have identification, designations as per cable way layout drawings and painted/stenciled at each end of cable way and where there is a branch connection to another cable way.
- 8.5.1.5** In certain cases, it may be necessary to site fabricate portions of trays, supports and other non standard bends where the normal prefabricated trays, supports and accessories may not be suitable. Fabricated sections of trays, supports and accessories to make the installation complete at site shall be neat in appearance and shall match with the prefabricated sections in the dimensions. They shall be applied with one coat of red lead primer, one coat of oil primer followed by two finishing coats of aluminium paint.

## **8.5.2 Conduits/Pipes/Ducts Installation**

- 8.5.2.1** The Contractor shall ensure for properly embedding conduit pipe sleeves wherever necessary for cabling work. All openings in the floor/ roof/ wall/ cable tunnel/ cable trenches made for conduit installation shall be sealed and made water proof by the Contractor either with any proven fire sealing system rated for one hour or Modular multi-diameter cable sealing system consisting of frames, blocks, Compression wedge and its accessories. The Cable sealing system should have been tested for fire insulation for min. 1 hr as per BS 476 and shall also provide water sealing. System shall be anti-rodent and anti- termite.
- 8.5.2.2** GI pull wire of adequate size shall be laid in all conduits before installation. Metallic conduit runs at termination shall have two lock nuts wherever required for junction boxes etc. Conduit runs/sleeves shall be provided with PVC bushings having round edge at each end. All conduits/pipes shall have their ends closed by caps until cables are pulled. After cables are pulled, the ends of conduits/pipes shall be sealed with Glass wool/Cement Mortar/Putty to prevent entrance of moisture and foreign material.
- 8.5.2.3** Exposed conduit/pipe shall be adequately supported by racks, clamps, straps or by other approved means. Conduits /pipe support shall be installed square and true to line and grade with required average spacing between the supports shall be provided.
- 8.5.2.4** For bending of conduits, bending machine shall be arranged at site by the Contractor to facilitate cold bending. The bends formed shall be smooth.

## **8.5.3 Junction Boxes Installation**

- 8.5.3.1** Junction boxes shall be mounted at a height of 1200mm above floor level or as specified in the drawings and shall be adequately supported/mounted on masonry wall by means of anchor fasteners/ expandable bolts or shall be mounted on an angle, plate or other structural supports fixed to floor, wall, ceiling or equipment foundations.

#### **8.5.4 Cable laying**

**8.5.4.1** For Cable unloading, pulling etc following guidelines shall be followed in general:

**8.5.4.2** Cable drums shall be unloaded, handled and stored in an approved manner on hard and well drained surface so that they may not sink. In no case shall be drum be stored flat i.e., with flange horizontal. Rolling of drums shall be avoided as far as possible. For short distances, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum. In absence of any indication, the drums may be rolled in the same direction as it was rolled during taking up the cables. For unreeling the cable, the drum shall be mounted on suitable jacks or on cable wheels and shall be rolled slowly so that cable comes out over the drum and not from below. All possible care shall be taken during unreeling and laying to avoid damage due to twist, kink or sharp bends. Cable ends shall be provided with sealed plastic caps to prevent damage and ingress of moisture.

**8.5.4.3** While laying cable, ground rollers shall be used at every 2 meters interval to avoid cable touching ground. The cables shall be pushed over the rollers by a gang of people positioned in between the rollers. Cables shall not be pulled from the end without having intermediate pushing arrangements. Pulling tension shall not exceed the values recommended by cable manufacturer. Selection of cable drums for each run shall be so planned so as to avoid using straight through joints. Care should be taken while laying the cables so as to avoid damage to cables. If any particular cable is damaged, the same shall be repaired or changed to the satisfaction of Project Manager. Cables shall be laid on cable trays strictly in line with cable schedule.

**8.5.4.4** Power and control cables shall be laid on separate tiers in line with approved guidelines/ drawings. The laying of different voltage grade cables shall be on different tiers according to the voltage grade of the cables. In horizontal tray stacks, H.T. cables shall be laid on topmost tier and cables of subsequent lower voltage grades on lower tiers of trays. Single core cable in trefoil formation shall be laid with a distance as per design calculations between trefoil center lines and clamped at every two meters. All multi core cables shall be laid in formation, as per design calculations. Power and control cables shall be securely fixed to trays/support with self-locking type nylon cable straps with de-interlocking facilities. For horizontal trays arrangements, multi core power cables and control cables shall be secured at every five meter interval. For vertical tray arrangement, individual multi core power cables and control cables shall be secured at every one meter by nylon cable strap. After completion of cable laying work in the particular vertical tray, all the control cables shall be bound to trays/supports by aluminium strips at every five meter interval and at every bend.

**8.5.4.5** Bending radii for cables shall be as per manufacturer's recommendations and BIS: 1255.

**8.5.4.6** Where cables cross roads/rail tracks, the cables shall be laid in Hume pipe.

**8.5.4.7** Joints in critical equipment in main plant area shall not be permitted. No joints shall be allowed in trip circuits, protection circuits and CT/PT circuits. The Contractor shall identify and accordingly procure the cable drum length.

**8.5.4.8** In each cable run some extra length shall be kept at suitable point to enable one LT/two HT straight through joints to made, should the cable develop fault at a later stage.



Control cable termination inside equipment enclosure shall have sufficient lengths so that shifting of termination in terminal blocks can be done without requiring any splicing.

**8.5.4.9** Wherever few cables are branching out from main trunk route troughs shall be used.

**8.5.4.10** Wind loading shall be considered for designing support as well Cable trays wherever required.

**8.5.4.11** The installation work shall be carried out in a neat workman like manner & areas of work shall be cleaned of all scraps, water, etc. after the completion of work in each area every day. Contractor shall replace RCC/Steel trench covers after the Installation work in that particular area is completed or when further work is not likely to be taken up for some time.

**8.5.4.12** Separation of cable types between HT power & LT power cables, LT power & LT control/instrumentation cables as stipulated in the BIS 1255.

**8.5.4.13** In direct burial, construction of cable trench for cables shall include excavation, preparation of sieved sand bedding, riddled soil cover, supply and installation of brick or concrete protective covers, back filling and compacting, supply and installation of caution tapes, route markers and joint markers. Laying of cables and providing protective covering shall be as per BIS:1255. While crossing the floors, un-armored cables shall be protected in conduits up to a height of 500 mm from floor level if not laid in tray.

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

**8.5.4.15** Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry, and at every 20 meters in cable tray/trench runs. Cable tags shall also be provided inside the switchgear, control and relay panels etc. where a number of cables enter together through a gland plate. Cable tag shall be of rectangular shape for power cables and control cables. Cable tag shall be of 2 mm thick aluminum or of a suitable material with number punched /engraved/Printed on it and securely attached to the cable by not less than two turns of 20 SWG GI wire conforming to BIS:280. Alternatively, the Contractor may also provide cable tags made of nylon, cable marking ties with cable number heat stamped on the cable tags.

#### **8.5.5 Cable Terminations & Connections**

**8.5.5.1** The termination and connection of cables shall be done strictly in accordance with cable termination kit manufacturer" instructions, drawings and/or as directed by Project Engineer. Cable jointer shall be qualified to carryout satisfactory cable jointing/termination. Contractor shall furnish for review documentary evidence/experience reports of the jointers to be deployed at site.

**8.5.5.2** All the Works of Cable Terminations & Connections shall include all clamps, fittings etc. and clamping, fitting, fixing, plumbing, soldering, drilling, cutting, taping, preparation of

cable end, crimping of lug, insulated sleeving over control cable lugs, heat shrinking (where applicable), connecting to cable terminal, shorting and grounding as required to complete the job to the satisfaction of the Project Manager. All cable terminations shall be appropriately tightened to ensure secure and reliable connections

**8.5.5.3** The equipment will be generally provided with undrilled gland plates for cables /conduit entry. The Contractor shall be responsible for punching of gland plates, painting and touching up. Holes shall not be made by gas cutting. The holes shall be true in shape. All cable entry points shall be sealed and made vermin and dust proof. Unused openings shall be effectively sealed by 2mm thick aluminium sheets / Stopper.

**8.5.5.4** Control cable cores entering control panel/switchgear/MCC/miscellaneous panels shall be neatly bunched, clamped and tied with self-locking type nylon cable ties with de interlocking facility to keep them in position.

**8.5.5.5** All the cores of the control cable to be terminated shall have identification by providing ferrules at either end of the core, each ferrule shall be indelible, printed single tube ferrule and shall include the complete wire number and TB number as per the drawings. The ferrule shall fit tightly on the core. Spare cores shall have similar ferrules with suffix sp1, sp2 etc. along with cable numbers and coiled up after end sealing.

**8.6 DRAWINGS AND DOCUMENTS:** During Detailed Engineering the drawings & Documents for the following Cables shall be submitted for Approval by CLUVPL.

1. DC Solar EBC Cables
2. DC Power Cables
3. AC LT Cables - Inverter Power, Aux Power & Control Cables
4. AC HT KV Cables

All the Cable documents shall cover the following details individually.

- a) Sizing & drop calculation
- b) GTP, GA, Vendor Documents, de-rating factor TC and reports as applicable.
- c) Cable schedule with loss calculation
- d) Cable routing/laying/tray arrangements
- e) MQP





## SECTION 9.0 POWER EXPORT SUB STATION

**9.1** PESS is the HT Sub Station to combine the AC power from all PCSS and to export the Power to the SECL's Substation. It shall be located in a suitable location and shall comprise of necessary numbers of incoming, Outgoing (including one Auxiliary supply feeder) indoor / PCOB HT switchgears as per system requirement, all with suitable control, protection and metering equipments. The Auxiliary Power Supply System for PESS shall have another source from the nearest PCSS/Power Collection Block incorporated in the PESS.

A combined configuration (that includes a PCSS components in PESS) shall also be considered and the contractor shall obtain approval for the configuration by CLUVPL.

In the PESS Building, in addition to the HT Switch gear Panels, C&R Panels for PCOB type Switchgears as applicable, Equipment for SCADA, Operator Work Stations, Auxiliary DC and AC (UPS) control power equipment, communication system, fire alarm panel, Office, Stores, Pantry and Wash rooms etc, the C&R panel for power transformer and its associated auxiliaries (as applicable) shall also be installed in line with system requirements.

**9.2** The Power Export Sub Station (PESS) shall consist of

1. A conventional concrete Building to accommodate the indoor equipment & other space for office / Store etc.
2. Indoor HT switchboard with metering and protective relays.

or

Outdoor HT Switch yard Type with PCOB and other outdoor accessories mounted on suitable H Pole Structures and with Indoor C&R Panel. The detailed requirement of outdoor equipment for designing HT switchyard for PESS are furnished under Section: 20.0 (Power Evacuation Scheme) of this technical specification.

3. Cables, Conductors, Earthing & Lightning Protection Systems.
4. Battery with charger & DCDB.
5. UPS.
6. HT / 440 V Auxiliary transformer & 440 V ACDB, Lighting System.
7. SCADA and Work Stations.
8. Fire Alarm System and Fire fighting Equipment.
9. Data and communication facilities.
10. Other Equipment as per the system requirement.

Detailed specifications of the above equipment are furnished in their respective Sections.

**9.3** PESS shall be capable of collecting and exporting the generated AC Power with all accessories to SECL's Substation through Over Head Lines / UG cables.

- 9.4 The location of PESS shall be selected in such a way to minimise the cable losses. The Power Export Sub Station building shall be built as per section 21.0
- 9.5 All the outdoor Transformers shall be erected as per the requirements of relevant Standards / IE Rules / CBIP Norms.
- 9.6 PESS building shall accommodate HT Switch board, C&R panel (as applicable), indoor Inverter(s), separate rooms for SCADA System & Work Stations, Office for solar power Plant, Store rooms, Battery room, Pantry, Toilet, etc. The overall Layout of PESS Indoor equipment along with sufficient and statutorily required space allotted for each equipment shall be furnished for approval of CLUVPL, during detailed engineering based on the system requirements.
- 9.7 All power, control and Communication cables shall be laid and dressed properly on cable trays or in trenches. Proper Lightning Protection System & Earthing System shall be incorporated as per Standards / Specification.
- 9.8 PESS shall be provided with suitable capacity of 110 V DC system for meeting the power requirement of HT switchgears, Emergency lights, SCADA, etc. The battery together with the charger and DCDB shall be suitable to meet the DC load.
- 9.9 PESS shall be ventilated with adequate number of exhaust fans mounted on wall openings provided with louvers and insect proof screen. Exhaust Fans shall be of industrial type of suitable air flow capacity and installed in sufficient numbers. An exhaust fan shall also be provided in the toilets.
- 9.10 PESS office room, SCADA and AC store room shall be equipped with adequately rated energy efficient (minimum 3 star as per BEE standards) split type air conditioning system.
- 9.11 Auxiliary Power System at 415 V, 3 Phase, 50 HZ shall be provided in PESS to power up the auxiliary loads like 110 V DC system battery chargers, UPS, lighting, ventilation fans, Pumps and other system loads.
- 9.12 Fire Alarm System, Fire fighting Equipment, Voice Communication gadgets, CCTV System devises and Displays and other equipment required as per System Design shall be suitably installed.
- 9.13 **Drawings & Documents:** During Detailed Engineering the following details of the PESS shall be submitted for approval by CLUVPL.

1. PESS Equipment Layout.





## SECTION 10.0 HT SWITCH-GEAR

### 10.1. General Requirements

The requirements of HT Switch-gear for PCSS & PESS as applicable in their respective sections of 7.0 & 9.0 are furnished in this section.

PESS - Option 1 (Indoor Switch Board) OR Option 2 (Outdoor Switch Yard).

PCSS - Option 1 (Indoor Switch Board) OR Option 2 (Outdoor Switch Yard).

Contractor shall comply to the specific requirements of the optioned switch-gear.

### 10.2. Option 1 - Indoor Switch Board with Circuit Breakers:

**10.2.1. Standards and Construction Features:** The HT, switch-gear ICOG panels shall conform to BIS 12729 and BIS 13118 for all essential features of design, construction and testing. The board shall be factory assembled and wired, totally enclosed, dead front, draw out type, fully interlocked and compartmental design. Enclosure shall be constructed with rolled steel sections. The doors and covers shall be constructed from cold rolled steel sheets of minimum 2.0 mm and load bearing member shall be minimum 2.5 mm or higher thickness. Gland plates shall be minimum 3 mm thick made out of hot rolled or cold rolled steel sheets and for non-magnetic material it shall be minimum 4 mm.

**10.2.2.** The switch-gear must provide a maximum degree of personal safety and operational security for the operators and others in the vicinity of the switch-gear under all operating and fault conditions.

**10.2.3. Internal Arc Fault:** To fulfill the high safety requirement for personnel, the switch-gear insulation must be designed to provide the best possible protection in the event of an arc fault. To ensure this condition, all compartments of the switch-gear shall satisfy the requirements of IEC 62271-200. The products of the arc shall not transport from one compartment to another. There must be no danger to any person standing near the switch-gear, caused by the venting of hot gases or the scattering of other products of the arc.

**10.2.4. Bus Bars:** The bus bars shall be of electrolytic grade copper, air insulated and housed in a separate metal clad chamber at the top. The bus bars shall be provided with insulation sleeving rated for full system voltage. Electrical clearances between live parts and between live part and earth shall be as per type test report submitted during detailed engineering. The cross section of bus bars shall be adequate to limit the temperature rise to 45°C over ambient of 50°C while carrying rated current.

**10.2.5. Cable Compartment:** The cable compartment shall be located at the bottom and shall be accessible through bolted cover plates at the rear. The current transformers, Surge arresters and Line PTs as applicable may also be located in the cable compartment.

**10.2.6. The circuit breaker compartment:** The Circuit Breaker Compartment of the switchboard shall have a fixed and a moving portion, fixed portion being part of the switchboard. The

moving portion shall contain the circuit breaker of horizontal draw out design mounted on a truck. The circuit breaker compartment shall have a front hinged door after opening of which the circuit breaker shall be accessible.

**10.2.7.** The design of the board shall permit the moving portions to be withdrawn and provide for isolation of the main contacts by means of plug and socket connections. Automatic safety shutters shall be provided over the isolating contacts in the stationary portion and shall be so designed as to close firmly over the contacts when the circuit breaker is in drawn out position. The draw out mechanism of the circuit breaker shall have Service, Test and Isolated positions with suitably interlocked Secondary plug socket for Connection/Disconnection of other than the Main Power Contacts.

**10.2.8. Interlocks for CB Draw out Mechanism:**

In the design of the switch-gear, the following positive inter-locking shall be provided:

- 1) Interlock to prevent movement of truck to "Service" position without engaging secondary plug socket connections.
- 2) Interlock to prevent disconnection of secondary plug socket connection in "Service" position.
- 3) Interlock to prevent withdrawal of truck past "Isolated" position without disconnecting secondary plug socket connection.
- 4) Interlock to prevent switching ON of breaker unless truck is properly engaged in "Service" or "Isolated" positions.
- 5) Interlock to prevent movement of truck from "Service" to "Test" position, while the Breaker is on.
- 6) Interlock to ensure that the breaker truck is in "Isolated" position before closing the integral earth switch if provided.
- 7) Interlock to prevent insertion of truck to "Service" position with earth switch "ON".
- 8) Interlock to prevent opening of cubicle door with the breaker "ON" while in "Service" position.
- 9) The movement of the Breaker Truck shall be possible to any of the three positions "Service", "Test" and "Isolated" with compartment door closed.
- 10) Interlock to prevent opening of cable chamber door while cables are in charged condition / while the respective Breaker is in service position.
- 11) Front door shall be interlocked with the breaker such that the door cannot be opened with the circuit breaker in service position or can the circuit breaker inserted into the service position with door open. It shall be possible to defeat the interlock with use of tools if this becomes necessary.

**10.2.9. Bus & Line Earth Provisions:** The HT switchboard shall be provided with earthing truck or earthing switch with safety interlock features for bus earthing and outgoing cable

earthing. The earthing switch / truck shall be interlocked with the circuit breaker so that it can be closed only when the circuit breaker is racked out to isolated position. The interlock shall also ensure that the cable side or bus side is dead before earth switch is closed through voltage metering facility, audio visual alarm and holding solenoid. A copper earth bus shall be provided at the bottom of the switchboard throughout its length.

**10.2.10. Labels:** The switchboard, devices and terminal blocks shall be provided with legibly engraved inscription plates for identification. The switchboard shall be provided with caution notice boards conforming to BIS 2551 in the front and rear.

**10.2.11. The technical particulars of the switch board shall be as follows:**

1. Nominal system voltage : As per system requirement
2. Highest system voltage : As per system requirement
3. Phase : 3
4. System frequency : 50 Hz
5. System Earthing : Solidly Earthed
6. Type of circuit breaker : Vacuum
7. Continuous rating of CB in enclosure : 120% of load current
8. Continuous current rating of bus bar : 120% of load current
9. Short circuit interrupting capacity of CB : As per system parameters requirement.
10. Power frequency withstand voltage for one minute : As per BIS/IEC
11. Impulse withstand voltage (as per standards) : As per BIS/IEC
12. Degree of protection of enclosure (Minimum) : IP 4X
13. Terminal arrangement: Suitable for terminating XLPE insulated, Al conductor, Armoured, HT grade cable(s). Copper termination strip of adequate size suitable for terminating aluminium cables through bimetallic lugs as applicable shall be provided. The height from gland Plate to the termination point shall be minimum 750 mm or as per the recommendation of the OEM of indoor cable termination kit.

**10.2.12. Technical particulars of HT Circuit Breaker:** The circuit breaker shall be rated for continuous 120% of load current and short circuit rating required shall be as per system requirement and fully interlocked horizontal draw out design. The circuit breaker shall be of vacuum design. The circuit breaker shall have motorized spring charged closing mechanism of trip free design with provision for manual closing, manual tripping and mechanical ON/OFF indicators and mechanical Spring Charging Status indicators.



The circuit breaker shall be of tested and proven design and the Contractor shall furnish type test certificates for short circuit making and breaking capacities, electrical and mechanical endurance tests and power frequency and impulse voltage withstand tests for the circuit breaker panel. The circuit breakers and accessories shall conform to IEC-62271-100 or equivalent Indian Standard.

The duty requirement of the Circuit breaker shall be Minimum E1/M2 class under all duty conditions and shall be capable of performing their duties without opening resistor. The circuit breaker shall meet the duty requirement of any type of fault or fault location and shall be suitable for line charging and dropping when used on effectively grounded or ungrounded systems and perform make and break operations as per the stipulated duty cycles satisfactorily.

The circuit breaker shall be capable for breaking the steady & transient magnetizing current corresponding to connected transformers. It shall also be capable of breaking line charging currents as per IEC- 62271-100 with a voltage factor of 1.4. The rated transient recovery voltage for terminal fault and short line faults shall be as per IEC: 62271-100.

The total break time of the breaker shall not exceed under any duty conditions specified such as with the combined variation of the trip coil voltage etc. All the duty requirements shall be provided with the support of adequate test reports.

**Operating Mechanism** - Circuit Breaker shall be electrically operated with the aid of spring charging / discharging mechanism. The operating mechanism shall be electrically operated during normal conditions and could be mechanically operated as and when necessary with anti-pumping and trip free (as per IEC definition) under every method of closing. The mechanism of the breaker shall be such that the position of the breaker is maintained even after the failure in vacuum. The circuit breaker shall be able to perform the duty cycle without any interruption. Electrical tripping shall be performed by shunt trip coil.

Provision shall also be made for local electrical control. "Local / remote" selector switch and close & trip push buttons shall be provided in the breaker control cabinet. Operating mechanism and all accessories shall be in control cabinet.

The status of the circuit Breaker like ON/OFF, Service/Test/Isolated, Spring Charging, Local Remote, E/S, Secondary Plug, control / trip circuit healthiness, are to be suitably interfaced with SCADA system.

**10.2.13. Current transformer:** Required sets of current transformers on the incoming and outgoing feeders as per BIS-2705, each having two secondary cores of ratios as per system requirement. The primary and secondary current limits and other technical parameters of the CTs shall be compatible with the protection relays.

**10.2.14. Potential transformer:** One set of PT as per BIS-3156, having two secondary cores of ratios and class of accuracy as per system requirement shall be provided for Bus-Sections (Bus PT) and outgoing grid feeders (Line PT). The Line PT shall be connected on



the outgoing end and shall have fuse protection. Bus PT shall be accommodated in a separate compartment.

**10.2.15. Instruments and meters:** Electronic Multi Function Meter (MFM) to read current, voltage, kW, kVA, var, kWh, power factor, frequency etc., in the incoming and outgoing feeders shall be provided at PCS and shall be suitably interfaced with SCADA system.

**10.2.16. Protective relays:** Microprocessor based numeric protection relays for multi characteristic inverse minimum time/current type over current and earth fault protection with numerical display of setting values, measured values, memorized fault values and software self-supervision with auto diagnosis. The relays shall have communication port for hooking up to SCADA at PESS. The protection relays shall have the data transfer interface conforming to the standards. The protection relays shall be provided with non-volatile memory for preserving important data during auxiliary supply breaks.

One set of trip circuit supervision relay and one set of high-speed trip relay shall also be provided.

**10.2.17. Internal wiring:** The internal wires to be used shall be 1100 V grade PVC insulated stranded flexible copper and the minimum Size of the wires shall be as follows:

CT & PT circuit: 2.5 sq. mm

Main AC & DC circuit: 4.0 sq. mm

Other circuit: 1.5 sq. mm.

**10.2.18. Other devices:** Requisite number of LED type indication lamps, breaker control switches, HRC fuses and other devices shall be part of the switchgear. All instruments and meters shall be of robust design, vibration proof and suitable for flush mounting on vertical panels. Control and trip power supply for the HT switch-gear shall be derived from 110 V DC. 230V AC supply from station UPS shall be used to monitor the availability of trip supply at all times and to annunciate to SCADA during failure of DC.

**10.2.19. Type Test Reports and Quality assurance:** Type test, routine test and acceptance tests for the Switch gear Panel shall be, as per the standard requirement.

Contractor shall submit the following type test reports and Certificates issued by NABL/ILAC accredited agency for HT Breaker (Sl. No 1 to 6) in line with IEC 62271-100 and for Switch board (Sl. No 7 to 9) in line with IEC 62271-200 during detailed Engineering.

1. Short circuit making and breaking currents.
2. Peak withstand current and short time current.
3. Lightning Impulse voltage withstand.
4. Operation Duty tests.
5. Electrical Endurance (E1).
6. Mechanical Endurance(M2).
7. Internal arc test.

8. Temperature Rise.

9. Ingress Protection.

In addition to the above, all the type test certificates and factory test reports for the accessories (CT, PT, Meter & Relay) and bought out items shall also be submitted for CLUVPL approval during detailed engineering.

**10.3. Option 2 - Outdoor Switch Yard with outdoor Vacuum Circuit Breakers:** Please refer Section 20 of this specification for the detailed specification of the HT outdoor Switch yard for PCSS/PESS as an option.

**10.4. Drawings and Documents:**

1. HT Switch Board/Switch Gear - GTP, GA, Vendor documents, Schematic Diagram and Type Test Reports for CB & Enclosure.
2. HT Switch Board/Switch Gear - GTP, GA, Vendor documents and Type Test Reports for Accessories.
3. HT Outdoor Switchyard Equipment (CB, CT, PT, SA, ABS)- GTP, GA, Vendor documents, Schematic Diagram and Type Test Reports.
4. HT Switch Board/Switch Gear with Accessories - MQP
5. HT Outdoor Switchyard Equipment - MQP



## SECTION 11.0 EARTHING

### 11.1. DC Earthing system for PVARRAY YARD

The earthing for PV array and DC power system shall be made with earth mat connected with a total number of earth pits corresponding to at least 1No. earth pit for every 1 MW(DC) uniformly distributed around array yard. Design calculations along with drawings shall be submitted for approval by CLUVPL to establish the adequacy of earth pits as above. Electrical Resistivity Test (ERT) of the soil at the project site shall be made by the Contractor before commencing the earthing system design. The earthing system design calculations shall conform to latest CEA regulations for electrical safety- with amendments and Indian Electricity Rules / Indian Electricity Act. The design calculation for the DC System earthing shall be as per IEEE 2778-2020: Guide for Solar Power Plant Grounding for Personal Protection / IEEE 80-Guide for Safety in AC Substation Grounding.

- 11.1.1. DC System fault level shall be considered as per System Requirement and fault duration shall be considered as per BIS3043 for designing earth conductors and 0.5 sec duration for calculating DC earthing touch and step potential. In addition, and If necessary, more numbers of earth pits and conductors shall be provided to achieve earthing resistance less than 1 Ohm.
- 11.1.2. Each earth pit shall be provided with an earth electrode of 3 M length copper bonded steel rod of diameter not less than 14 mm including accessories and masonry enclosure with cover plate as per BIS 3043. The pit around the electrode shall be treated with carbon-based earth enhancement compound as required as per provisions of BIS 3043. Requirements for earthing enhancing compounds shall conform to IEC 62561-7. The minimum quantity of earth enhancement compound to be used with each earth-pit shall be 25 Kg. Necessary provision shall be made for bolted isolating joints of each earthing pit for periodic checking of earth resistance. For each earth pit, necessary Test Point shall be provided.
- 11.1.3. Galvanized steel shall be considered for earth conductors. Earth mat conductors shall be laid at a depth of minimum 600 mm below the ground level.
- 11.1.4. Each PV Module shall have earth continuity with the adjacent PV modules, creating a Series Earthing formation through suitably designed earthing conductors fixed to the Earthing holes provided in the PV modules for earthing purpose. Two distinct earth connections are to be connected in the earth pits for the above formed PV module Series Earthing formation.
- 11.1.5. Each Array structure of the Solar PV Yard shall be mechanically and electrically connected to provide independent return to earth with two distinct earth connections and are to be connected to earth pits as per BIS standards.
- 11.1.6. Earth resistance of the earth pits shall be tested in the presence of the representative of CLUVPL.
- 11.2. AC Earthing System for PCSS & PESS

- 11.2.1.** AC earthing system for PCSS and PESS shall be made with an earth mat connected with number of earth pits uniformly distributed around each PCSS and PESS respectively. The earthing system design calculations shall conform to latest CEA regulations for electrical safety- with amendments and Indian Electricity Rules / Indian Electricity Act. The design shall ensure that the touch potential and ground potential rise are within limits in accordance with the requirements stipulated in IEEE 80-Guide for Safety in AC Substation Grounding. For touch and step potential calculations at PCSS and PESS, the actual system fault level arrived through an appropriate software based analysis (E.g., E-Tap), shall also be considered. AC System fault level shall be considered as per System Requirement and fault duration shall be considered as per BIS 3043 for designing earth conductors and 0.5 sec duration for calculating AC earthing touch and step potential. The earthing system shall also conform to BIS 3043. The Contractor shall ensure adequate Earthing system protection to provide an acceptable degree of protection as per BIS for each PCSS. If necessary, more numbers of Earth pits & conductors shall be provided to achieve acceptable value of the earthing resistance. Theoretical earthing design calculations with necessary drawings shall be submitted for CLUVPL approval during detailed Engineering.
- 11.2.2.** Each earth pit shall be provided with an earth electrode of 3 M length copper bonded steel rod of diameter not less than 14 mm including accessories and masonry enclosure with cover plate as per BIS 3043. The pit around the electrode shall be treated with carbon-based earth enhancement compound as required as per provisions of BIS 3043. Requirements for earthing enhancing compounds shall conform to IEC 62561-7. The minimum quantity of earth enhancement compound to be used with each earth-pit shall be 25 Kg. Necessary provision shall be made for bolted isolating joints of each earthing pit for periodic checking of earth resistance. For each earth pit, necessary Test Point shall be provided.
- 11.2.3.** Galvanized steel shall be considered for earth conductors. Earth mat conductors shall be laid at a depth of minimum 600 mm below the ground level. The risers and equipment connections shall be made by using suitably sized GI flats. All cable trays are to be earthed by suitably sized GI flats at regular interval of 25 meters to the earthing grid or nearest earthing pit.
- 11.2.4.** The complete earthing system shall be mechanically & electrically connected to provide independent return to earth. In compliance to Rule 33 and 61 of Indian Electricity Rules, 1956 (as amended up to date), all non-current carrying metal parts shall be earthed with two separate and distinct earth continuity conductors to an efficient earth electrode.
- 11.2.5.** Earth resistance of the earth pits shall be tested in the presence of the representative of CLUVPL.
- 11.2.6.** For Earthing of electronic equipment such as SCADA, UPS, Battery chargers, Communication System Etc. Contractor shall follow the OEM's recommendation to provide dedicated earth pit/s near the equipment as applicable.
- 11.3. DRAWING & DOCUMENTS:**  
During Detailed Engineering the following particulars of the "Earthing System" shall be submitted for approval by CLUVPL

1. DC Earthing for PV Array - Design calculation with Touch & Step potential Verification and GA Layout.
2. AC Earthing for PESS and PCSS - Design calculation with Touch & Step potential Verification and GA Layout.





## SECTION 12.0 SCADA & VOICE COMMUNICATION SYSTEM

**12.1 Introduction:** The Solar PV power plant shall be provided with a comprehensive control automation system which shall acquire all data, store, analyze and control the operation of various equipment and systems of Solar PV Power Plant such that minimal operator interaction is needed. For this purpose, a Supervisory Control and Data Acquisition (SCADA) system with Operator Work stations shall be provided in the Control Room at PESS building.

**12.2** The Control Automation system shall be configured with three levels of pecking order.

**12.2.1 Level 1: PV Module String Level Monitoring:** All the PV Module strings shall be monitored through their respective String Monitoring Units provided in the String Combiner & Monitoring Boxes (SCMB). Refer Section 4.0 String combiner & Monitoring Box for interfacing of SMUs with the SCADA.

**12.2.2 Level 2: PCSS Equipment Control & Monitoring:** The following equipment / Sub Systems at PCSS shall be connected to the suitably designed Remote I/O Units (RIO) or Control and Monitoring units (CMU) for effective automatic control and monitoring from SCADA.

1. The Group of SCMBs
2. Inverters
3. Inverter Duty Transformer
4. NIFS
5. HT Switchgear System
6. 415 V Auxiliary Power system
7. Lighting System
8. 110 V DC system
9. UPS System
10. Fire alarm system
11. Voice Communication
12. CCTV Surveillance System as applicable.

All the RIO/CMU of respective PCSS shall be connected with each other in a redundant (2 sets of connections) Optic Fiber Ring network and the ends of such rings shall be connected to the Central Processing Unit (CPU) at PESS.

**12.2.3 Level 3: PESS Equipment Control & Monitoring:** The following equipment / Sub Systems at PESS shall be connected to the Redundant Central Processing Unit (CPU) with suitable interfacing devices for effective automatic control and monitoring from SCADA.

1. The Ring Ends of Level 2 RIOs/CMUs
2. Work Stations and Printer
3. GPS for Time Synchronization
4. Evacuation Sub Station (ESS) System - Including SECL SS details, Tariff Metering System and SLDC Connectivity Panel as applicable.
5. Firewall

The following PESS plant level equipment and Systems shall be connected to the CPU using suitable interfacing devices and communication protocols.

- 1) Weather Monitoring station
- 2) HT Switchgear System
- 3) 415 V Auxiliary Power system
- 4) Lighting System
- 5) 110 V DC system
- 6) UPS System
- 7) Fire alarm system - Master
- 8) Voice Communication
- 9) CCTV Surveillance System as applicable
- 10) If PESS is integrated with a Block of PCSS, the PCSS level Equipment listed in 12.2.2, as applicable.

**12.3 Main Control Panel:** Main control panel shall have Central Processing unit (CPU) and Remote I/O Unit (RIO) / Control and Monitoring unit (CMU), suitable rated power supplies with CLUVPL protection and network switches. Panel front and rear door shall be of minimum 2 mm thickness with CRCA sheet steel. Panel shall have a minimum protection of IP-42.

**12.3.1 The Central Processing unit** shall be a rugged industrial type microprocessor-based unit with built in redundancy. Main control SCADA panel shall be provided with two processors (main processing unit and memories), one for normal operation and one as hot standby. In case of failure of working processor, there shall be an appropriate alarm and simultaneously the hot standby processor shall take over the complete plant operation automatically. The transfer from main processor to standby processor shall be totally bump less and shall not cause any plant disturbance whatsoever.

**12.3.2 Remote I/O Units (RIO) / Control and Monitoring units (CMU):** The RIO /CMU shall be industrial grade microprocessor based unit with direct digital interface to the redundant Data bus formed through Optic Fiber Cable Network or with appropriate Data Switches and Light Interface Units (LIU) and shall be capable of controlling the operations of the main Equipment like Inverters, HT Vacuum/SF6 Circuit Breakers (VCB) etc. with intelligent interlocks, safety configurations & protection logics as per the process requirement from SCADA. Status abnormality of all equipment connected to RIO/CMU shall be monitored for providing necessary alarm / alerts. RIO /CMU shall be with built-in memory and extended removable flash memory cards to acquire data on continuous basis and store the data in the memory modules. RIO /CMU shall have other standard features like RTC, self-diagnostic routines, event logging, alarms etc.

**12.4 PCSS SCADA panels** shall be provided in each PCSS and shall have Remote I/O Unit (RIO) / Control and Monitoring unit (CMU) as specified in clause 12.3.2 above, suitable rated power supplies with SPD protection and network switches. Panel front and rear door shall be of minimum 2mm thickness with CRCA sheet steel. Panel shall have a minimum protection of IP-42.

**12.5 Optic Fiber Cable Ring Network:**

**12.5.1** An optic Fiber cable network in ring architecture shall be provided to connect all PCSS, and PESS for data transfers in a most economical manner. Single mode 12 core or

above corrugated steel tape armoured Optic Fiber cable conforming to IEC 60794 shall be used and the Fibers shall be allocated for each system as below.

- 1) For Main Equipment Data Transfer PCSSs to SCADA - 2 Circuits (4 Fibers)
- 2) For Fire alarm System - 1 circuit (2 Fibers)
- 3) Voice communication - 1 circuit (2 Fibers)
- 4) CCTV surveillance - 1 circuit (2 Fibers)

12.5.2 The OFC shall be routed buried at a safer depth below ground inside a protective HDPE pipe and below the Protective brick layer or ducts or racks. The ring network shall consist of necessary splitter boxes, Light interface Units (LIU), closure terminals, couplets, drop / patch cables, attenuators, etc. of reputed make.

12.5.3 The other systems may also be hooked up to the main OFR network by using additional pair of Fibers. Details of Proposed OFC, routing and quantity, along with its Network Scheme shall be submitted for approval by CLUVPL during detailed engineering.

12.5.4 An optic Fiber cable link with minimum 6 Fibers shall be incorporated to connect PESS with the PSS of SPIA through buried OFC.

## **12.6 Supervisory Control and Data Acquisition system (SCADA)**

12.6.1 The computer aided SCADA of Solar PV Power Plant shall be designed for simultaneous monitoring and recording of various parameters of different sub-systems in the solar power plant, power generation on the DC and AC sides, capable of computing performance ratios and efficiency of different sub system operations and implement corrective action for achieving maximum plant output. With inputs from various measuring devices in the field, the performance ratio shall be dynamically calculated and displayed. Solar PV Power Plant SCADA shall be connected with necessary hardware and software for establishing proper linkage to power evacuation Sub Station SCADA for operational interface.

12.6.2 The SCADA system shall be designed on reliable operating platform and time-tested software featuring control & Monitoring of Solar PV inverter, HT Switchgear System, Monitoring of PV module Strings, insolation level and weather, DC & AC switch gears, power transformers, DC / UPS power systems, battery & charging systems, lighting system, security, alerts, analytical reporting, auditing and data archiving functions etc.

12.6.3 SCADA shall be capable of providing different on-screen dashboards for overall / zone of the plant, combiner box monitoring, weather station parameters, DC / AC SLD, Trend Charts, Alarm / Alert listing, Audit Reports, Equipment parameters, communication link monitoring, GIS based plant view with dynamic change key performance indices and operating parameters, etc. All Numerical relay functions shall be programmable from SCADA.

12.6.4 Minimum of three operating stations with servers is envisaged for the SCADA system. Personal computer (PC) with monitor and key board shall serve as servers. One server shall be Operating Station with data storage, second server shall serve as back up data storage as well as Operating Station cum Engineering Station and the third server shall be web connected to act as Web Station with web data storage. SCADA software shall be OPC compliant.



- 12.6.5 Earthing requirements of SCADA system shall be maintained as per OEM recommendation. System earth pit shall be isolated from panel earth pit.
- 12.6.6 The proposed SCADA configuration, equipment details, software features, on screen dashboards and other operational highlights shall be clearly furnished by the EPC. Necessary design documents and drawings of SCADA including Plant Monitoring Desk shall be submitted for approval by CLUVPL during detailed engineering.
- 12.6.7 Each Operating station PCs shall be of reputed make, rugged & robust in nature to operate in a hostile environment. Each PC shall have minimum Intel Core i7 processor having 500 GB SSD and 1 TB HDD with 8 GB RAM. The PC shall also have 21" or higher TFT / Backlit LED Color monitor, DVD Drive with Writer, USB ports, Keyboard & Scroll Mouse. The PCs shall be preloaded with suitable Licensed Operating System and Licensed MS office.
- 12.6.8 The printer shall be A4 colour laser type rugged & robust in nature and of reputed make. The printer shall be equipped for printing, scanning, copying and faxing and shall be a network printer.
- 12.6.9 Powder coated, Plant Monitoring Desks of modular, welded construction, console system design and made of CRCA Steel Sheet of suitable thickness to accommodate each Operating station components (CPU [on a sliding Rack Platform], power sockets, terminals complete with wiring arranged in the internal space of the console and TFT / Backlit LED Color monitor, Keypad and Mouse [on a sliding Drawer] on the Top) shall be provided. Appropriate matching desk to place the printer shall be provided. Connections from SCADA and other systems shall be through the bottom cable entries. All the above desks shall be positioned and installed aesthetically and the visible wires/cables shall be neatly routed and dressed. Ergonomically designed Computer station height adjustable cushioned chairs with arm rests, matching with the consoles shall be provided. GA, Layout and Schematic drawings of the Plant Monitoring Desks shall be submitted for approval by CLUVPL during detailed Engineering.
- 12.6.10 The Data Acquisition System shall perform the following minimum operations:  
Measurement and continuous recording of:
- 1) Power Export at PESS and Power Evacuation at Point of Coupling at PSS.
  - 2) Energy Export at POC at PSS.
  - 3) Ambient temperatures near PV array fields
  - 4) Module Surface Temperature
  - 5) Wind speed, Rainfall
  - 6) AC and DC side power of each inverter
  - 7) Solar irradiation / insolation
  - 8) HT Voltage and frequency
  - 9) Fire Alarm Status and monitoring
  - 10) PESS building Indoor Ambient temperature
  - 11) Any other parameters considered necessary by EPC based on current Solar PV Power Plant practice

- 12.6.11 SCADA shall provide One minute (Or as required by the Site Engineers), daily, monthly and annual average of Solar Insolation value.
- 12.6.12 SCADA shall provide fifteen (15) Minutes, (Or as required by the Site Engineers) daily, monthly and annual average of following parameters:
- 1) Module Surface Temperature
  - 2) Exported energy
  - 3) Energy output from each inverter
  - 4) Plant output power
  - 5) Inverter status & efficiency
- Provision shall also be made for graphic display not limited to the following required but shall be as per the requirements of Site Engineers):
- 1) AC power Vs Time
  - 2) Expected Energy Vs Actual Energy generated (PR)
  - 3) Bar chart for Plant Performance and PV module performance
  - 4) DC & AC Side SLD with combiner box status
- 12.6.13 All data shall be recorded in a common work sheet chronologically and shall be MS Excel compatible. All instantaneous data can be shown in the Work Station Display as required by the site engineer.
- 12.6.14 SCADA shall have features to be integrated with the local system as well remotely via the web using either a standard modem or a GSM/WIFI modem. The EPC shall provide compatible software and hardware so that data can be transmitted via. standard modem. Plant generation data shall be made available for CLUVPL website for display in CLUVPL intranet. Email daily reports of Plant performance shall be configured in plant SCADA.
- 12.6.15 The SCADA system shall enable automatic operation of entire solar PV power plant in all modes, during power generation as well as in non power generation periods. SCADA shall be in addition to proprietary data logging and control system provided by the EPC and it shall be the responsibility of EPC to ensure all system interfacings are properly matched to have an integrated operation from SCADA.
- 12.6.16 The Solar PV Power Plant will be requiring interface with the load dispatch center (LDC) for power export. It is the responsibility of contractor to make provisions in SCADA to have required networking with the state LDC. In General, the required protocol for SLDC is IEC 60870-5-104 protocol. However, if any other specific protocol than IEC 60870-5-104 is required by SLDC, the same shall be complied with. The Contractor shall provide necessary hardware to meet the requirements of SLDC and their standards for transmission of data to the state LDC. Charges as prescribed by SLDC towards data connectivity with LDC either by VSAT or any other communication including speech communication to the adjacent station shall be borne by contractor without any extra cost to CLUVPL.

## **12.7 Voice Communication System**

- 12.7.1 A Voice Communication Network interconnecting all Power Collection sub stations, Power Export Sub Station, Security Buildings and watch-towers shall be provided with necessary hardware, software and network interface. Exact locations for Voice

Communication shall be finalized during detailed engineering. Separate network shall be considered for Voice Communication.

12.7.2 Suitable capacity electronic IP PBX with a provision for connecting CLUVPL phone network shall be provided at PESS with cable network for IP phones inside the project site building.

12.7.3 Proposed Voice Communication System Scheme, exchange and phone data sheet, number and location of hand sets, etc., shall be submitted for approval by CLUVPL during detailed Engineering.

## 12.8 Communication Cables

12.8.1 **RS485 Cable** - Design, Transmission and Constructional features of RS485 cable shall conform to the general and special requirements of EN 50290-2-23, BS EN 50288-7, IEC 60228, BS 5308, BIS 5831 and IEC 60332-1. The cable shall have FRLS properties as per ASTM-D-2863.

12.8.2 **Ethernet Cable** – Ethernet cable of type CAT6 or above. Design, Transmission and Constructional properties shall conform to the general and special requirements of TIA 568B, IEC 60332-3, IEC 11801 and EN 50173. The cable shall have FRLS properties as per ASTM-D-2863.

12.9 **Drawings& Documents:** During Detailed Engineering the following particulars of the "SCADA system" and "Voice Communication System" shall be submitted for approval by CLUVPL.

- 1) SCADA - Configuration /Architecture Diagram with list of I/O signals
- 2) SCADA - Vendor Documents, GA drawing & Schematics
- 3) SCADA - MQP
- 4) Optical Fiber Cable Network - GTP, GA, Vendor Documents, Routing diagram with schedule& MQP
- 5) Communication Cables - GTP, GA, Vendor documents and MQP
- 6) Communication Cables - Schedule
- 7) IP Telecom System - Block Diagram, GTP, GA, Vendor Documents & MQP



**SECTION 13.0**  
**WEATHER MONITORING SYSTEM (WMS) & INSTRUMENTS**

13.1 Contractor shall provide in the Weather Monitoring System (WMS), all measuring instruments as listed below for the project along with all necessary software & hardware to make it compatible with SCADA.

- (1) Pyranometer – 3 Nos, with provision for tilting arrangement.
- (2) Wind Speed sensor - 1no.
- (3) Wind Direction Sensor – 1 No
- (4) Rain Gauge – 1 No
- (5) Data Logger – 1 No
- (6) Module Surface temperature sensor-1 no in each PCSS zone.
- (7) RTD type measuring instrument for Ambient Air Temperature - 1 no in each PCSS zone.

Necessary chain link fencing shall be provided around the Weather Monitoring Station and shall be secured with steel gate arrangement to prevent unauthorized entry / tampering of readings.

13.2 **PYRANOMETER:** Typical specification for Pyranometers, for measuring incident global solar radiation shall be as follows:

SN	Parameter	Value
1	Spectral Response	0.31to2.8 Microns
2	Sensitivity	7 to 14 Microvolt/w/m <sup>2</sup>
3	Time response (95%)	Max 15 s
4	Non linearity	±0.2%
5	Tilt error	±0.2%
6	Zero offset thermal radiation	±7W/m <sup>2</sup>
7	Zero offset temperature change	±2 W/m <sup>2</sup>
8	Operating temperature range	- 40 deg to +80 deg.
9	Non stability	Max ±0.8%
10	Field of view	180°
11	Humidity Range	0-100%
12	Directional Response (up to 80° with 1000W/m <sup>2</sup> beam)	<10W/m <sup>2</sup>
13	Input Power for instrument &Peripherals	230 VAC
14	Output Signal	Analogue form which is compatible with the Data Logger System & SCADA

Three numbers (One as main Meter second as Check Meter and the other as Standby Meter) calibrated Pyranometers shall be installed by the Contractor at each project

location (Bhatgaon 1 set, Bishrampur 2 sets), preferably near PESS / PCSS building as applicable, in a non shadowed area, to measure the GHI. The output of these Pyranometers shall be made available to SCADA either directly or through data logger. Provision for downloading the recorded GHI values directly from Data logger (if connected through Data Logger), shall be made.

Data loggers / SCADA shall be programmed to monitor Pyranometers constantly to detect any abnormality and give immediate warning for recalibration of instrument. Deviation of readings between the Pyranometers shall be within the limit of 2% with reference to the Higher reading. The Higher reading Pyranometer will be designated as Main Meter and the collected values from the main Pyranometer shall be used to arrive at the month wise Measured Average Global Irradiation on Horizontal surface.

Contractor shall demonstrate the correctness of Pyranometer readings stored in data logger and displayed on SCADA monitor before the Provisional take over/commencement of each PG Test and at the start of each quarter of the O&M year during O&M period.

13.3 **Calibration Certificates:** For Pyranometers, Valid Calibration certificate with calibration traceability to World Radiation Reference (WRR) or World Radiation Centre (WRC) shall be furnished along with the Test Reports generated during FAT for approval by CLUVPL. For other Instruments / Sensors, Valid Calibration Certificates by the OEMs / Third Party Testing Labs shall be furnished during FAT.

13.4 Each instrument shall be supplied with necessary cables. The signal cable length shall not exceed 20 meters from the instrument to the Data Logger. (The standard 10 m long cable with a pre wired water proof connector plug is preferred)

13.5 **Data Logger**

The Data Logger shall be an industrial microprocessor-based unit capable of collecting weather data from field instruments listed above and have suitable required number of Input Ports. The Output of Data Logger shall be connected to SCADA through suitable interfacing & data network and shall be programmed to stream the measured Weather Parameters continuously. Data Logger shall also be programmed to monitor the weather parameters obtained from field instruments constantly to detect abnormality of any Instruments and give alarm to SCADA. Data logger panel shall have a minimum protection of IP 65. In particular, the sensitivity of Pyranometer and resolution of Data Logger of Weather Monitoring System shall be such that the Data Logger can read and record even  $1W/m^2$  changes in insolation. If Pyranometer is directly connected to SCADA, the SCADA shall read and record even  $1W/m^2$  changes in insolation. Contractor shall provide all Instrument manuals during Detailed Engineering.

13.6 To measure Module Surface Temperature, Contractor shall install a suitable

Temperature measuring Sensors on a randomly selected Module, one each in a PCSS PV array Zone. The Sensors shall measure the temperature at least in the range of - 4°C to +70°C and shall communicate the value to SCADA through a nearest SCMB.

13.7 To measure Ambient Air Temperature, Contractor shall install RTD type measuring Instruments at suitable places with proper installation methods, one each in a PCSS PV array Zone. The Instruments shall measure the temperature in the range of - 4°C to +70°C and shall communicate the Temperature value continuously to SCADA through a nearest SCMB or the RTU at the PCSS.

13.8 **Drawings & Documents:** The following drawings / Documents shall be submitted to CLUVPL during Detailed Engineering for approval.

1) Weather monitoring System - GTP, GA Layout, vendor documents and MQP





## SECTION 14.0 LIGHTNING PROTECTION SYSTEM

### 14.1. General Requirements

**14.1.1.** The Solar PV Power plant shall be provided with Lightning Protection System(LPS) covering Solar array (DC) side and AC side. The lightning protection system must be completed prior to start-up of commissioning activities of the project. The main aim of Lightning Protection System is to protect PV Modules or other sub-system components, Outdoor Electrical Equipment and buildings from any over voltage surge before it reaches the above equipment. The source of over voltage can be lightning or other atmospheric disturbance.

#### 14.1.2. Down Conductor

1. Down conductor shall be straight and follow a direct path to the earth electrode. Length of the conductor shall be minimized. Any joints to the down conductor shall be welded type only.
2. The Down conductor shall be of Hot Dip Galvanized Iron strip in accordance with latest BIS 2633 & BIS 4759 standards. For ESE type Air Terminals, sufficiently sized Earthing Copper Cables with proper support and termination arrangement are also acceptable.
3. For buildings, Down conductors shall be welded outside building Steel columns at one-meter intervals or provide cleats with an interval of 0.75 meter on building walls as applicable. On roofs, necessary arrangement shall be made with supporting blocks of insulating material at an interval of 1.5 meters and avoid directly cleating on surface of roof. Down conductor shall be bonded with metallic structures which are within two-meter vicinity of it. Running of Down conductor through GI conduits shall be avoided.
4. Test link shall be provided to the down conductor at a height of one meter above the ground and there shall not be any other connection below the test link except connection to the earth electrode.

#### 14.1.3. Earth Pit

Each earth pit shall be provided with an earth electrode of 3 M length copper bonded steel rod of diameter not less than 14 mm including accessories and masonry enclosure with cover plate as per BIS 3043. The pit around the electrode shall be treated with carbon-based earth enhancement compound as required as per provisions of BIS 3043. Requirements for earthing enhancing compounds shall conform to IEC 62561-7. The minimum quantity of earth enhancement compound to be used with each earth-pit shall be 25 Kg. Necessary provision shall be made for bolted isolating joints of each earthing pit for periodic checking of earth resistance. For each earth pit, necessary Test Point shall be provided. The distance between earth pits shall be more than 3 meters.

### 14.2. Lightning Protection of PV Array Yard

**14.2.1.** The PV Array Yard and the other sub-system components shall be protected against lightning using Early Streamer Emission Type in accordance with the latest NFC 17-102

and shall be of class III or higher (Class II or I) and the same shall be type tested. Wherever required, ESE Air Terminals shall be provided at the highest point to cover the Array and sub-system components. Design calculation for the required Number of ESE Type lightning system shall be submitted during detailed engineering for approval by CLUVPL. The selection of location of each Lightning System shall be done in proper approach so that it does not cast shadow on the PV Modules in conformation with the overall shadow analysis.

- 14.2.2.** The lightning system shall include ESE type lightning terminal, a Supporting Pole and 2 sets of separate Earthing arrangement with down conductor, test links and Earth pits Etc. as described in Clause 14.1.
- 14.2.3.** Necessary concrete foundation for holding the Supporting Pole for the ESE type lightning terminal at the desired height in position along with supporting anchors shall be provided. Consideration of maximum wind speed and maintenance requirement at site in future also shall be done during design.
- 14.2.4.** Each of the Down Conductor shall be connected to the respective Earth Electrodes in the Earth Pit. Both Earth Electrodes shall be interconnected to achieve Earth Resistance not more than 10  $\Omega$ .
- 14.3. Lightning Protection for Sub Stations & Buildings:**
- 14.3.1.** Lightning protection for Sub Stations & Buildings shall be as per BIS/IEC 62305. The Lightning protection system for buildings shall comprise of lightning conductors on the roof with spike rods at the highest point above roof. Alternatively, a dedicated, type tested Early Streamer Emission Type of class III or higher in accordance with the latest NFC 17-102 shall also be accepted.
- 14.3.2.** 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 connected to the individual earth pit as per required Standards including accessories.
- 14.3.3.** The CONTRACTOR shall ensure adequate lightning protection to provide an acceptable degree of protection (minimum protection class 3) as per BIS for the substation including transformer. Adequate number of Lightning Protection Systems shall be provided in accordance with the theoretical lightning design calculations which shall be submitted for approval by CLUVPL during detailed engineering.
- 14.4. Drawings & Documents:** During Detailed Engineering the following Drawings and Documents for Lightning Protection System and its Earthing System of PV Array, PCSS, PESS & Buildings shall be submitted for approval by CLUVPL.
1. LA - Design calculation, GTP, GA & vendor documents.
  2. LA - Layout.







## SECTION 15.0 AUXILIARY POWER SUPPLY SYSTEM

### 15.1. General Requirements

- 15.1.1. Contractor shall provide exclusive Auxiliary Power Supply System of 415 V, 3 $\phi$ , 4 Wire, 50 Hz supply, in order to meet auxiliary power requirements of the solar power plant.
- 15.1.2. The Power distribution shall be through Auxiliary transformers and appropriately designed AC Distribution Panels & DC Distribution Panels to cater the requirements of Critical and general Loads of the solar power plant.
- 15.1.3. For sizing calculation of auxiliary transformers, power factor of 0.8 lag, design margin of 20% for future needs shall be considered.
- 15.1.4. Associated cable rating for the Auxiliary Power Supply System shall be chosen such that the voltage drop at any of the remote consumption points shall not exceed 3%.
- 15.1.5. The Auxiliary Power Supply System shall feed 110 V DC system with battery chargers, Lighting System, UPS, some auxiliary loads of SCADA System & switchgear panels, Air Conditioners, ventilation fans, water pumps, IDT auxiliary supply, Inverter auxiliary supply, CCTV and other system loads as applicable.
- 15.1.6. Design details of both Auxiliary Power Supply System in PESS and PCSS: The Auxiliary Power Supply System shall be fed from two 100% capacity rated sources. The status and alarm conditions of both the sources shall be indicated to the SCADA System. Design details shall be submitted for approval of CLUVPL during detailed engineering.

### 15.2. Power Collection Sub Station (PCSS)

- 15.2.1. PCSS shall have Auxiliary Power Supply System with ACDB (LT Panel) integrated with suitable rated LV Auxiliary Transformers. The Power shall be drawn from LV sides of Inverter Duty Transformer or as per the system requirement.
- 15.2.2. In PCSS, the Auxiliary Power Supply System shall be fed from two 100% capacity rated sources, one Normal and the other Standby, with an Automatic Change Over Scheme. Normal source shall supply power during regular operation, failure of which shall result in Auto Changeover to Standby source.

### 15.3. Power Export Sub Station (PESS)

- 15.3.1. PESS shall have Auxiliary Power Supply System with ACDB (LT Panel) which shall be fed from HT (as per system requirement) supply through one number of suitable 100% capacity rated auxiliary HT transformer as the first source. The Second source shall be 100% capacity rated source from one of the windings of the nearest installed IDT with suitably rated LT Auxiliary transformer / 100% capacity rated second auxiliary HT transformer.
- 15.3.2. Total loads in PESS shall be distributed between the two sources such that each auxiliary source supplies 50% of the total load. Bus coupler shall be used in order to separate the

loads and proper arrangement shall be made to supply the total load by any one source in case of failure of other source automatically.

- 15.3.3. The HT (as per system requirement) PESS auxiliary Transformer shall comply to the General requirements of Transformer as per Section 6 of this Specification and shall be sized as per the system requirement.

**15.4. Auxiliary LT Panel:**

- 15.4.1 Incoming AC supply from Auxiliary Transformers shall be fed to Aux. LT Panel through suitable MCCBs and shall be sized in such a way to cater the auxiliary loads of the PESS.
- 15.4.2 LT Panel shall be of metal enclosed, indoor, floor-mounted, freestanding type. LT Panel frames and load bearing members shall be fabricated using suitable Mild Steel structural sections or pressed and shaped Cold Rolled Sheet Steel of thickness 2.0 mm. Frames shall be enclosed in cold rolled sheet steel of thickness 1.6 mm. Doors and covers shall also be of cold rolled sheet steel of thickness 1.6 mm. Stiffeners shall be provided wherever necessary. The gland plate thickness shall be 3.0 mm for hot / cold-rolled sheet steel and 4.0 mm for non-magnetic material.
- 15.4.3 LT Panels shall be of dust-proof and vermin-proof construction and shall be provided with a degree of protection of IP: 4X (Indoor) or better as per BIS/IEC 60947. All doors and cut-outs shall be provided with EPDM / Neoprene gaskets. The doors shall be of hinged type.
- 15.4.4 LT Panels shall be supplied with base frames made of structural steel sections, along with all necessary mounting hardware required to the foundation.
- 15.4.5 LT Panels shall be provided with three phase and neutral bus bars. Bus bars shall be of Copper or Aluminium. Entire bus bar system shall be insulated with PVC sleeves. Bus bar sleeves shall be compliant to UL224 (Extruded insulating tubing), CE/UL certified, having fire retardant properties and working temperature of 105°C.
- 15.4.6 The cross-section of the bus bars shall be uniform throughout the length of switchboard section and shall be adequately supported and braced to withstand the stresses due to the specified short circuit currents. Neutral bus bar short circuit strength shall be same as main bus bars.
- 15.4.7 The Contractor shall furnish calculations establishing the adequacy of bus bar sizes for specified current ratings. All bus bars shall be colour coded as per BIS: 375.
- 15.4.8 A galvanized steel / Copper / Aluminium earth bus shall be provided at the bottom of each panel and shall extend throughout the length of each switchboard. It shall be welded / bolted to the framework of each panel. The earth bus shall have sufficient cross section to carry the momentary short circuit and short time fault current to earth without exceeding the allowable temperature rise.
- 15.4.9 The minimum clearance in air between phases and between phases and earth for the entire bus bars (sleeved or insulated) shall be 25 mm. For all other components, the clearance between "two live parts", "a live part and an earthed part", shall be at least ten (10) mm throughout. Wherever it is not possible to maintain these clearances, insulation shall be provided by sleeving or barriers. All connections from the bus bars up

to switch / fuses/MCCB shall be fully insulated and securely bolted to minimize the risk of phase to phase and phase to earth short circuits.

- 15.4.10 Cable termination arrangement for power cables shall be suitable for heavy duty, 1.1 kV grade, stranded aluminium conductor, PVC/ XLPE insulated, armoured / unarmoured and PVC sheathed cables. All necessary cable terminating accessories such as supporting clamps and brackets, hardware etc., shall be provided by the Contractor, to suit the final cable sizes.
- 15.4.11 All auxiliary wiring shall be carried out with 650 V grade, single core stranded copper conductor, colour coded, PVC insulated wires. Conductor size shall be 1.5 mm<sup>2</sup> (min.) for control circuit wiring and 2.5 mm<sup>2</sup> (min) for CT and space heater circuits.
- 15.4.12 The MCCBs shall be fixed modular type, air break type, having trip free mechanism with quick make and quick break type contacts. All MCCBs shall have current limiting feature, inbuilt front adjustable releases (overload & short circuit) and shall have adjustable earth fault protection unit also. The protection settings shall have suitable range to achieve the required time & current settings. LED indications & Auxiliary switches for remote monitoring shall also be provided for faults, MCCB status (on/off etc).
- 15.4.13 Suitable Rated Multi Function Meters (MFM) shall be provided for each of the incomers to the ACDB, at 415 V side.
- 15.5. SCADA Requirement:** The Status / parameters of the following Equipment of Auxiliary Power System shall be communicated to SCADA.
- a) Status of the MCCBs and Critical MCBs.
  - b) Parameters of Aux. Transformer.
  - c) Readings of the MFM.
- 15.6. Small Power Installation:** Sufficiently rated, 415V, 3 Ø, 4/5 pin configuration, industrial, interlocked switch socket outlets, in weather proof enclosure shall be provided in appropriate locations for the purpose of availing supply during Testing / maintenance of outdoor equipment like transformer Etc.
- 15.7. Drawings & Documents:** During Detailed Engineering the following particulars of the "Auxiliary Power Supply System" shall be submitted for approval by CLUVPL.
- 1) Auxiliary Power Supply System - Sizing Calculation & SLD
  - 2) Auxiliary Power Supply System ACDBs - GTP, GA and vendor documents
  - 3) Auxiliary Power Supply System ACDBs - MQP
  - 4) Auxiliary Transformer - GTP, GA and vendor documents
  - 5) Auxiliary Transformer - MQP
  - 6) Auxiliary Transformer - Foundation details



**SECTION 16.0**  
**CONTROL POWER – DC SYSTEM: CHARGERS & BATTERIES**

**16.1.1. General Requirement:** 110 V DC power system with adequate capacity to have Four (4) hours backup time shall be provided in each PCSS and PESS. Battery condition, charger function status, abnormality warnings etc. shall be made available in plant SCADA. The basic design data for battery and battery charger is specified below.

**16.1.2. Battery:**

**Specifications:**

1. Type of cell : Valve regulated lead acid type (VRLA) only and the battery shall be located in a safe environment as recommended by the OEM.
2. Nominal DC voltage : 110V DC
3. Load : To meet the requirements of breakers, SCADA system panels and auxiliaries, Inverters, Emergency lighting, Battery Banks and other equipment requiring 110 V DC supply as per System requirement.
4. Battery capacity : Sizing of battery shall include a design margin of 10%, ageing factor of 1.25, End Cell voltage of 1.75 V, Temperature correction factor corresponding to 10<sup>0</sup> C and the AH Capacity shall be based on Four (4) hour rate of discharge.
5. Duty : Sub Station duty
6. End cell voltage : 1.75 Volts (C10 or higher battery Shall be selected to achieve the Same).
7. Nominal voltage per cell : 2.0 V  
Float Voltage per cell : As per System requirement
8. Ampere hour efficiency : Better than 90%
9. Watt hour efficiency : Better than 80%
10. Self-discharge : Not to exceed 1% per week.
11. Accessories :
  - Battery rack made of acid resistant paint coated steel sheet.
  - Set of lead coated heavy-duty copper strips with bolts and nuts as inter cell and inter row connectors.
  - Cell testing voltmeter.

12. Standards to comply (latest editions) All Battery components such as containers, electrolyte, connectors, fasteners, vent plugs, plates, sediment space, cell insulators, racks etc. shall comply respective standards
- Thermometer with temperature correction chart.
- : 1. IEEE 485 - Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications  
2. IEC 60896: Stationary lead-acid: Valve regulated types - Requirements  
3. BIS 266: Sulphuric Acid - Specification  
4. BIS 1069: Quality Tolerances for Water for Storage Batteries - Specification  
5. BIS 1146: Specification for Rubber and Plastics Containers for Lead-Acid Storage Batteries  
6. BIS 1652: Stationary Cells and Batteries, Lead-Acid Type with Plante Positive Plates- Specification  
7. BIS 3116: Sealing Compound for Lead-acid Batteries (Bitumen Based) - Specification  
8. BIS 8320: General Requirements and Methods of Tests for Lead-acid Storage Batteries  
9. BIS 6071: Specification for Synthetic separators for lead-acid batteries.

If any other international or national standard followed, details shall be furnished.

### 16.1.3. Battery Charger:

- 1) **General Design Parameters:** The battery charger shall be designed for charging the battery in float as well as boost modes and simultaneously supplying the continuous load current indicated in the duty cycle. The charger shall be designed to operate with input voltage from the auxiliary power supply of 415V  $\pm 10\%$ , 3 phase, 50 Hz  $+5\%/-3\%$ , combined voltage and frequency variation of 10% and a continuous load variation from no load to full load with an output Load voltage of 110V DC  $\pm 1\%$ . Output voltage variation shall remain in  $\pm 1\%$  range even when battery is not connected. Charger shall recharge the fully discharged battery within 8 hours.

The Charger panel shall be constructed in heavy duty metal enclosure fabricated from not less than 2 mm thick sheet steel, the housing / rack of the battery shall be corrosive resistant and both shall be designed for floor mounting. The panel shall be of indoor type and with protection class IP-42 and shall be made up as per BIS: 6005. Two coats of Lead oxide primer followed by powder painting with final shade of RAL9002 for complete panel except end covers & RAL 5012 for end covers.

The temperature rise inside the panel shall not exceed 10 deg. C above ambient temperature.

- 2) **Configuration:** The charger shall consist of input switchgears, Rectifier Duty Transformer, Full wave bridge rectifier with SCRs/IGBTs and diodes, regulator, filter circuit, output switchgear, metering and protective devices for under voltage, over voltage and earth fault, alarm indicator circuit and integral DC distribution board. All necessary Control Gears, all indications including status of Charging/Discharging of battery, Alarm Windows and meters like AC voltmeter, DC voltmeter, DC ammeter etc. shall be provided on the front door of the Panel.
- 3) **Float Mode:** The float circuit shall be designed for supplying the continuous load current as well as charge the battery. Uniform and step-less adjustments of voltage setting (in both manual and automatic modes) shall be provided covering the entire Float Charging output range specified by battery OEM & shall be capable of matching the float voltage correction recommendations (w.r.t. temperature) as suggested by the respective battery OEM. Step-less adjustment of the load limiter setting shall also be possible from 80% to 100% of the rated output current for Float Charging mode.
- 4) **Boost Mode:** The Boost circuit shall be designed for supplying the continuous load current as well as boost charge the battery. Control device to vary the voltage in Boost charging mode shall be provided (in both manual and automatic modes) to achieve the desired output. The charger shall be provided with auto-changeover circuitry from float to boost and vice versa in addition to manual changeover switch. During Boost charging with automatic mode, the Chargers shall operate in constant current mode. It shall be possible to set the Boost charging current continuously over a range of 50 to 100% of the rated output current for Boost charging mode. In addition, it shall be possible to set the upper limit of this Boost charging voltage within the range of boost charging mode.
- 5) **Load Limiters:** Chargers shall be provided with load limiters in order to avoid damage of Chargers and to avoid inadvertent blowing of fuses in case of overload or short circuit in DC System and avoid tripping of the circuit. When the voltage is in automatic control mode, load limiters shall facilitate a smooth reduction in voltage when the load current exceeds its set value and shall build up the nominal voltage automatically once the current drops off its set value.
- 6) The charger shall have protection features for own circuits against the faulty conditions in the AC Input and / or in the DC output.

- 7) The charger shall have soft start feature to avoid inrush currents.
- 8) Momentary output voltage of the Charger, without the Battery connected shall be within  $\pm 5\%$  of the voltage setting during sudden load Change from 100% to 20% of full load or vice-versa. Output voltage shall return to, and remain, within the limits specified in less than 2 seconds after the above-mentioned change.
- 9) The output voltage of bridge for float charger shall be 120V DC max. The output voltage of the bridge for boost charger shall be 145V DC max.
- 10) RMS ripple factor in input voltage of the charger shall not be more than 3%.
- 11) Protection measures shall be arranged to avoid current/voltage surges of harmful magnitude/nature which may arise during changeover of both modes Auto to Manual and Float to Boost or vice-versa under normal operating condition.
- 12) The Charger shall be provided with built in digital panel for control and monitoring. In addition, the Charger shall be provided with suitable output interface for connection to SCADA to allow remote monitoring the operating status of the Charger. Parameters like Charger output current, output voltage, float/boost mode, automatic/manual mode, etc. shall be included.

**16.1.4. DC Distribution Board (DCDB)**

- 1) The DCDB shall preferably form an integral part of main battery charger and shall be compartmentalized from the other charger circuits and shall be equipped with main incoming MCCB and required number of double pole MCBs.
- 2) The utilization category of the DC switching devices shall be based on the individual loads as recommended in BIS 13947.

**16.2. DC system requirements of Power Collection Sub Station (PCSS)**

Each PCSS shall be provided with suitable capacity 110 V DC system for meeting the power requirement of switchgears, control panels, Inverter Monitoring Units (IMU), String Monitoring Units (SMU) in the yard, etc. The battery together with the charger and DCDB shall be suitable to meet the DC load.

**16.3. DC system requirements of Power Export Sub Station (PESS)**

PESS shall be provided with adequate capacity 110 V DC power system for meeting the power requirement of switchgears, control panels, SS RTUs, SCADA System, Emergency lighting, etc. A Battery charger along with Battery Bank of appropriate capacity with the specified BIS/IEC standards & protection and automatic charging system shall be provided along with relay circuit, fuses, annunciations. etc. A DC Power Supply Distribution Panel/Board shall be supplied along with the Charger as specified.

**16.4. Drawings & Documents:** During Detailed Engineering Sizing of Charger including Rectifier Duty Transformer & Full wave bridge rectifier, Battery, scheme, SLD and data sheets etc. of "Chargers and Batteries" shall be submitted under the following Drawing titles for review and approval by CLUVPL.

- 1) DC System with Batteries for PESS, PCSS - Sizing Calculation
- 2) DC System with Batteries for PESS, PCSS - GTP, GA & vendor docs and DCDB details
- 3) DC System with Batteries for PESS, PCSS – MQP







## SECTION 17.0 CONTROL POWER – AC SYSTEM: UPS & BATTERIES

### 17.1. General Requirements

- 17.1.1.** Uninterrupted power supply shall be provided to SCADA and other systems requiring uninterruptible power as part of PESS and PCSS Auxiliary Power Supply Systems.
- 17.1.2.** The UPS System shall consist of rectifier/charger, batteries, inverter, static bypass, manual bypass, protective devices, UPSDB and accessories. During normal operation, UPS System shall satisfactorily function without Battery in the circuit under all load conditions. Upon failure or deterioration of the normal AC Input supply, UPS shall automatically provide continuous supply of electric power to its load within tolerances and without interruption.

### 17.2. Uninterrupted Power Supply (UPS)

- 17.2.1.** The UPS module shall be Industrial Grade, Static type providing 100% power backup for 4 Hours to SCADA and other systems powered by it. The continuous power rating of the UPS shall be selected by the Contractor based on the power demand. The minimum UPS rating shall be 2 KVA and it shall be over entire battery voltage range at specified power factor. UPS shall maintain the output voltage within acceptable limits at all loads, from full load to no load.
- 17.2.2.** Power factor of 0.8 lagging shall be considered for capacity calculation of UPS with a design margin of 10% at 50 deg C. The UPS shall have an overload capacity of 125 % rated capacity for 10 minutes and 150 % rated capacity for 10 seconds.
- 17.2.3.** The UPS system shall be of double-conversion type conforming to BIS: 16242 / IEC 62040. The overall efficiency of the UPS system, output to input, shall not be less than 90% at 50% of rated load. Selection of overall rating, output power characteristic variations, wave form, frequency and load limits, response times, battery type & sizing, alarm & shut down conditions, etc., shall be the responsibility of the Contractor.
- 17.2.4.** The UPS system shall be of modular / non modular type design and made up of one or more physically detachable equipment modules or cabinets, preferably of the draw-out type and removable from the front of the UPS. The UPS System shall be constructed in heavy duty metal enclosure fabricated from not less than 2 mm thick sheet steel, the housing / rack of the battery shall be corrosive resistant and both shall be designed for floor mounting. The Enclosure shall be of indoor type and with protection class IP-42.
- 17.2.5.** All active electronic devices shall be solid state. All semiconductor devices shall be hermetically sealed. All relays shall be of dust proof design. All power semiconductors in the module shall be protected by fast acting fuses so that the failure of any one power semiconductor will not cause cascading failures. Each fuse shall be provided with a blown fuse indicator on the control panel.
- 17.2.6.** The UPS module shall not incur permanent damage to itself and the connected load under all predictable types of failure conditions within itself and the connected load. Fast



acting current limiting devices shall be used to protect against failures of solid-state devices. The total harmonic current distortion that generated by the UPS shall be within acceptable limits i.e., total harmonic content shall be less than 5% and any single harmonic content shall be less than 3%.

**17.2.7.** The UPS system module shall be provided with built in digital panel for control and monitoring. In addition, the UPS system shall be provided with suitable output interface for connection to SCADA to allow remote monitoring of the operating status of the UPS system.

**17.2.8.** The temperature rise inside all the cabinets/enclosures shall not exceed 10 deg. C above ambient temperature.

**17.3. Battery**

**17.3.1.** The rated name plate AC output capacity of UPS shall be taken for UPS battery size calculation for 4 hours backup.

**Battery:**

**Specifications:**

1.	Type of cell	:	Valve regulated lead acid type (VRLA) only and the battery shall be located in a safe environment as recommended by the OEM.
2.	Load	:	To meet the requirements SCADA system panels and auxiliaries, Emergency lighting etc. as per System requirement.
3.	Battery capacity	:	Sizing of battery shall include a design margin of 10%, ageing factor of 1.25, End Cell voltage of 1.75 V, Temperature correction factor corresponding to 10 <sup>0</sup> C and the AH Capacity shall be based on 4 - hour rate of discharge.
4.	Duty	:	Sub Station duty
5.	End cell voltage	:	1.75 Volts.
6.	Nominal voltage per cell & Float Voltage per cell	:	As per System requirement
7.	Ampere hour efficiency	:	Better than 90%
8.	Watt hour efficiency	:	Better than 80%
9.	Self-discharge	:	Not to exceed 1% per week.

10.	Accessories	:	<ul style="list-style-type: none"> <li>• Battery rack made of acid resistant paint coated steel sheet.</li> <li>• Set of lead coated heavy-duty copper strips with bolts and nuts as inter cell and inter row connectors.</li> <li>• Cell testing voltmeter.</li> <li>• Thermometer with temperature correction chart.</li> </ul>
11.	Standards to comply (latest editions) All Battery components such as containers, electrolyte, connectors, fasteners, vent plugs, plates, sediment space, cell insulators, racks etc. shall comply respective standards	:	<ol style="list-style-type: none"> <li>1. IEEE 485 - Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications</li> <li>2. IEC 60896: Stationary lead-acid: Valve regulated types - Requirements</li> <li>3. BIS 266: Sulphuric Acid - Specification</li> <li>4. BIS 1069: Quality Tolerances for Water for Storage Batteries - Specification</li> <li>5. BIS 1146: Specification for Rubber and Plastics Containers for Lead-Acid Storage Batteries</li> <li>6. BIS 1652: Stationary Cells and Batteries, Lead-Acid Type with Plante Positive Plates- Specification</li> <li>7. BIS 3116: Sealing Compound for Lead-acid Batteries (Bitumen Based) - Specification</li> <li>8. BIS 8320: General Requirements and Methods of Tests for Lead-acid Storage Batteries</li> <li>9. BIS 6071: Specification for Synthetic separators for lead-acid batteries.</li> <li>10. If any other international or national standard followed, details shall be furnished.</li> </ol>

**17.4. Drawings & Documents:** During Detailed Engineering Sizing, scheme, SLD, rating calculations of rectifier/charger, batteries, inverter and battery sizing calculations and data sheets etc. of “UPS and Batteries” shall be submitted under the following Drawing titles for review and approval by CLUVPL.

- 1) UPS with Battery for PESS, PCSS - Sizing Calculation
- 2) UPS with Battery for PESS, PCSS - GTP, GA & vendor documents
- 3) UPS with Battery for PESS, PCSS – MQP





## SECTION 18.0

### LIGHTING SYSTEM & CCTV SYSTEM

#### 18.1. LIGHTING SYSTEM

##### 18.1.1. GENERAL REQUIREMENTS

- 1) Solar Plant shall be provided with adequate lighting throughout the plant.
- 2) Lighting system shall be fed from 415V, 3 phase, 4 wire system from ACDB of PESS / PCSS respectively, through Lighting Distribution Boards (LDBs). 20% of the total lighting system shall be considered as Emergency lighting and it shall be supplied from UPS DB or DCDB as per the scheme adopted by Contractor and the 20% of the emergency lighting load shall be considered for sizing of UPS or Battery and Charger. Emergency lighting shall be provided at each PCSS, PESS, Security Room / Main gate.
- 3) **Lighting fixtures and accessories:** All lighting fixtures shall be complete with lamp, lamp holder, clamps, terminal blocks, brackets, locking arrangements, etc. Fixtures shall be designed for minimum glare and not to form any bright spots by direct lighting or by reflection. The reflectors shall be manufactured from CRCA sheet steel or aluminium.
- 4) All lighting fixtures shall be provided with an external, brass/GI earthing terminal suitable for connecting to 14 SWG, GI earthing wire. All metal or metal enclosed parts of the housing and accessories shall be bonded and connected to the earthing terminal as so to ensure satisfactory earthing continuity throughout the fixture.
- 5) **LED Luminaires:** LED Luminaires shall be used for indoor / outdoor lighting in Array Yard, PCSS, PESS, Watch towers, Security room / main gate as applicable. For DC Lighting LED Luminaires shall be used subject to the availability. LED lamp fixtures shall be indoor type and pre-wired comprising of Lamp(s) with lamp holder(s), Electronic powering unit(s) and metal reflector(s). The lamp fitting shall be covered by Glass or Perspex material. The Lamp Fixture shall be fitted on roof. The number of lighting fixtures should be such that it should give sufficient luminance level for comfortable operation as per BEE standards. All the LED Luminaries shall comply to the respective Indian Standards (BIS).
- 6) **Switches:** All the switches and receptacles shall be of modular type and these shall be provided with pre-galvanized/galvanized modular switchbox & plate.
- 7) **Junction Boxes:** Junction boxes for indoor / outdoor lighting shall be provided as applicable. Indoor junction boxes shall be fire retardant and outdoor junction boxes shall have IP 55 degree of protection.
- 8) **Conduits, Pipes and Accessories:** Heavy duty PVC conduits conforming to BIS: 9537(Specifications Conduits for Electrical Installations: Part-III - Rigid Plain Conduits of Insulating materials) along with various accessories shall be used for

indoor wiring in the buildings. These conduits shall be concealed in the wall/floor/roof.

- 9) **Lighting Wires, Lighting Poles:** For Technical requirements of wires, refer to the Section 8.0 of this specifications. Lighting Poles shall be designed as per the respective BIS and shall be capable of withstanding the wind gust prevailing at site. The lighting poles shall have loop in loop out arrangement for cable entry. The Lighting Poles shall be positioned in such a way to avoid casting Shadow on the nearby PV array.
- 10) **Earthing:** Junction boxes, switch boxes, fixtures, etc. shall be earth through a separate earth conductor. Lighting panels shall be earthed to plant earthing system with two separate connections.
- 11) Automated switching control through industrial timers provided at LDBs shall be made available for the outdoor lighting such as PV array yard / road and watch tower lighting. There shall also be provision for manual operation of switching by bypassing the timers.
- 12) Lighting and its power system design, calculations and drawings shall be submitted for approval by CLUVPL during Detailed Engineering.

#### **18.1.2. PV Array Yard Peripheral Road & Internal Road Illumination:**

- 1) The Contractor shall provide adequate PV array Yard Lighting System that includes erection of poles, fixtures and cables as per BIS standards, along the internal roads and Peripheral Roads keeping the general security in mind. The PV array Yard Lighting System shall be fed from the Auxiliary Power Supply System of the nearest PCSS / PESS, through buried cable network.
- 2) Along the Peripheral & Internal Roads, illumination shall be provided with Street light poles of minimum pole height of 3.5 meters and 35 meters inter-pole spacing and luminaries of LED type with minimum 30 W.

**18.1.3. Power Collection Sub Station Building:** Sufficient number of luminaries shall be provided inside PCSS PEB to achieve an average Illumination level of minimum 150 Lux. External Wall mounted luminaries shall be provided on all directions to have a uniform and sufficient lighting around the PEB.

**18.1.4. Power Export Sub Station Building:** Indoor lighting for the SCADA and Office rooms shall have adequate average illumination level of 300 Lux, Store room and Switch gear rooms shall have an average illumination level of 200 Lux and 150 Lux respectively. External Wall mounted luminaries shall be provided on all directions to have a uniform and sufficient lighting around the PESS building.

**18.1.5. Outdoor Electrical Equipment:** To illuminate the outdoor space wherein electrical equipment are installed, sufficient number of luminaries with necessary supports / Poles shall be provided to achieve an average Illumination level of 50 Lux on the equipment and 20 Lux in general.

## **18.2. CCTV SYSTEM**

- 18.2.1.** Surveillance CCTV system is required to ensure effective surveillance of solar power plant area (array yard, PCSS Control Rooms, PESS Control Room, etc.) as well as create a tamperproof record for post event analysis. The System shall provide an online display of video images on Large LCD/LED monitors as per Industry standard of not less than 65" size shall be located in SCADA Control Room. Necessary Devices and Software to view the same display at a remote location through internet shall be provided.
- 18.2.2.** The Contractor shall make use of the 2 allocated cores of Fiber optic Network of SCADA for CCTV system. Also, wireless communication may be used according to the site requirement in certain areas.
- 18.2.3.** System should facilitate viewing of live and recorded images and controlling of all cameras by the authorized users present in the CCTV Local Area Network (LAN). System should provide interoperability of hardware, OS, software, networking, internet connection, printing, database connectivity, reporting, and communication protocols. System expansion should be possible through off-the-shelf available hardware. Equipment with better specifications shall be accepted.
- 18.2.4.** All CCTV Cameras provided shall be day/night vision type and should have low lux so that the same can operate in minimum illumination also. Cameras should be IP cameras, should have remote swivel arrangement, should have both auto/manual focus mode and control should also be both manual/auto. A minimum of suitable type of 1 Camera/MW for monitoring Array Yard shall be strategically located to uniformly cover the entire area.
- 18.2.5.** The system should be based on Stand Alone Integrated NVR (Network Video Recording). Specifications of Stand-Alone Integrated NVR
- 1) Ability to connect Cameras as per requirement,
  - 2) Facility to store 90 days of Video,
  - 3) Capability to set the frame rate, contrast, brightness of each individual camera,
  - 4) Should have facility to view live video (with audio) images in a monitor, in a PC and web browser.
  - 5) Remote Administration: Should be fully administrable/ programmable remotely through client software and web browser.
  - 6) Minimum recording rate per channel – NTSC/30 fps per channel, PAL/25 per channel.
  - 7) Configurable/adjustable recording rate.
  - 8) Full recording and playback facilities on remote machine.
  - 9) Smart monitoring (Motion Detection).
  - 10) Adjustable motion detection (motion detection sensitivity should be adjustable).

- 11) Ability to convert H.264 video into AVI files.
  - 12) Date and time stamping of video files.
  - 13) Viewing for all cameras.
  - 14) Should support backup devices like USB drive, DVD writer NVR Software must be able to take backup in DVD writer, USB drive etc. Remote controller shall be available for operating the NVR.
  - 15) Should have live display, playback, record facilities.
  - 16) Should have minimum 1 USB port.
- 18.2.6.** System should have the capability of increasing the storage capacity as and when required.
- 18.2.7.** It should have low maintenance cost and should be upgradeable to inputs for more cameras, as and when required, with minimum cost.
- 18.2.8.** It should be compatible with alarm system.
- 18.2.9.** IP Cameras are to be provided with suitable LAN and the Cameras should be C-mount type.
- 18.2.10.** The firm installing the system should have adequate infrastructure for providing after sales/installation service.
- 18.2.11.** IP Cameras of CCTV system shall be provided in the following Locations:
- 1) Suitable locations of Array Yard, around the Periphery located in separate poles / Lighting Poles.
  - 2) Power Collection Sub Station
  - 3) Power Export Sub Station
  - 4) Entrance gate(s)
- 18.2.12.** General Technical Specifications of Cameras
- 1) Box Camera - 1/3" CCD Colour camera with C mount Auto iris lens
    - 6mm Lens with Auto Iris Lens
    - Minimum 480 TVL or above horizontal resolution
    - 0.5 Lux at F 1.2 minimum illumination
    - 270 deg swivel arrangement with remote operation.
  - 2) Dome Camera – 1/3" CCD Colour Camera
    - 4mm Fixed focal lens
    - Minimum 480 TVL or above horizontal resolution
    - 0.4 Lux at F 1.2 minimum illumination

3) Camera – Infra Red (Night Vision)

- 1/3" CCD Color
- 3.6/4 mm lens with Infra-Red
- Selectable mode for Day and Night
- C/CS mount
- Fixed Board Lens
- lux minimum illumination

**18.2.13.** Video Cable: Video cable suitable for NVR shall be provided by the Contractor.

**18.2.14.** Power Cable: Where ever provided, the power cables shall be of suitable rating to with stand the load and Voltage spikes.

**18.2.15.** Other technical requirements:

- 1) The NVR system should have CE certification with certificates
- 2) All Cameras must be provided with suitable mounts/housings Wall, Dome etc.
- 3) All cameras must be connected with NVR system with suitable cables (with heavy gauge PVC conduits) and Contractor must lay and dress the necessary cables to connect NVR with cameras.
- 4) The NVR system offered must be an integrated NVR system and should not be an NVR system assembled using third party Personal Computers and NVR cards.

**18.3. Drawings & Documents:** During Detailed Engineering the following particulars of the "Lighting System & CCTV System" shall be submitted for approval by CLUVPL.

- 1) Lighting system PESS& PCSS - Design, Luminaire details & Layout
- 2) Lighting system security building and Watch Tower - Design, Luminaire details & Layout
- 3) Lighting system Outdoor Yard and Roads - Design, Luminaire details & Layout
- 4) Lighting pole foundation details.
- 5) CCTV System – Design, Scheme, Layout & Data sheets etc.





## SECTION 19.0 FIRE PROTECTION SYSTEM

### 19.1 Introduction

Fire Protection System shall consist of a Central Fire Detection & Alarm System with Fire alarm Control Panels and Fire Fighting Equipment and shall be installed in the Solar Power Plant premises. The system shall be suitable for protection of entire equipment including outdoor Electrical Equipment, as per CEIG requirements against the risk of fire. Contractor shall comply with recommendation of Tariff Advisory Committee / LPA for incurring minimal premium for insurance. Contractor shall be responsible for getting the approval for the fire protection system from concerned authorities for insurance, meeting any additional requirement as demanded by such authorities without any extra cost to CLUVPL.

### 19.2 Fire Detection & Alarm System:

#### 19.2.1 Central Fire Detection & Alarm System (CFDAS):

A Central Fire Detection & Alarm System shall be provided in the Power Export Sub Station (PESS) to monitor all the Equipment and the Buildings located in all PCSS and PESS against any fire related events and initiate Unambiguous Visual & Audible alerts. This dedicated, floor mounted, standalone Central System shall have the CPU & suitable Display Unit installed in an Enclosure and serves as the Master.

All the Fire Alarm Control Panels (FACP) installed across the Solar Power Plant shall be connected to this Master CFDAS through suitable interfacing devices & dedicated redundant Fibers of FO cables in a ring network and all signals from FACPs shall be brought to this Master CFDAS.

The Central System shall be able to represent the whole configuration of site graphically with reference to the Fire Protection system and shall have the facility to monitor, navigate and Control the FACPs installed at various locations from a single window. Visual & Audible alerts for all the events like fire/ smoke, fault in the CFDAS / FACP Systems, power supply failure, communication failure etc. shall be made available. Provision to analyze the system through an extensive History log shall be one of the features of this Central Fire Detection & Alarm System.

All the Alarm conditions of entire zones of solar Power Plant shall be immediately announced on CFDAS through Audio / Flashing Visual alarms. Necessary features like Acknowledge, Sound Cancel, Steady Display of active alarm conditions, and recognition & Reset of inactive alarms shall be provided.

The Central Fire Detection & Alarm System shall be integrated with SCADA system replicated with the above features through proper interface, communication means and authenticated software. Modbus RS485 communication, as applicable, is also acceptable.

#### 19.2.2 Fire Alarm Control Panel (FACP):

FACP shall be an intelligent microprocessor based addressable Control Panel of modular construction complete with central processing unit, input and output modules, power supply module, supervision control and isolator modules with 10% spare provisions.



All the potential locations/ Electrical equipment for Fire Vulnerability shall be installed with adequate number of alarm initiating devices (e.g., multi sensor type Heat / Fire / smoke detectors), Audio device, Manual Call Points and alarm notification appliances etc. and shall be connected to the dedicated FACP. All the rooms where Electrical Equipment and Air conditioners are installed, Office Room, Store Room, SCADA room etc. are some of the locations considered as potential locations for Fire Vulnerability. For Outdoor Electrical Equipment, suitable Heat / Fire / smoke Sensors shall be installed and connected to the FACP. The status of NIFPS of Transformers also shall be monitored through FACP.

Alarm conditions initiated by the sensors in a zone connected to the FACP shall be immediately announced by the FACP through flashing Visual alarm accompanied with the Audio alarm continuously until the alarm has been acknowledged. Acknowledgment shall stop the Audio Alarm and make the visual alarm to be steady till it is active. Reset of the Visual Alarm shall be done only after the alarm condition vanishes. A subsequent alarm condition received from another zone after acknowledgement shall announce the new alarm information as above.

All the addressable FACPs shall be connected with the Master CFDAS located at PESS. FACPs shall be installed in Power Collection Sub Stations (PCSS), Power Export Sub Station (PESS) and the Security Office at the Main Gate and any other mandatory locations.

19.3 **Fire Fighting Equipment:** The firefighting equipment like portable DCP type and Clean agent gas (such as IG 54 1/1G 55) type fire extinguishers for fighting electrical fires shall be kept in strategic locations of all the buildings inside the Solar Power Plant including Security office at the main gate, HT Switch gears and the Transformer fire protection cubicle as applicable. The design basis for the selection of location, type, capacity and quantity of such portable DCP fire extinguishers shall be furnished during detailed Engineering.

19.4 **Drawings and Documents:** The following drawings / Documents shall be submitted to CLUVPL during Detailed Engineering for approval.

- 1) Fire Detection & Alarm System - CFDAS&FACP and other accessories - GTP, GA, Schematic Diagram, Layout, vendor documents & MQP.
- 2) Fire protection system - DCP fire extinguisher and Clean agent gas extinguishing system etc. - Design, Layout, GTP and vendor documents.





## SECTION 20.0

### POWER EVACUATION & TARIFF METERING

**20.1. Power Evacuation:** Power evacuation of the proposed Solar PV plant from PESS of each location to the respective SECL's Substation shall be provided by the Contractor, through OH lines / UG Cables, matching the present SECL SS arrangement.

The scope of the Power evacuation works shall include Engineering, Supply, Erection and Commissioning of the following systems to enable export of Power.

- i) Power Transmission System through OH lines/UG Cables between PESS and the respective SECL's Substation.
- ii) Bay Extension if necessary, at SECL Substation's Switch yard.
- iii) Tariff Metering System for each location to measure the energy Export at the respective SECL's Substation and all other related works as per system requirement.
- iv) SCADA equipment and data communication scheme through Fiber Optic Cable for extending the designated data from the Pooling Power transformer and its accessories installed at PESS as applicable to SCADA system and voice communication arrangement.
- v) Relay coordination setting calculations.
- vi) Establishing Grid connectivity between PESS and SECL's Substation by following necessary precautions and safety measures in co ordination with the concerned authorities.
- vii) Suitably designed Earthing and lightning Protection scheme for the total Power evacuation system shall be followed as per the existing practice and requirements of latest Standards and Regulations.
- viii) All other related works for evacuation of power as per system requirement.

**20.2. Transmission Lines/ UG Cables:**

**20.2.1.** Overhead HT transmission line to evacuate the power generated to SECL's Substation shall be taken through suitably designed towers/structures with shield wire (OPGW) protections as per system requirement.

The UG cables to evacuate the power generated to SECL's Substation shall conform to the requirements as per Section 8.0 and as per the existing practice and requirements of latest CEA Regulations / IE Rules and shall be finalized during detailed engineering and approved by CLUVPL.

**20.2.2. CONDUCTOR:** This specification covers design, manufacture, testing before dispatch, supply and delivery of Aluminum Conductors Steel Reinforced (ACSR) Conductors.

Conductor sizing calculation shall be submitted to the CLUVPL for approval. Adequacy of the conductor size shall be established with the sizing calculation and any upward revision of conductor sizing shall be done.

Conductor size shall be selected to take care of momentary additional loading during tripping of any one of the incoming HT feeder and till the time of reduction of solar

power output according to the reduction in evacuation capacity on account of HT feeder tripping.

Conductor resistance shall be selected in such a way to minimize the Transmission losses during maximum output from the solar power plants.

The conductor sag and swing calculation shall confirm standards and shall consider the site conditions. Span calculation shall be submitted to the CLUVPL for approval.

The Overhead lines shall cross the roads by shortest distance to achieve 90° angle of crossing maximum possible. Minimum ground clearance and requirement of guards for Transmission line crossing Main roads shall be decided during detailed engineering.

**20.2.3. Buried HT cable portions in the other transmission line routes & Main Road crossings:**

HT cable portions are envisaged in the HT transmission line route to cross existing and upcoming transmission line corridors, Main roads Etc. In that case, required gantries for terminating HT cable bits are to be installed. HT cable technical requirements are furnished in the Power & control cable section. Buried HT cable bits are to be run underneath of Existing and upcoming transmission line power corridors /Roads. The HT cable termination lattice type gantries are to be suitably located. HT cable terminations shall be made in the gantries. If additional portions of buried HT cabling are required in the line due to site condition, the same shall be provided and included in the scope.

**20.2.4. APPLICABLE STANDARD:** The specification for HT Transmission Tower lines, Span, termination, etc shall be as per the following latest revisions of the standards.

**BIS 398:** Aluminium Conductors for Overhead Transmission Purposes:

**Part 1:** Aluminium Stranded Conductors

**Part 2:** Aluminium conductors, Galvanized Steel Reinforced.

**BIS 5613 Part 2:** Code of practice for design, installation and maintenance of overhead power lines part 2 lines above 11 kV up to and including 220 kV.

**Section 1 - Design**

**Section 2 - Installation & Maintenance**

The design shall be finalized during detailed engineering and approved by CLUVPL.

**20.3. TRANSMISSION TOWERS:**

20.3.1. Tower design and material selection shall be as per BIS 802 (part-1) 1977, BIS 802 (part-2) 1978, BIS 802 (part-3) 1978 and other relevant BIS including latest amendments.

20.3.2. Transmission line tower span shall be suitably selected as per BIS 5613.

20.3.3. Tower foundation shall be designed as per BIS 4091-1979.

20.3.4. Minimum statutory clearance between the HT transmission lines shall be maintained where two and three lines are running in parallel.

20.3.5. Live wire to ground clearance shall be minimum 8 Meter while crossing Main Roads and exact clearance will be finalized during detailed engineering.

20.3.6. All Galvanizing of steel structure shall confirm to BIS 209, 2629, 4759 & 6745 and galvanizing of fasteners shall confirm relevant parts of BIS 1367.

20.3.7. The insulators selected for the overhead lines shall be as per the specification mentioned under the head Insulators in the specification and as per relevant other

standards. The selection of insulators shall be suitable for the extreme climatic condition and shall confirm to the provisions of BIS 731-1971. Insulator fittings shall confirm the relevant portions of BIS 2486 part-1,2,3.

20.3.8. The Insulator string shall be designed and selected to suit the requirement of evacuation scheme.

20.3.9. Earth conductors and accessories: Earth conductor shall be placed on top of the structure to provide a shield angle over the top power conductors, the angle being  $30^{\circ}$  with the vertical in case of vertical formation of power conductors. With horizontal formation of power conductors, the shield angle is usually maintained at  $25^{\circ}$  for outer conductors and  $45^{\circ}$  for the central one. Shield wire of Transmission line (Earth conductor) shall be of Optical Fibre Ground Wire (OPGW) and shall be used for both shielding and communication purpose.

20.3.10. All metal support and all reinforced and pre-stressed cement concrete supports of overhead lines and metallic fittings attached thereto shall be permanently and efficiently earthed. For this purpose, a continuous earth wire shall be provided and securely fastened to each structure and connected with earth ordinarily at 3 points in every kilometer, the spacing between the points being as nearly equidistance as possible. Alternatively, each support and metallic fittings attached thereto shall be efficiently earthed.

20.3.11. All other points not mentioned shall be considered to be required and relevant for the safe and reliable operation and maintenance of HT overhead feeders and to meet the statutory requirements shall be considered as good engineering practices.

20.3.12. All the towers shall have Phase plate, Number/Circuit plate and danger board shall be displayed as per the standards.

20.3.13. Anti climbing device and Step bolts shall be provided as per standards.

20.3.14. Earthing of towers shall be done as per standards

**20.3.15. Design Parameters for Towers**

- i) Factor of safety as per the norms of Discom/Transco
- ii) Wind Pressure on Tower & conductor– As per BIS 802
- iii) Wind load on cross-arms, full projected area of conductors and Structure etc. as per the norms of Discom/Transco.
- iv) Ground clearance and all other clearance shall be as per IE Rules-2003 with latest amendments
- v) The live metal clearance shall be as per BIS: 5613
- vi) Tower accessories like danger plates, phase indication plates, anti climbing device shall be provided.

20.3.16. Contractor has to submit the design calculation and general technical particulars of all the elements of transmission system for CLUVPL approval.

**20.4. Optical Ground Wire Scheme (OPGW):**

20.4.1. Optical Ground wire scheme shall be provided for HT line shielding purpose and for linking Solar plant SCADA with SECL's Substation. Required hardware at both ends shall be included in the scope. Detailed scheme for interconnecting Solar plant SCADA over OPGW shall be submitted to CLUVPL for approval. OPGW shall also to be suitably

terminated at the cable termination gantries and Optical fibre cable shall be buried in the HT power cable portions. The OPGW serves as a ground wire for protection of HT transmission line.

- 20.4.2. OPGW shall contain Dual Window Single Mode (DWSM) minimum 12 optical fibres in conformity with ITU-T recommendations G-654. The fibres shall be embedded in a water tight Aluminium/Aluminium alloy (AA) wires. If stainless steel tube is used in contact with the AA or AS wires, there shall be no galvanic corrosion. The design of OPGW shall be similar to the galvanized stranded steel earth wire. The OPGW shall withstand without change in its characteristics, a fault current of 20 kA or more for 0.1 second (short circuit dissipation power equal to  $40 (kA)^2 \text{ sec}$  without exceeding the maximum allowable temperature of OPGW for short circuit duration as specified taking OPGW temperature before short circuit as  $53^\circ \text{C}$ . The temperature rise, measured in the core of OPGW shall not exceed 75% of the OPGW maximum rated temperature. The OPGW shall be used to provide lightning protection to the transmission line and shall withstand a lightning current of 200 kA (peak) without change in its characteristics.
- 20.4.3. **Requirement of metallic wires:** The properties of the metallic wires shall be in conformity with ASTM-415 and 416. The surface of the OPGW shall be free from all imperfections such as nicks, indentations, excess of lubricants etc. Adjacent wire layers shall be stranded with reverse lay directions. The direction of lay of the external layer shall be right hand. The wires in each layer shall be evenly and closely stranded around the underlying wires or around the central core. For Aluminium clad steel wires, the Aluminium covering on each individual steel wire shall be continuous and uniform and shall provide sufficiently strong bonding strength at the boundary between Aluminium layer and steel core.
- 20.4.4. **Requirements of core protection tube:** The OPGW shall be of tube core construction. The core tube shall be made of Aluminium, Aluminium Alloy or stainless steel and shall protect the Optic Fibres from mechanical and thermal loadings. The tube shall have sufficient resistance in order to protect the optical fibres against radial compression transmitted by the metallic wires of the external layers. The internal and external surfaces of the tube shall be circular and the tube thickness shall be constant. No tube joints shall be allowed in finished OPGW.
- 20.4.5. **Associated Hardware for OPGW:**
- i) The OPGW hardware fittings and accessories shall follow the general requirements regarding design, materials, dimensions & tolerances, protection against corrosion and markings as specified in IEC-61284.
  - ii) **Suspension clamp:** Preformed Armour grip suspension clamp with aluminium alloy retaining rods shall be used. The total drop of the suspension clamp from the center of the attachment to the center point of the OPGW shall not exceed 150 mm. The suspension clamp shall have a breaking strength of not less than 25 KN and shall have slip strength of 12 to 17 KN.
  - iii) **Dead-end clamp:** The dead end clamps shall be aluminum alloy and of bolted type using armour with necessary hardware for attaching the same to the tower strain plates. Dead-end clamps shall allow the OPGW to be continuous through

the clamp without cutting and jointing. The dead-end clamp shall have slip strength not less than 0.95 times the OPGW rated tensile strength.

- iv) **Grounding the jumper assembly at suspension and tension towers:** The bolted clamps shall attach the OPGW to the structures. The clamp shall have two parallel grooves for the OPGW, one on either side of connecting bolt. The clamps shall be such that clamping characteristics do not adversely change if only one OPGW is installed. The tower attachment plates shall locate the OPGW on the inside of the tower. It shall be attached directly to tower legs/cross arm without drilling or any other modification to the tower.
- v) At splice locations the OPGW shall be coiled on the tower close to the splice box.
- vi) **Vibration dampers:** 4R-stock bridge type vibration claspers shall be used. The damper shall have aluminium/Aluminium Alloy clamp capable of supporting the damper during installation and maintain the damper in position without damaging or crushing the OPGW or causing fatigue under the clamp. Vibration dampers shall conform to the requirements as per IEC 61897.
- vii) **Joint boxes** OPGW/SHIELD WIRE /OPGW-OFAC Terminal Joint boxes shall be sturdy, weather proof conforming to IP55 and shall include all necessary hardware to retain, terminate, protect and splice the fibres, as well as suitable clamps for fixing to the tower without any need for drilling holes in the tower/substation gantry structure.
- viii) The distribution rack/termination boxes in the communication rooms shall be free standing, vermin proof, watertight conforming to IP55 and shall be made of hot dipped galvanized steel. The distribution rack shall be suitable for all types of cable.
- ix) **Termination/ Splicing:** The OPGW shall be terminated/spliced at the splice locations using joint boxes which shall be located approximately 10 m (minimum 5m) above ground level. Spare length of 15 m of optical fibre shall be coiled and attached to the tower near the joint boxes.
- x) Single splice loss shall not exceed 0.1 dB. Each fusion splice shall have a spare length of fibre of approximately 1m associated with it. This excess fibre shall be coiled neatly and clipped (or otherwise retained) within the joint box.

20.4.6. **OPGW (Optical waveguide fibres):** The single mode optical wave guide fibres shall have characteristics in accordance with the ITU-T-G Series Recommendations - Transmission Systems and Media, Digital systems and Networks -Recommendations G.211 – G.653 and G- 654 or equivalent standards. The physical and optical characteristics of optical fibres shall as per the recent revision of ITU-T G652D, ITU-T-G 654, ITU-T G.653. The mechanical properties of optical fibres shall be as per IEC 60794.

20.4.7. Wherever HT UG cables are required to be laid, the usage of OFC may also be considered and OFC and its cabling network shall conform to the requirements as per Section 12.0 and as per the existing practice and requirements of latest Regulations, which shall be finalized during detailed engineering and approved by CLUVPL.

#### 20.5. **Detailed & Check Survey**

The Contractor shall take care of the following points while doing the detailed survey.

- i) The route of power evacuation through OH Lines/ UG Cables up to SECL's Substation shall be straight and short as far as possible.



- ii) Religious places, public and private premises, ponds, tanks, lakes, gardens, and plantations shall be avoided in the evacuation route, as far as practicable.
- iii) Crossing with permanent objects shall be minimum but where unavoidable preferably with smooth curvature.
- iv) Difficult and unsafe approaches shall be avoided.
- v) The route survey shall be conducted along the approved alignment only.
- vi) Final quantity of the OH Lines/ UG cables shall be estimated by the Contractor, on completion of the detail survey, preparation of route profile drawing and designing of the different items as elaborated in the specification and scope of work.

After completing the detailed survey, the Contractor shall submit the final profile and route layout for final approval by the CLUVPL. To facilitate checking of the alignment, suitable reference marks shall be provided.

The Contractor shall undertake the check survey during execution on the basis of the alignment profile arrived after the detailed survey. During check survey, minor changes due to unavoidable constraints, the Contractor may have to change the said alignment after obtaining prior approval from the CLUVPL.

Tree removal/ trimming: After finalizing the power evacuation route, trees, other vegetation and any other obstructions in the en-route shall be removed/ trimmed wherever required.

**20.6. Outdoor Switchyard Equipment & Works:** The HT Outdoor Switchyard Equipments at PCSS/PESS/Bay extension at SECL's Substations shall include Surge arresters, Line Isolator with Earth Switch, Potential Transformer, Measuring Current Transformer, Protection Current Transformer, Vacuum Circuit breaker, Bus Isolator, Aluminium Tubular conductors, Tariff Metering Scheme, Indoor Control & Relay panel, Clamps and connectors, Columns, beams, poles, Support Insulators, String insulators, Bus post / Pole Insulators, Power & Control cables, Communication cables etc., as per the best engineering practice and the latest Technical Standard / Regulations of CEA and IE Rules for Construction of Substation and Switchyard.

**20.6.1. Steel Structural Work:**

- 1) Preparation of identified switchyard location for erection of new Switchyard Equipment, that includes erection of new structures safely as per system requirement.
- 2) The structural work shall include design, fabrication and supply of all switchyard structures, galvanized steel structural work for equipment supports, towers and lightning masts. All structural steel shall be of mild steel conforming to BIS 2062.
- 3) Minimum thickness of members other than bracings shall be 5 mm and that for bracings shall be 4 mm.
- 4) Switchyard structures shall be designed in accordance with BIS 802-1977.
- 5) All fastening bolts and nuts shall conform to BIS 1363/ BIS 1367, all washers shall conform to BIS 2016/ BIS 6610 and spring washers shall conform to BIS 3063.

- 6) Minimum size of bolts for all bolted connections shall be 16 mm dia and minimum two bolts shall be provided for each member connection in important structures like towers and gantries. The center to center distance between bolts shall be a minimum of 2.5 times the nominal diameter of the bolt.
- 7) All foundation bolts shall conform to BIS 5624.
- 8) All embedded members shall be installed during concreting in accordance with construction drawings.
- 9) The steel structure shall not be erected on the foundations until at least 7 days after placing of the concrete in the foundations. All base plates shall be set level, in exact position and shall be given full and even bearing grouted into place. All anchor bolts and base plates shall be set accurately to the grade and alignment designated on drawing or as directed.
- 10) All galvanized steel shall be handled with care to avoid bending or damage to the galvanizing. Pieces bent in handling may be used only after they are straightened to the satisfaction of the engineer. Material on which galvanizing has been damaged shall be repaired as specified.
- 11) All connectors of the steel structures shall be bolted. Welded or riveted joints shall not be permitted.
- 12) The structures may be erected by assembling in sections on the ground and hoisting successive sections into place, or they may be built up in place by individual members at the option of the Contractor. If erected by assembling in sections, not less than 50 percent of all bolting in place shall be done on each section before starting another section.
- 13) All bolts shall be drawn up tight but not to such a degree as to endanger the strength of the bolt. Wrenches approved by the engineer shall only be used on the work and the use of any wrench, which may deform the nut or cut or flake galvanizing shall not be permitted.
  - i) Reasonable amount of drift shall be allowed in assembling but reaming for correction of mismatched holes shall not be permitted.
  - ii) During structural erection inspection shall be carried out at every stage to identify all loose bolts or other errors in erection are rectified in time.
  - iii) All exposed structural steel shall be hot dip galvanized as per BIS 4759. The thickness of zinc coating shall not be less than 610 g/m<sup>2</sup>.
  - iv) All bolts, nuts and washers shall be hot dip galvanized as per BIS 1367.
  - v) All spring washers shall be electro galvanized as per BIS 1573.
  - vi) All foundation bolts shall be galvanized as per BIS 5624 up to a depth of 300 mm (minimum) below top of pedestal.

**20.6.2. Aluminium Tubular conductors, Clamps and Connectors:**

- 1) The single bus arrangement of HT Switchyard shall be designed with suitably sized Aluminum tubular conductors. Design calculation and General Technical Particulars of Aluminum tubular conductors shall be submitted for CLUVPL's approval.
- 2) The material of clamps and connectors shall be Aluminium alloy casting conforming to designation A6 of BIS: 617 for connecting to equipment terminals and conductors



of aluminium. In case the terminals are of copper, the same clamps/connectors shall be used with 2mm thick bimetallic.

- 3) The material of clamps and connectors shall be Galvanized mild steel for connecting to shield wire. Bolts, nuts and plain washers shall be hot dip galvanized mild steel for sizes M12 and above. For sizes below M12, they shall be electro-galvanized mild steel. The spring washers shall be electro-galvanized mild steel.

#### 20.6.3. Vacuum Circuit Breakers:

- 1) Vacuum Circuit Breakers shall be outdoor type, comprising three identical single pole unit complete in all respects with all fittings and wiring. The circuit breakers and accessories shall conform to latest BIS/IEC 62271: Part 100: High - Voltage Switchgear and Control Gear Part 100 - Alternating - Current Circuit - Breakers.
- 2) The circuit breaker shall meet the duty requirement for any type of fault and shall be suitable for line charging and breaking when used on effectively grounded or ungrounded systems and perform make and break operations as per the stipulated duty cycles satisfactorily. The circuit breaker shall be capable for breaking the steady & transient magnetizing current corresponding to HT transformers. The rated transient recovery voltage for terminal fault and short line faults shall be as per BIS / IEC:62271-100.
- 3) The Contractor shall ensure that total break time of the breaker shall not exceed under any duty conditions specified such as with the combined variation of the trip coil voltage, pneumatic pressure etc.
- 4) Operating Mechanism: Circuit Breaker shall be with electrically spring charged mechanism. The operating mechanism shall be electrically and mechanically operated with anti-pumping and trip free (as per IEC definition) under every method of closing. The mechanism of the breaker shall be such that the position of the breaker is maintained even after the failure in vacuum. The circuit breaker shall be able to perform the duty cycle without any interruption. Electrical tripping shall be performed by shunt trip coil. Provision shall also be made for local electrical control. "Local / remote" selector switch and close & trip push buttons shall be provided in the breaker control cabinet. Operating mechanism and all accessories shall be in control cabinet.
- 5) Technical Parameters for HT Circuit breaker:

SN	Parameter	Requirement
1.	Type of circuit breaker	Outdoor Type Vacuum Circuit Breaker
2.	Nominal System Voltage	As per system requirement
3.	Highest system Voltage	As per system requirement
4.	Rated frequency	50 Hz
5.	Number of poles	Three (3) (Outdoor Type)
6.	Continuous Max. current rating	To suit system requirements
7.	Rated /Minimum Power Frequency withstand voltage	As per BIS / IEC
8.	Rated lightning impulse withstand	As per BIS / IEC

	voltage	
9.	Minimum creepage distance	25mm/KV of highest system voltage
10.	Rated operating duty cycle	O-0.3 sec. –CO-3 min.-CO
11.	Rated line charging/breaking current (Voltage factor 1.4)	As per IEC
12.	Control Circuit Voltage	As per Existing DC Source
13.	Maximum fault level	As per system parameters requirement
14.	Total closing time	Not more than 150msec
15.	Auxiliary contact	As per system requirement
16.	Minimum clearances a) Between phases b) Between live parts & ground	AS per BIS 3072

- 6) Type Test Reports and Quality assurance: Type test, routine test and acceptance tests for the HT outdoor Circuit Breaker shall be, as per the standard requirement. Contractor shall submit the following type test reports and Certificates issued by NABL/ILAC accredited agency for HT Circuit Breaker in line with BIS 13118/IEC 62271-100 (Latest version) during detailed Engineering.
- Short circuit making and breaking currents.
  - Peak withstand current and short time current.
  - Lightning Impulse voltage withstand.
  - Operation Duty tests
  - Electrical Endurance (E1).
  - Mechanical Endurance (M2).

In addition to the above, all the type test certificates and factory test reports for the accessories and bought out items shall also be submitted for CLUVPL approval during detailed engineering.

#### 20.6.4. Isolators:

- Isolators shall be Manually operated Double break, upright mounting with the movement of the blade in an Operating mechanism of Isolator and earth horizontal plane suitable for Switch outdoor installation. The isolators and accessories shall conform in general to BIS / IEC 62271-102. Earth switches shall be provided on isolators wherever called for.
- Isolator shall be gang operated for main blades and earth switches. The operation of the three poles shall be well synchronized and interlocked. The design of linkages and gears shall be such so as to allow one man to operate the handle with ease for isolator and earth switch.
- They shall be constructed such that they do not open under influence of short circuit current and wind pressure together. The earth switches wherever provided shall be constructional interlocked so that the earth switches can be operated only when the isolator is open and vice-versa.

4) In addition to the constructional interlock, isolator and earth switches shall have provision to prevent their operation unless the associated and other interlocking conditions are met.

5) Technical Parameters for HT Isolator:

SN	Parameter	Requirement
1.	Type of Isolators	Outdoor
2.	Nominal system voltage	As per system requirement
3.	Highest system voltage	As per system requirement
4.	Rated Normal Current	To suit system requirements
5.	Rated short time current of isolator and earth switch	As per system parameters requirement
6.	Rated dynamic short time withstand current of isolator and earth switch	As per BIS / IEC
7.	Impulse withstand voltage with 1.2/50 micro sec. wave across isolating distance	As per BIS / IEC
8.	One-minute Power frequency withstand Voltage across isolating distance	As per BIS / IEC
9.	Temperature rise	As per Table-IV of BIS: 9921
10.	Rated mechanical terminal load	As per 62271-102
11.	Safe duration of over load	150 % of rated current 5 minutes & 120% of rated current 30 minutes
12.	Creepage distance (Total)	As per BIS/IEC
13.	Max. Temperature rise in deg. C a. Copper contacts in air Silver faced Copper & Bare copper b. Terminal of isolator to be connected to Silver faced copper & Bare copper	105 & 75 105 & 90

6) The following Type tests as per BIS /IEC 62271-102 (Latest version) shall be submitted during detailed Engineering.

a) Short time withstand & peak withstand current test for Isolator & Earth Switch.

b) Power frequency (Dry & Wet), Lightning Impulse dry withstand Test

c) Mechanical endurance Test.

e) Temperature rise.

The type tests shall be conducted on the isolator along with approved insulators and terminal connectors. Mechanical endurance test shall be

conducted on the main switch as well as earth switch of one isolator of each type.

#### 20.6.5. Instrument Transformers

The instrument transformers i.e., current and Potential transformers shall be single phase transformer units and shall be supplied with a common marshaling box for a set of three single phase units. The tank as well as top metallic shall be hot dip galvanized or painted as per system requirement.

The instrument transformers shall be oil filled hermetically sealed units. The instrument transformers shall be provided with filling and drain plugs. Polarity marks shall indelibly be marked on each instrument transformer and at the lead terminals at the associated terminal block.

**20.6.5.1** The wiring diagram for the interconnection of three single phase instrument transformers shall be pasted inside the Marshaling box in such a manner so that it is visible and it does not deteriorate with time. Terminal blocks in the marshaling box shall have facility for star/delta formation, short circuiting and grounding of secondary terminals. The box shall have enough terminals to wire all control circuits plus 20% terminals spare

#### 20.6.5.2 General Requirement of Current Transformers (CTs)

- 1) The CTs shall have single primary of either ring type or hair pin type or bar type. In case of "Bar Primary" inverted type CTs, the following requirements shall be met. The secondaries shall be totally encased in metallic shielding providing a uniform equi- potential surface for even electric field distribution.
- 2) Different ratios shall be achieved by secondary taps only, and primary reconnections shall not be accepted. The guaranteed burdens and accuracy class are to be intended as simultaneous for all cores.
- 3) The instrument security factor at all ratios shall be less than five (5) for metering core.
- 4) The secondary terminals shall be terminated on stud type suitable no's of non-disconnecting and disconnecting terminal blocks inside the terminal box of degree of protection IP:55 at the bottom of CT. The CT shall have provision for measurement of capacitance and tan delta as erected at site.
- 5) Current transformers shall be tested in accordance with the requirement of IEC 60044-1/ BIS 2705 and all the type test certificates shall be submitted for CLUVPL approval during detailed engineering.
- 6) Technical requirements for Current Transformers.

SN	Parameter	Requirement
1.	Installation	Outdoor Rated
2.	Highest system Voltage (Um)	As per system requirement
3.	Rated frequency	50 Hz
4.	System neutral earthing	Effectively earthed

5.	Short time thermal current	As per system parameters requirement
6.	Class of accuracy: i) Protection (Core I) ii) Metering (Core II)	5P10 0.2S
7.	Rated dynamic current	As per BIS / IEC
8.	Rated min power frequency withstand voltage (RMS value)	As per BIS / IEC
9.	Lightning impulse withstand voltage (peak value)	As per BIS / IEC
10.	Minimum Creepage distance	25 mm/kV of highest system voltage
11.	Temperature rise	As per IEC 60044
12.	Type of insulation	Class A
13.	Number of cores	As per requirement
14.	Number of terminals in marshaling box	All terminals of control circuits wired up to marshaling box plus minimum 20% terminals spare

- 7) The following Type tests as per IEC 60044-1 / BIS 2705 (Latest version) shall be submitted during detailed Engineering.
- Short time current Test.
  - Temperature rise test.
  - Lightning Impulse Test.
  - High Voltage Power frequency wet withstand voltage test.
  - Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class.
  - IP-55 for terminal box

### 20.6.5.3 General Requirement of Potential Transformers (PTs)

- Voltage transformers shall be electro-magnetic (EMU) type and shall comprise of compensating reactor, intermediate transformer, and protective and damping devices. The oil level indicator of EMU with danger level marking shall be clearly visible to maintenance personnel standing on ground.
- The secondaries shall be protected by HRC cartridge type fuses for all windings. In addition, fuses shall also be provided for protection and metering windings for connection to fuse monitoring scheme.
- The secondary terminals shall be terminated on stud type non-disconnecting terminal blocks via the fuse inside the terminal box of degree of protection IP55. The access to secondary terminals shall be without the danger of access to high voltage circuit.

- 4) The accuracy of metering core shall be maintained through the entire burden range up to 50VA on all three windings without any adjustments during operations.
- 5) Potential transformers shall be tested in accordance with the requirement of IEC 60044-2/ BIS 3156 and all the type test certificates shall be submitted for CLUVPL approval during detailed engineering.
- 6) Technical requirements for Potential Transformers

SN	Parameter	Requirement
1.	Highest System Voltage (Um)	As per system requirement
2.	System neutral earthing	Effectively earthed
3.	Rated min Power frequency withstand voltage (rms)	As per BIS / IEC compliance
4.	Rated lightning impulse withstand voltage (peak value)	As per BIS / IEC compliance
5.	Class of Accuracy	0.2
6.	Standard reference range of Frequencies for which the accuracy is valid	96% to 102% for protection and 99% to 101% for measurement
7.	Rated voltage factor	1.2 continuous & 1.5 for 30 sec
8.	Stray capacitance and stray Conductance of LV terminal Over Entire carrier frequency Range	As per IEC:358
9.	One Minute Power Frequency Withstand voltage for secondary winding	2 kV rms
10.	Temp. rise over an ambient Temp. of 50°C	As per IEC 60044
11.	Number of terminals in control spare	All terminals of control circuits wired Cabinet up to marshaling box Partial discharge level 10 Pico Coulombs max.

- 7) The following Type/Factory tests as per IEC 60044-2/ BIS 3156 (Latest version) shall be submitted during detailed Engineering.
  - a) Insulation resistance tests winding to winding and each winding to ground.
  - b) Polarity test on each transformer.
  - c) Turn's ratio test.
  - d) IP-55 for terminal box.
  - e) Temperature rise test.
  - f) Lightning Impulse Test.
  - g) High Voltage Power frequency wet withstand voltage test.

h) Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class.

#### 20.6.6. Surge Arrestor

- 1) Arresters shall be of hermetically sealed units, self-supporting construction, suitable for mounting on lattice type support structures. The surge arrestors (SAs) shall conform to IEC 60099-4 or BIS: 3070.
- 2) The SAs shall be of heavy-duty station class and gapless Metal Oxide type without any series or shunt gaps. The SAs shall be capable of discharging over-voltages occurring during switching of unloaded transformers, and long lines.
- 3) Arrestors shall be complete with insulating base for mounting on structure. Self contained discharge counters, suitably enclosed for outdoor use. Suitable leakage current meters should also be supplied within the same enclosure. The reading of millimeter and counters shall be visible through an inspection glass panel.
- 4) The surge arrestors shall conform to type tests and shall be subjected to routine and acceptance tests in accordance with IEC-60099-4.
- 5) Technical Requirement for Surge Arrestor

SN	Parameter	Requirement
1.	Rated System Voltage	As per system requirement
2.	Rated Arrester Voltage	As per system requirement
3.	Nominal discharge current	10 kA of 8/20 micro-sec wave
4.	Minimum discharge capability	5 kilo joule/kV (referred to rated arrester voltage corresponding to minimum discharge characteristics)
5.	Maximum continuous operating Voltage (MCOV)	As per system requirement
6.	Max. residual voltage (1 kA)	As per system requirement
7.	Max. residual voltage at nominal discharge current	As per system requirement
8.	Max. switching impulse residual Voltage at 500A peak	As per system requirement
9.	Max. steep current for short duration test Value (4/10 micro-sec-wave)	As per system requirement
10.	Current for pressure relief test	As per system requirement
11.	One-minute power frequency withstand voltage of arrester housing (dry and wet)	As per BIS / IEC

12.	Impulse withstand voltage of arrester housing with 1.2/50 micro sec. Wave	As per BIS / IEC
13.	Radio interference voltage at 156kV	Not more than 1000 micro volt
14.	Partial discharge at 1.05 (Max. continuous operating voltage)	Not more than 50 p.c

- 6) The following Type tests as per IEC 60099-4 / BIS: 3070 (Latest version) shall be submitted during detailed Engineering.
- Lightning, switching impulse residual voltage measurement.
  - Operating duty test
  - Repetitive charge transfer capability test
  - Temporary over voltage test and reference voltage measurement on ZnO blocks in the laboratory.

#### 20.6.7. Insulators & Fittings

- Supporting insulators of circuit breakers, disconnecting switches and surge arrestors, bushing insulators for instrument transformers as well as all post type insulators for evacuating the power shall be made of best quality porcelain and shall be brown glazed.
- All insulators shall be suitable for heavily polluted atmosphere and shall be able to withstand the duty requirements of the associated equipment.
- When operating under normal rated voltage, there shall be no electric discharge between the conductors and bushing which would cause corrosion or injury to conductors, insulators or supports by the formation of substances produced by chemical action.
- No radio interference shall be caused by the insulators/bushings when operating at the normal rated voltage.
- All iron parts shall be hot dip galvanized and all joints shall be airtight. All current carrying contact surfaces shall be silver plated.
- Individual units of each strings shall be identical and interchangeable and shall be suitable for forming either suspension or strain strings and shall be so designed as to prevent formation of any defect due to expansion or contraction in porcelain or metal fittings.
- The design, material selection, constructional features and testing of insulators and fittings shall comply with all currently applicable statutes, regulations and safety codes.
- All the Type tests, routine tests and acceptance tests shall be carried out as per BIS/IEC 60168.
- The following Type tests as per BIS/IEC 60168 (Latest version) shall be submitted during detailed Engineering.
  - Power frequency withstand voltage test,



- b) Lightning Impulse withstand voltage test,
- c) Mechanical failing load test.

#### 20.6.8. Control and Protection Relay Panel:

**General Requirement of Control and Protection Relay Panel:** The HT Control and Protection Relay Panel shall be simplex sheet steel cubicle enclosed and shall be dust, moisture and vermin proof.

The panel shall be floor mounted, free standing, dead front design fabricated out of minimum 2 mm thick sheet steel and with IP 50 degree of protection. Front and rear door shall be of minimum 2.5mm thickness. All surfaces to be painted shall be thoroughly cleaned, descaled, made free from rust and given passivation and epoxy based powder coating paint shade RAL 7032 for the exterior and white color for interior.

Cable entries to the panel shall be from the bottom. The bottom plates of the panel shall be fitted with removable gland plates.

The HT C&R panel shall incorporate all necessary instruments, meters, Protective relays, trip relays, auxiliary relays, control switches, selector switches, indicating lamps, mimic, annunciators, audible alarms, horizontal and vertical wiring trough, wiring supports, interior lighting system, terminal blocks fuses and links etc. Coloured mimic diagram and symbols showing the exact representation of the system shall be provided in the front of control panel. Automatic semaphore indication for indicating OPEN and CLOSE position of circuit breakers, isolators and earth switches shall be suitably incorporated in the mimic diagram.

Space heaters with thermostat control shall be provided at the bottom with ON/OFF switch to prevent condensation. LED lamp with switch control shall be provided for internal illumination to facilitate maintenance work inside the panel. One (1) No. 5A, 240V, single phase AC, 3 pin socket outlet shall also be provided.

Earth bus of bare copper strip of size 25 x 6 mm shall be provided all along the length of the panel at the bottom. The structure of each cubicle, doors and non-current carrying metallic parts of all panel mounted devices shall be connected to earth bus for effective earthing.

All instruments and meters shall be of robust design, vibration proof and suitable for flush mounting on HT Control Relay panel.

##### 20.6.8.1 DC & AC auxiliary Circuit:

The DC control supply for the entire control and relay panel shall be fed from existing 110V Battery charger and battery arrangement at PESS with a variation of plus/ minus 30 %. Provision of a DC-DC power supply module to suit the Voltage requirements of the New Switchyard equipment also is accepted. The functionality of the relay shall not be affected by the variation of DC supply. The Switchyard equipment's Control devices shall withstand higher DC voltage during rapid charging of station batteries and shall be able to remain stable when transient dips of the DC voltage.

The AC auxiliary supply of 230V, single phase 50Hz for the control, relay and protection panel shall be fed from AC distribution board at PESS through separate MCB.

The DC & AC auxiliary circuits for the power evacuating scheme at SECL's Substation shall be designed as per the system provisions of the present SECL's Substation Switch yard.

#### 20.6.8.2 Protection Relays:

- i) Relays shall be suitable for flush mounting on the panel with connections from the rear, protected with dust tight cases for tropical use and with transparent cover removable from the front.
- ii) The underground feeder circuit shall have fast acting, microprocessor based numeric protection relays to detect phase and earth faults as the main protection. The protective relays shall be multi characteristic inverse minimum time/current type over current and earth fault protection with numerical display of setting values, measured values, memorized fault values and software self-supervision with auto diagnosis. The numerical protection relay shall also have protections for Over/Under Voltage and PT Fuse Failure.
- iii) The numerical relay shall be able to retain in a non-volatile memory all its latest logics, algorithm, settings, registered values, events, oscillography and operation indications in the event of DC power failure. An internal watchdog or self-supervision functions shall be provided. In the event of an internal relay failure, the relay shall trigger an alarm or indication and identify any internal relay errors and failures. Self-supervision separate alarm/trip contact shall be provided. The self-supervision functions shall not affect the performance of any protection functions.
- iv) The main Numerical Protective Relays shall synchronize the internal clock with GPS based time synchronizing equipment directly. GPS system with external antenna with complete scheme shall be supplied for time synchronization for Energy meters, SCADA and Numerical relays. Required cabling is included in the scope of Contractor.
- v) Trip Relays and Auxiliary Relays: Auxiliary relays and High-speed Trip relays shall be suitable for operation on DC system in the range of 80% to 120% of the nominal DC Voltage. The relays shall be stable and not be affected by a slow decay, surges, dips, ripples, spikes and chattering of the DC supply. This DC supply shall be monitored continuously and an alarm provided in event of failure. Trip & Auxiliary relays shall be housed in dust and moisture proof cases and shall be arranged so that adjustments, testing and replacement can be effected with the minimum of time and labour.
- vi) Trip & Auxiliary relays shall be provided with LCD/ LED or flag indicators, phase labeled/coloured, where applicable.
- vii) Resetting facilities shall be made available, either electrically or manually, without opening the front cover of the relay. All indicators shall be clearly visible without opening of relay front cover or relay panel door. Relays, with provision for manual operation from outside the case, other than for resetting, will not be accepted.

- viii) Relay contacts shall be suitably rated for tripping, control and indication purposes. The contacts shall be suitable for making and breaking the maximum currents, which they may be required to control in normal service. Separate and sufficient number of contacts shall be provided for tripping, control and alarm functions. Separate contacts shall be provided for alarm tripping functions. Relay contacts shall make firmly without bounce and the whole of the relay mechanisms shall be as far as possible unaffected by vibration or external magnetic fields.
- ix) The communication protocol for the protective relays shall be of latest IEC 61850 and the communication port shall be compatible for hooking up the data transfer up to SCADA at PESS.

#### **20.6.8.3 Instruments and Meters:**

MFM: All phase current, voltage, Export /Import KW, KVAR, KWhr, Frequency, P.F, etc., shall be available in the Multi-function meter. The multifunction meter of each HT feeder shall be suitably communicated to PESS SCADA for monitoring scheme. The multifunction meter shall have accuracy class of 0.2.

Ammeter: One number of analog ammeter with selector switch shall be housed in the Panel.

Voltmeter: One number of analog voltmeter with selector switch shall be housed in the Panel.

#### **20.6.8.4 Panel Internal Wiring:**

All wiring shall be carried out with 1100V grade Single core, standard copper conductor wires with PVC insulation conforming to BIS 694 or equivalent International Standard. The minimum size of the stranded copper wire shall be as follows:

- i) Main AC and DC circuits: 4 sq mm.
- ii) All CT and PT circuits: 2.5 sq mm.
- iii) All other circuits: 1.5 sq mm.

Each terminal block shall be provided with at least 20% spare terminals.

#### **20.6.8.5 Interlocking Facilities**

- i) Isolating devices, earthing switches, circuit breakers, etc., shall be provided with an interlocking system which ensures safe operation of the equipment under all service conditions.
- ii) All electrical interlocks shall function so as to interrupt the operating supply, and shall cover the emergency hand operation of apparatus which is power operated under normal operation.
- iii) Wiring connection to any electrical interlock shall not produce or permit faulty operation.
- iv) Circuit breakers shall be electrically interlocked so that except under maintenance conditions it is not possible to close a circuit breaker.
- v) Isolators shall be so interlocked such that they cannot be operated unless the associated circuit breaker is opened.

vi) Earth switches shall be so interlocked that it can be closed only when the particular bus section is dead.

#### 20.6.8.6 TESTS:

The following tests shall be carried out at the manufacturer's works for final inspection after completing the assemble of control and relay panel:

- Assembly inspection and dimensional check
- Insulation resistance measurement and dielectric test
- Functional check on control circuits
- Check to verify the functioning of instruments and meters
- Secondary injection tests on protective relays

20.6.9. **TARIFF METERING SYSTEM:** Suitably designed Tariff Metering System to measure the generated energy shall be placed at the respective SECL's Substation of each SPP location of total 40MW SPP. The month wise cumulative measurements at each SECL Substation(Metering Point) of total 40MW SPP shall be measured by the team of contractor and SECL/CUVPL jointly (Joint Meter Reading). Tariff Metering scheme shall have the following features.

- 1) Tri Vector type (TVM) Net energy meters shall be microprocessor based multi-function type and shall be suitable for billing purposes with necessary sealing arrangement as per system requirements. Energy meter shall be 0.2s accuracy class suitable for ABT requirement with metering panel. Three nos. of TVM energy meters (Main, check and Standby) along with respective metering CTs and PTs either as Indoor type or outdoor type as per system requirement shall be provided by the Contractor. CT & PT signals shall be extended to the TVM energy meters from the dedicated metering CT (0.2S class of accuracy) & metering PT (0.2 Class of accuracy).
- 2) TVM Meters shall be suitable for interfacing and synchronizing the built-in clock of the meter by GPS time synchronization equipment. Contractor shall synchronize the meter using GPS time synchronization equipment. All the hardware required for synchronization shall be in scope of Contractor.
- 3) The responsibility of arranging for the meters, its inspection/calibration/testing charges etc. from Statutory authorities rests with the Contractor and all charges incurred on Meter testing, shall be borne by the Contractor.
- 4) **Technical Requirements of Energy Meters**
  - I. The meters shall be capable of measuring voltage, current, frequency, power factor, active and reactive power, real and reactive energy, maximum demand etc. The meters shall have facility to monitor power interruptions, run hour with power on time and off time with date. The meters shall have crisp high visibility display and scrolling facility to display the desired parameter.
  - II. The meters Shall carry out measurement of active energy (both import and export) and reactive energy (both import and export) by 3-phase, 4 wire principle suitable for balanced/ unbalanced 3 phase load.
  - III. The active and reactive energy shall be directly computed by using CT & PT primary ratings. The reactive energy shall be recorded for each metering

- interval in four different registers as MVARh (lag) when active export, MVARh (Lag) when active import, MVARh (lead) when active export, MVARh (Lead) when active import.
- IV. The meters Shall have an optical port and /or RS 232/485 port on the front of the meter for data collection from either a hand-held meter reading instrument (MRI) having a display for energy readings or from a Laptop with suitable software. The Contractor shall supply the MRI and/or Laptop complete with all optical interface unit required.
  - V. Two separate registers shall be provided to record MVARH when system voltage is more than 103% and is lower than 97%.
  - VI. The meters Shall compute the net MWh and MVARh during each successive 15-minute block metering interval along with a plus/minus sign, instantaneous MWh, instantaneous MVARh, average frequency of each 15 minutes, net active energy at midnight, net reactive energy for voltage low and high conditions at each midnight.
  - VII. Each energy meter shall have a display unit. It shall display the net MWh and MVARh with a plus/minus sign and average frequency during the previous metering interval; peak MWh demand since the last demand reset; accumulated total (instantaneous) MWh and MVARh with a plus/minus sign, date and time; and instantaneous current and voltage on each phase.
  - VIII. All the registers shall be stored in a non-volatile memory. Meter registers for each metering interval, as well as accumulated totals, shall be downloadable. All the net active/reactive energy values displayed or stored shall be with a plus /minus sign for export/import.
  - IX. The meters Shall have a built-in clock and calendar with an accuracy of less than 15seconds per month drift without assistance of external time synchronizing pulse.
  - X. Date/time shall be displayed on demand. The clock shall be synchronized by GPS time synchronization equipment being supplied by the Contractor.
  - XI. The voltage monitoring shall be inbuilt feature provided to signal failures to the Substation Automation System, the meter shall be suitable to operate with power drawn from the PT supplies. The burden of the meters shall be less than 2 VA.
  - XII. The power supply to the meter shall be healthy even with a single-phase PT supply. An automatic backup, in the event of non-availability of voltage in all the phases, shall be provided by a built-in long-life battery and shall not need replacement for at least 10 years with a continuous PT interruption of at least 2 years. Even under absence of PT input, energy meter display shall be available and it shall be possible to download data from the energy meter. In case data downloading is not possible in absence of PT supply, meter with provision of required auxiliary power supply shall be provided. Date and time of PT interruption and restoration shall be automatically stored in a non-volatile memory.

- XIII. The meter shall have access to test MWh and MVARh accuracy and calibration at site and test terminal blocks shall be provided for the same.
- XIV. Each meter shall have a unique identification code provided by CLUVPL and shall be permanently marked on the front of the meter and stored in the non-volatile memory of the meter.
- XV. Type Test requirement for Energy Meter: All Type Test Reports shall be provided as per IEC 62052-11/IEC 62053-22/ BIS 14697

**20.7. SCADA requirements:**

The following equipment / Sub Systems for HT outdoor switch yard shall be connected to the suitably designed Remote I/O Units (RIO) or Control and Monitoring units (CMU) for effective automatic control and monitoring from SCADA at PESS.

- 1) Energy Meters.
- 2) Numerical Relays.
- 3) Status of Breaker & Isolators.
- 4) MFM.

**20.8. Documents & Drawings:**

- 1) Schematic wiring diagrams of the control & Protection circuits of the Total Switchyard Scheme.
- 2) GTP, GA, Vendor documents and Type test certificates for Circuit Breaker.
- 3) GTP, GA, Vendor documents and Type test certificates for Isolators.
- 4) GTP, GA, Vendor documents and Surge arrestor.
- 5) GTP, GA, Vendor documents and Type test certificates for CT& PT.
- 6) GTP, GA, Vendor documents and test certificates for Tariff Metering System.
- 7) GTP, GA, Vendor documents and test certificates for C&R panel and it's accessories.
- 8) MQP for CB, Isolators, CT, PT, C&R panel and Surge arrestor.



**SECTION 21.0**  
**CIVIL WORKS AND STRUCTURAL STEEL WORKS**

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## 21.1 GENERAL CIVIL SPECIFICATION

- 21.1.1 The scope of civil works detailed below is only indicative. Any other civil and Structural steel work which is not mentioned or not included here but necessary for the establishment and operation & maintenance of Solar Power Plant shall be included in the scope and borne by the Contractor. All the specifications in this section is applicable for each of the four project sites at Goraknathpur, Shivnandanpur, Bhatgaon I and Bhatgaon II separately.
- 21.1.2 This specifications document is not exhaustive and the contractor shall be responsible not only for the requirements specified herein but for the correct choice of materials, for proper fabrication and for the conformity to codes, regulations and legal requirements and for supplying all the documentation of these materials.
- 21.1.3 In General, all civil works shall be carried out as per relevant latest BIS, unless otherwise specified.
- 21.1.4 Regarding construction power supply & construction water supply – “Facilities at site” to refer clause 1.4.2 of Section 1.0.
- 21.1.5 General civil material specification for all RCC / Foundation works shall be as mentioned below:

Cement	Cement of the following Grades shall be used for all works. It shall conform to the following standards. (a) 43 Grade OPC BIS 8112 (b) 53 Grade OPC BIS 12269 (c) Portland - Pozzolana Cement BIS 1489 (Parts 1 & 2)
Aggregate	Coarse aggregate - Shall confirm to latest BIS 383. Fine aggregate - River sand / M-Sand can be used subject to confirmation of latest BIS 383. However, quarry dust shall not be used for construction activities. Approval shall be obtained from CLUVPL site in-charge for source of M-Sand.
Water	Potable water confirming to BIS 456
Reinforcement	All reinforcement steel used shall confirm BIS 1786 and shall grade Minimum Fe 500 Binding wire for reinforcement shall be annealed steel wire 20 BWG conforming to BIS: 280 “Specification for Mild Steel Wire”. The number of strands shall be as per BIS specification.
Bricks	Chamber burnt bricks shall be used for : ✓ 230 mm thick walls up to basement in CM 1:5. ✓ 115 mm thick above and below basement in CM 1:4.



	<p>Fly ash bricks shall be used for:</p> <ul style="list-style-type: none"><li>✓ All 230 mm thick brick wall above basement in CM 1:5.</li></ul> <p>Chamber burnt Bricks shall conform to the requirements laid down in BIS: 1077. Class 5 bricks shall be used for the work. Brickwork shall be as per BIS: 2212.</p> <p>Fly ash lime bricks shall conform to latest IS 12894</p>
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- 21.1.6 Minimum Grade of RCC work shall be M25 as per BIS standards. The Contractor shall get mix design approved from Govt. Engineering College / NABL accredited laboratories. Advance action should be taken by the contractor for Mix design approval using the locally available coarse & fine aggregates (clause 21.1.5) before commencement of the concreting works.
- 21.1.7 During the execution of solar project, all debris/waste materials generated like construction waste, packaging of civil materials, packaging of electrical equipments, hazardous waste etc... shall be removed from the project site premises and shall be disposed off safely as per Govt. guidelines/norms. Similarly, excavated earth shall either be re-used for backfilling purpose if suitable else, shall be disposed off, minimum 2km away from the project site, suitably without causing any obstruction to nearby drainage.
- 21.1.8 For storage of civil construction materials and electrical equipments during project execution stage, temporary storage shed shall be erected in project site in vacant land. Safety and security of the stored materials/equipments shall be ensured by contractor on his own.
- 21.1.9 Contractor shall clear the project site of trees, bushes, vegetation. Necessary approval for cutting trees/vegetation shall be obtained by contractor from State/Central Govt. authorities. Demolition of existing structures / facilities, if any encountered within the project site premises is in contractor scope.
- 21.1.10 The contractor shall provide latest rigid insulated portable office cabin for each site (4 Nos) for the use of CLUVPL officials to monitor the progress of site activities, conduct review meetings, study of drawings etc., of size not less than 20'x8'x8.5' with door, windows and all necessary provisions including Manager cabin (with table, executive chair, visitor chairs, desktop PC(latest configuration) & laser printer), workstations (3Nos) with revolving chairs, visitors chairs, file cabinets, desktop PC(latest configuration) & printer, Split ACs, wall mounting fans, LED electrical fittings with wiring, water dispenser etc. complete. All running and maintenance charges including charges for energy and consumables required for smooth functioning of the container office cabin shall be on the account of the contractor. After the provisional takeover

of the project by CLUVPL, the contractor can take back this container at his possession.

## **21.2 PRELIMINARY WORKS**

### **21.2.1 TOPOGRAPHICAL SURVEY**

Topographical survey for the all the project sites in both directions shall be carried out:

- Grid interval –5 m x 5 m in undulated terrain and 10 m x 10 m in relatively flat terrain.
- Contour interval – 1 m
- Northing & Easting co-ordinates shall be based on UTM (Universal Transverse Mercator of respective Zone).
- The topographical survey shall also cover at least 50 meter width of the adjacent land beyond the solar plot, for correlation with adjoining plots.

After completion of topographical survey, the contractor shall submit draft survey report consisting of following documents:

- Write-up consisting of details of survey agency, equipments used for surveying & period of surveying and reference Bench Mark adopted
- Contour layout for entire project area (AutoCAD file) with recommendation for micro grading required for the Solar Project Site
- Topographical survey drawing with spot levels for the entire project area (AutoCAD file)
- Excel file consisting of XYZ data at every 5 m in undulated terrain/ 10 m in flat terrain in both directions for entire project area

After attending CLUVPL's comments if any in this regard, two (2) sets of hard copy and one (1) set of soft copy (in editable AutoCAD format) of the Final Survey report with all relevant drawings shall be submitted to CLUVPL for approval.

### **21.2.2 SOIL INVESTIGATION**

21.2.2.1 The contractor shall have to perform the soil investigation in all the project sites at the respective locations to ascertain the soil parameters of the proposed solar power Plant for construction of Solar Module support structure foundations, Power Collection Sub Station, Power Export Sub Station, etc., The Contractor shall carry out sub soil investigation through a certified soil consultant.

21.2.2.2 The scope of sub-soil investigation includes: execution of complete soil exploration including boring according to the site requirement, drilling, collection of undisturbed soil sample where ever possible, otherwise disturbed soil samples, SPT, Electrical Resistivity test, etc., conducting laboratory test of samples to find out the various

parameters mainly related to load bearing capacity and settlement, ground water table level, sub soil conditions such as chemical characteristics of soil. The soil test also includes analysis of ground water sample. For swelling type of soil, the effect of swelling pressure shall be taken into account in arriving at pile capacity as well as safe bearing capacity of the soil.

21.2.2.3 Before conducting soil investigation at site, borehole/test location layout shall be furnished to CLUVPL for approval. Layout shall indicate locations of bore holes along with PESS building, PCSS building (if provided), roads & fencing/plant boundary in proposed solar project site. UTM Coordinates of the borehole location shall tabulated in bore location layout indicatively considering location of PESS buildings.

21.2.2.4 After completion of soil investigation, the contractor shall submit draft soil investigation report consisting of following details:

- a) Recommended type of foundation for all structures. Recommended depth and type of foundation for RCC structures in case of shallow foundation.
- b) Bore log details along with soil classification (As per BIS 1498) and SPT data
- c) Bore location layout with UTM coordinates of all boreholes
- d) Laboratory test results of different strata of soil –Dry density, Specific gravity, Atterberg limits, Shrinkage limit, Sieve analysis data, Shear parameters (C and Phi values), Swelling pressure & Free swell index. It shall be mentioned whether the tested sample is Disturbed/Undisturbed.
- e) Safe bearing capacities of various soil strata for different types of foundations based on shear strength and settlement characteristics defining clearly, how these capacities were arrived at. Typical SBC calculation shall be added in report based on BIS 6403. SBC shall be arrived based on shear criteria and settlement criteria. Least value among Shear and settlement criteria shall be recommended SBC in each case.
- f) Pile capacity (i.e., Compression, uplift as per BIS 2911, Part 1/Sec 2 & lateral capacity (short pile) based on Brom's method) shall be tabulated in report for a depth of 1.20 m, 1.50 & 1.80 m with minimum 300 mm diameter. Sample calculation for the same shall also be included in soil report
- g) Chemical analysis of soil sample
- h) Chemical analysis of water sample - Source of water sample shall be mentioned.
  - o For construction purpose – Results shall be compared with construction water requirement as per BIS 456. It shall be concluded if the water is suitable for construction purpose or not.
  - o For module cleaning purpose - Results shall be compared with BIS 10500:2012 and CPHEEO standards. On comparison, suitable conclusion shall be arrived in report to indicate if water is potable or not. Requirement of any RO/UV treatment to be indicated in recommendation.

i) Electrical resistivity test results

21.2.2.5 After attending CLUVPL's comments if any in this regard, three (3) sets of hard copy and one (1) set of soft copy of the Final Soil investigation report shall be submitted to CLUVPL for approval.

21.2.3 **OVERALL PLANT LAYOUT**

Contractor shall prepare Overall Solar Plant layout for all the project sites in UTM grid of 50 m x 50 m and approval shall be obtained from CLUVPL before execution of work at site. Overall plant layout shall be developed by the contractor ensuring no water logging takes place in the array-yard area or near boundaries. Necessary pitch distance shall be maintained between rows of MMS Tables for easy approach & maintenance point of view.

Overall plant layout shall indicate location of MMS tables, Power Export Sub Station (PESS), Power Collection Sub Station (if provided), String Monitoring Units (SMU), Lightning arrestors (LA), Security cabin, approach road, peripheral road, gate and peripheral fencing.

The contractor shall prepare array layout to suit their design and plan the total power plant within the available land area without involving any major site modifications.

21.2.4 **COORDINATE LAYOUTS**

MMS Coordinate layout indicating relative locations of all the column legs of MMS in UTM Coordinate for each block shall be submitted for approval.

Similarly, coordinate layout for Power Export Sub-station and Power Collection sub-station (if provided) indicating locations of all the column positions in UTM Coordinate shall be submitted for approval.

Fencing layout indicating boundary coordinate of project site shall be submitted by contractor for approval.

21.3 **MODULE MOUNTING STRUCTURE (MMS)**

21.3.1 Module Mounting Structure (MMS) - General arrangement:

Contractor shall submit detailed MMS General Arrangement drawing indicating module, MMS Table configuration, supporting structural arrangement, member sizes and connection details as detailed below.

Type of MMS Structure	Relatively flat terrain - Fixed tilt simply supported type (Preferable) Highly undulated terrain - Fixed tilt Cantilever type
Column posts	➤ Cold formed member - C Section with Lip (CS)

	<ul style="list-style-type: none"> <li>➤ Minimum yield strength = 345 N/mm<sup>2</sup></li> <li>➤ Minimum thickness = 2.50 mm</li> </ul>
Rafter members	<ul style="list-style-type: none"> <li>➤ Cold formed member - C Section with Lip (CS)</li> <li>➤ Minimum yield strength = 345 N/mm<sup>2</sup></li> <li>➤ Minimum thickness = 2.00 mm</li> </ul>
Bracing members	<ul style="list-style-type: none"> <li>➤ Cold formed member - C Section (CU)</li> <li>➤ Minimum yield strength = 345 N/mm<sup>2</sup></li> <li>➤ Minimum thickness = 2.00 mm</li> </ul>
Purlin members	<ul style="list-style-type: none"> <li>➤ Aluminum-zinc alloy metallic coated steel section               <ul style="list-style-type: none"> <li>○ In case of relatively flat terrain - Hat section/Z Section purlin</li> <li>○ In case of highly undulated terrain – C Section with Lip (CS) with C section purlin splice.</li> </ul> </li> <li>➤ Steel grade = YS 550</li> <li>➤ Coating class = AZ 150</li> <li>➤ Minimum 0.90 mm base metal thickness</li> </ul>
Fasteners - Bolts, nuts, plain washers and spring washers	<ul style="list-style-type: none"> <li>➤ Module to purlin and purlin to rafter connection - SS304-A270</li> <li>➤ Other structural steel connections - HDG 4.6 or 8.8 based on design requirement</li> </ul>

Tilt angle for MMS structure for the Project location shall be decided based on PV Syst Report during detailed engineering.

All cold formed members shall conform to the physical specifications of ASTM A653 or latest BIS 811 or any other relevant international standards. All purlin members shall confirm to ASTM A792M or BIS: 15961 (latest revision).

All cold formed structural members shall be hot dip galvanized as per BIS 4759 or relevant Indian standards and the average coating thickness shall be 80 micron and local coating thickness shall be minimum 70 micron.

Sizes for fasteners shall be as per latest relevant BIS provisions. All fasteners shall be provided according to connection design requirements as per latest BIS 800. All bolts shall be tightened with designed torque mechanically.

### 21.3.2 Module Mounting Structure (MMS) – Design

Contractor shall submit detailed design document along with STAAD file for MMS structure along with MMS General Arrangement drawing for approval.

The structure shall be designed for loads and load combination as per Indian Standards (latest revisions)

Dead load (DL)	Dead loads shall be self-weight of all the modules,
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	members and fasteners.
Wind load (WL)	The wind load parameters shall be considered as per latest BIS 875 (Part-3).
Earthquake load (EL)	The MMS structure shall be designed for Seismic forces. Seismic parameters Zone & Importance Factor shall be based on latest BIS: 1893(Part-1).  (Seismic zone: III)

Vertical Deflection & Horizontal Sway Limits: The limiting permissible vertical and horizontal deflection for structural steel members shall be as per latest BIS 800: 2007.

Typical design calculation for a critical member (Member with highest Unity value in STAAD) in each of Column, rafter, purlin and bracing members shall be attached in design document.

### 21.3.3 Module Mounting Structure (MMS) - Foundation

Type of MMS foundation	Cast-in-situ Pile foundation as per latest BIS 2911.
Minimum pile diameter (Outer to outer)	300 mm
Minimum Grade of concrete for pile foundation	M25 as per BIS 456
Minimum clearance between lower edge of the Module and Finished Ground Level (FGL)	600 mm
Height of collar for MMS foundation above FGL	150 mm

- ✓ The depth of the pile foundation shall be designed by contractor based on design parameters & to prevent lift-off of structure, due to critical wind load combination.
- ✓ Contractor shall conduct Initial Pile Load Test as per latest BIS 2911 (Part-4) and submit pile test report to CLUVPL for approval for firming up depth of pile foundation.
  - Minimum number of pullout test results – 2 tests/each 10 MW site
  - Minimum number of lateral load test results – 2 tests/each 10 MW site
- ✓ As the Pile load test report is vital parameter to decide the depth of pile for MMS foundation, the same shall be conducted by NABL accredited agency & submitted by contractor to CLUVPL for approval within 45 days from date of LOA.

Foundation work of Module Mounting Structure shall commence only, after the proper micro-levelling of the site.

21.3.4 **Module Mounting Structure (MMS) - Fabrication** and erection shall be carried out in accordance with latest BIS 800 and BIS 801. Fabrication drawings of all members of MMS shall be submitted by contractor for approval.

- ✓ After approval of MMS fabrication drawings, prototype of 1 full MMS table shall be fabricated and erected at manufacturer premises and, the contractor shall arrange for a joint inspection with CLUVPL, before going for mass fabrication of MMS members.
- ✓ Contractor shall comply Manufacturing Quality Plan (MQP) for manufacturing of MMS members and shall arrange for joint inspection of each lot of MMS members at manufacturer premises and get Material Dispatch Clearance Certificate (MDCC) from the owner before dispatch.

21.3.5 Installation details of the Solar PV modules and the supporting structure with appropriate diagrams and drawings shall be submitted for approval by CLUVPL. There shall be no requirement of welding or complex machinery at site for installation of module mounting structure to the foundation. The structure shall be erected to allow for easy replacement of any module as well as easy access to the bottom of module by O&M staff.

## 21.4 POWER EXPORT SUB STATION (PESS)

### 21.4.1 GENERAL REQUIREMENTS:

The Power Export Sub Station building shall be designed as single storey RCC framed structure or Pre-Engineered Building (PEB) with aesthetic appearance and shall be designed based relevant latest BIS standards and National Building Code (NBC) of India.

PESS Building shall be provided with the following rooms/facilities:

Type of room	Minimum area requirement
Office room	16 m <sup>2</sup>
Store room	20 m <sup>2</sup>
SCADA Room	16 m <sup>2</sup>
HT Switchgear room, AC/DC Distribution panel area, Battery room etc .,	As per detailed engineering
Portico at main entrance	Min. 4.50 m x 3.60 m
Pantry room	8 m <sup>2</sup>
Gents toilet including wash area	5 m <sup>2</sup>
Ladies toilet including wash area	5 m <sup>2</sup>

Basement Height from NGL/FGL minimum 600 mm and shall be provided with 100 mm thick PCC, 150 mm thick Sand filling and 350 mm thick earth filling. Necessary ramps shall be provided for equipment's entry.

All passages / corridors shall be provided with a minimum width of 2.0 m. PESS building shall be provided with necessary electrical fittings and water supply & drainage system. Necessary anti-termite treatment shall be adopted for the PESS building.

The structural design along with STAAD file and detailed drawings of PESS building shall be submitted to CLUVPL for approval, before commencement of work.

**21.4.2** For PESS building, contractor can choose either RCC building or Pre-Engineered building during detailed engineering with approval of CLUVPL.

- ✓ For RCC building, contractor shall adhere to technical specifications laid out in ANNEXURE C1.
- ✓ For PEB building, contractor shall adhere to technical specifications laid out in ANNEXURE C2. All rooms shall be provided with false ceiling in case of PEB building.

**21.4.3 FLOORING**

Flooring/Finishing schedule for various rooms of PESS building shall be as follows:

Rooms	Flooring details
HT Switchgear room	Cement concrete flooring (Confirming to BIS 2571)
Office, SCADA Room, AC & Non-AC Store room, corridor	Vitrified ceramic tiles
Battery room	Acid resistant tile flooring - 10 mm thick (Confirming to BIS 4457)
Gents and ladies toilet	➤ Anti-skid ceramic tiles ➤ Dado glazed ceramic tiles up to 2.1m height
Pantry room	➤ Anti-skid ceramic tiles ➤ Polished Granite slab -12 to 16mm thick ➤ Dado glazed ceramic tiles up to 2.1m height
Portico	Anti-skid Paver block/Anti-skid flooring
External Staircase steps	Anti-skid step tiles

All rooms shall be provided with skirting of 150 mm height.

Vitrified ceramic tiles of approved quality, approved colour and shade of minimum size 600 mm x 600 mm shall be laid over PCC.

**21.4.4 DOORS, WINDOWS & VENTILATORS**

All doors, windows and ventilators shall confirm to the following:

Doors except	➤ Electro colour dyed (15 micron thickness) aluminum
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toilet doors	<p>framework with glazing.</p> <ul style="list-style-type: none"> <li>➤ To be provided with 6 mm thick tinted glass.</li> <li>➤ Minimum door size - 1.20 m x 2.10 m</li> <li>➤ Projection of sunshade from wall for door openings – 750 mm</li> <li>➤ An Aluminium sliding door shall be provided for entry from corridor to Equipment area.</li> </ul>
Toilet doors	<ul style="list-style-type: none"> <li>➤ FRP frame with FRP shutter</li> <li>➤ Minimum door size - 0.75 x 2.10 m</li> </ul>
Windows and ventilators	<ul style="list-style-type: none"> <li>➤ Electro colour dyed (15 micron thickness) aluminum framework with glazing.</li> <li>➤ To be provided with minimum 4mm thick tinted glass</li> <li>➤ To be provided with suitable MS grill protection</li> <li>➤ Projection of sunshade from wall for window openings – 600 mm</li> </ul>
Rolling shutter (RS)	<ul style="list-style-type: none"> <li>➤ Shall confirm to IS6248</li> <li>➤ Size based on functional requirement</li> <li>➤ Projection of sunshade from wall for RS openings – 1000 mm</li> </ul>

Doors and windows on external walls of the buildings shall be provided with RCC sunshade over the openings with 150 mm projection on either side of the openings. All glazing work shall conform to relevant BIS.

#### 21.4.5 PLINTH PROTECTION

Plinth protection to a minimum width of 0.75m with 75mm thick of cement concrete 1:2:4 over 75mm bed of dry brick ballast 40mm nominal size well rammed and consolidated and grouted with fine sand including finishing the top with suitable slope & edge drain.

#### 21.4.6 TOILET & WATER SUPPLY

Heavy Duty Rigid PVC pipes of reputed manufacturer and high quality conforming to BIS: 4985 shall be used for all water supply and plumbing works in the building. SINTEX make HDPE storage water tank conforming to BIS: 12701 shall be provided over the RCC roof/Elevated platform (in case of PEB) for a capacity of minimum 1000 litres with all required pipeline & fittings.

Each toilet shall have the following minimum fittings:

- All Sanitary ware shall be using low flow Chrome Plated (CP) fittings and fixtures.
- Each toilet shall have the following minimum fittings:
  - WC (Western type) of approved quality with seat cover, low level flushing tank, paper holder, health faucet etc.
  - Flat back semi-stall urinals for Gents Toilet
  - Wash basin of approved quality with all fittings.

- Mirror (600 x 450 mm) with PVC beading
- Stainless steel towel rail with brackets
- Stainless steel soap holder and liquid soap dispenser.

Pantry shall be provided with stainless steel sink with drain board.

**21.4.7 SEWAGE SYSTEM**

Adequate sewage disposal arrangements shall be provided. The septic tank and soak pit shall be designed as per NBC guidelines. The Contractor can also propose Bio septic tanks (As per manufacturer recommendation) . The outfall of septic tank shall be led to soak-pit of suitable dimensions for dispersion. The drainage system design and construction drawings of sewage piping / septic tank shall be submitted to CLUVPL for approval before commencement of work.

**21.5 POWER COLLECTION SUB STATION (PCSS)**

Power Collection Sub-Station (PCSS), if provided shall be a Pre-Engineered Building (PEB). Contractor shall adhere to technical specification provided in Annexure C2 for PEB design and construction.

**21.5.1** PCSS building shall be provided with RCC platform 1000 mm above ground level with chain link coverage on all four side from ground level to Finished Floor level (FFL). The internal layout of PEB building shall be designed in such a way that the heat generated from the inverter is diverted outside the PEB.

**21.5.2 FLOORING**

Flooring, including preparation of surface, cleaning etc., shall be of cement concrete flooring as per BIS: 2571 with ironite hardener. The PEB Building floor shall be at least 1000mm above the ground level. Necessary ramps shall be provided for equipment’s entry.

**21.5.3 DOORS, WINDOWS AND VENTILATORS:**

Doors	<ul style="list-style-type: none"> <li>➤ ‘C’ Section Powder Coated standard Aluminum Door Frame Sections</li> <li>➤ To be provided necessary fittings like hinges, handles, locks, tower bolts, stopper, hydraulic door closer, etc.,</li> <li>➤ Size based on functional requirement</li> </ul>
Windows and ventilators	<ul style="list-style-type: none"> <li>➤ Glazed with Powder Coated Standard Aluminum sections</li> <li>➤ To be provided with 4mm thick tinted glass</li> <li>➤ To be provided with all necessary fittings like hinges, handles, etc.,</li> <li>➤ To be provided with MS grill protection</li> <li>➤ Size based on functional requirement</li> </ul>
Rolling shutter (RS)	<ul style="list-style-type: none"> <li>➤ Shall confirm to IS6248</li> <li>➤ Size based on functional requirement</li> <li>➤ Push pull type (Hand operated) of standard make</li> </ul>

Suitable sunshades made out of approved colour sheet shall be provided to all external windows and door. The minimum projection for the sunshades shall be 450mm and 300mm wider than the width of the opening.

#### 21.5.4 **LIGHTING**

The PEB Building shall be provided with electric light to achieve average illumination level of 150 Lux. However, room should be designed to utilize maximum natural light during the day.

#### 21.5.5 **CANOPY FOR OUTDOOR INVERTER**

Outdoor inverter shall be housed within a canopy with following specification:

- ✓ Shall be provided with roofing with colour coated galvalume sheet. Sides can be kept open to ensure sufficient ventilation.
- ✓ Shall be provided with RCC pedestal of minimum size 300 mm x 300 mm.
- ✓ To be provided with RCC platform 1000 mm above ground level.
- ✓ Columns, rafter, and purlin shall be structural steel provided with 2 coats of enamel paint of approved brand over one coat of red oxide primer. Structural members shall be fabricated from tubular steel sections of minimum yield strength 310 MPa confirming to latest IS 4923 or equivalent ASTM specification.
- ✓ Design document and detailed drawing shall be submitted to CLUVPL for approval before commencement of work.

#### 21.6 **POWER EXPORT SWITCHYARD AND TOWER LINES**

Civil and structural works for the Power Export Switchyard & Tower lines shall be installed as per the technical requirements of State Electricity Department, and CEA norms. The switchyard civil works shall involve construction of all equipment / tower / mast foundations, cable trenches, earth pits, and drains. All pedestals for towers/equipment will extend to a minimum of 300mm above FGL.

Detailed design document, STAAD model shall be submitted for support structures and approval shall be obtained from owner before erection at site. However, for transmission line, the design and drawings as per latest IS shall be prepared by contractor and get it vetted by IIT/NIT & submitted to the owner. All structural steel shall be galvanized as per relevant BIS standards.

#### 21.7 **INVERTER DUTY TRANSFORMER FOUNDATION**

Foundation for inverter transfer shall be designed based on manufacturer's loading & relevant latest BIS code. Necessary chain link fencing with steel gate arrangement shall be provided around the transformer to meet the statutory requirement. Also, 40mm BG metal filling 100mm thick shall be provided around the transformer. Burnt oil pit & NIFPS foundation (if provided) shall be designed based on manufacturer's requirements & relevant latest BIS code

#### 21.8 **APPROACH ROAD AND PERIPHERAL ROAD**

21.8.1 The roads shall be designed and constructed based on the General layout of the Solar Power Plant.

- ✓ Approach road - Shall be laid by contractor from Main road to PESS building & PCS building (if provided) of Project site via Entrance gate for all the project sites.
- ✓ Peripheral road - Shall be provided abutting peripheral fencing around the project site.

All approach and peripheral roads shall be provided with shoulder of width 600 mm on either side as per IRC requirement. Internal and peripheral drains shall be provided within project site based on detailed drain design.

21.8.2 Carriage way width of all approach roads shall be of 3.50 M (Single lane). These roads shall be laid with:

Top coat	One layer of SDBC of 40 mm thick as per MORTH specification along with seal coat. To be provided with necessary cat eye, thermoplastic painting, road side berm painting with yellow and black colour as per requirement
Wet Mix Macadam (WMM)	One layer of 100 mm consolidated thickness as per MORTH specification.
Soling layer	This bottom layer shall be of two layers using laterite. Each of 115 mm thickness, consolidated thickness totalling to 230 mm and each layer shall be blinded with gravel with 1/3 quantity of laterite.

Carriage way width of all peripheral roads shall be of 3.50 M (Single lane). These roads shall be laid with:

Wet Mix Macadam (WMM)	One layer of 100 mm consolidated thickness as per MORTH specification.
Soling layer	This bottom layer shall be of two layers using laterite/BG Boulders/locally available natural rock boulders. Each of 115 mm thickness, consolidated thickness totalling to 230 mm and each layer shall be blinded with gravel with 1/3 quantity of laterite.

Approach road and Peripheral road detailed drawing and layout shall be submitted to CLUVPL for approval, before commencement of work.

**21.9 PRE-CAST PRE-STRESSED COMPOUND WALL**

Prestressed Precast concrete compound wall with built-up Y sections fixed with concertina coil (Total height above FGL = 2100+600 = 2700 mm) shall be provided all

around the project site and the compound wall shall be painted with 2 coats of emulsion paint of approved colour on both sides with one coat of primer.

(a) Prestressed precast compound wall

- Height of precast compound wall above FGL shall be 2100 mm
- Minimum Grade of concrete for precast prestressed Column post and wall panel shall M30 as per IS 456
- Pre- stressing tendons of high tensile steel / wire shall confirm to IS: 1785 PART-1 or IS: 6003
- Drainage holes at bottom and T Section at top shall be provided in compound wall.

(b) Y Section with Concertina coil

- Height of Built-up Y Section for fixing concertina coil and razor wire over compound wall shall be 600 mm.
- Y section shall consist of built up angles - ISA 50x50x6. Y section shall be hot dip galvanized.
- Concertina Coil shall be galvanized Punched Barbed Tape combined with the High Tensile Spring Steel core wire, to form continuous spirals. Concertina coils shall be clipped together at required/appropriate intervals with heavy duty clips and shall be fastened to the razor wire.
- All fixing accessories shall be made of Galvanized steel.
- Minimum diameter of concertina coil shall be 600 mm and shall be of Galvanised steel.

(c) Foundation

- Prestressed column posts (“H Section”) shall be embedded in cast in situ concrete pile below Finished Ground Level (FGL).
- Minimum Depth of cast in-situ concrete pile below FGL 1000 mm
- Necessary toe wall shall be provided below GL, before erecting wall panel on safety ground.

Approval shall be obtained for prestressed precast concrete compound wall manufacturer by submitting his credentials and past experience. However joint inspection shall be arranged by the contractor to the manufacturing unit to ensure the method of casting & quality measures adopted.

For Preliminary details of preferable scheme of Pre-stressed precast compound wall, refer Annexure C4.

Compound wall detailed drawing and layout shall be submitted to CLUVPL for approval, before commencement of work.

## 21.10 ENTRANCE GATE

The main entry to each plant / project area shall be provided with a main gate of size 5.00 x 2.40 M and a wicket gate of size 1.20 x 2.40 M (both using MS Structural

Steel). RCC gate pillars of required size shall be provided at the main entrance. Apart from this main gate, additional gates of size 1.20 x 2.40 M shall be provided at appropriate locations within each project site, wherever necessary.

For preliminary details of Entrance gate, **Refer Annexure C5.**

Entrance gate detailed drawing shall be submitted to CLUVPL for approval, before commencement of manufacturing / construction.

#### **21.11 SIGN BOARD**

Aesthetically designed sign board 2.40 M x 1.50 M shall be provided at the entrance of approach road to Solar Power Plant at each plant site. The sign board shall contain brief description of the Power Plant. The Signboard shall be made of stainless-steel tubular frame with SS steel plate of not less than 3 mm. Necessary SS steel tubular support column with concrete foundation shall be provided. Letters on board shall be designed with proper colour scheme and fluorescent paint system / arrangement. The design & size of the signboard shall have to be befitting the landscaping planned for the main entrance to power Plant. The sign board design and drawing shall be submitted to CLUVPL for approval, before the commencement of manufacturing.

#### **21.12 SECURITY BUILDING**

The Security Building shall be provided near the main entrance of each plant project site. The security building shall be of single storeyed RCC framed structure 3m x 3.6m (inner dimension) with an internal toilet provision for 1.5m x 1.2 m size & front verandah for a minimum width 1.20 m. Contractor shall design and construct RCC building as per relevant technical specification laid out in **Annexure C1.**

For preliminary architectural details of Security building, **Refer Annexure C6**

Security building shall be provided with all necessary electrical fittings and sanitary items along with adequate sewage disposal system.

The structural design and detailed drawings of security building shall be submitted to CLUVPL for approval before commencement of work.

#### **21.13 TWO/ FOUR WHEELER PARKING SHED**

Separate two / four wheeler parking shed to house minimum four 4wheelers and ten 2wheelers using MS structural framework with colour coated metal /Galvalume sheet roofing and flooring with paver block shall be provided in each project sites.

For preliminary architectural details of parking shed, **Refer Annexure C7**

#### **21.14 MODULE CLEANING SYSTEM**

Contractor shall design and install module Wet cleaning system for the entire project site for successful operation of the plant for 25 years.

<p>Water for module cleaning purpose</p>	<ul style="list-style-type: none"> <li>✓ Permanent source of water shall be identified for module cleaning and uninterrupted water supply for the plant. Necessary statutory approval for borewell (if required) may be obtained by the contractor.</li> <li>✓ Contractor shall conduct chemical analysis of water and ascertain the treatment requirements to make the water potable as per IS10500:2012.</li> <li>✓ Based on chemical analysis of water, if any equipment/system (RO/UV) is required for treatment of raw water before it is used for module cleaning, the same shall be submitted to CLUVPL for approval.</li> <li>✓ Contractor shall design module cleaning system considering minimum quantity of water as 4.00 liters / module.</li> </ul>
<p>Treatment unit (RO/UV)</p>	<p>Treatment unit (RO/UV, PSF, ACF, Feed pumps etc., as applicable) shall be housed within closed shed:</p> <ul style="list-style-type: none"> <li>✓ Columns, rafter, purlin and girts shall be structural steel provided with 2 coats of enamel paint of approved brand over one coat of red oxide primer.</li> <li>✓ To be provided with side cladding and roofing with colour coated galvalume sheet.</li> <li>✓ To be provided with RCC platform 600 mm above ground level.</li> </ul>
<p>Water storage tank</p>	<p>For storing raw water/treated water, RCC sump/PVC/FRP water tanks shall be provided.</p>
<p>Module cleaning pipeline network</p>	<ul style="list-style-type: none"> <li>✓ Contractor shall provide necessary arrangement for module washing in the Solar Power Plant. This shall include construction of a water storage sump, pump &amp; motor (with stand by arrangement) and routing buried main and distribution lines using UPVC pipe conforming to ASTM D1785 (latest) pipe network covering all areas of Solar arrays.</li> <li>✓ Tap off points from the PVC supply pipe network with manual isolating valves shall be provided at number of locations to enable the cleaning of modules using hoses of adequate length.</li> <li>✓ Necessary pressure relief valves shall be provided in all the pumps to control the desired pressure at outlet on safety requirements to prevent any damage to PV modules.</li> </ul>



To the extent feasible, the run-off from washing shall be designed to get absorbed in the soil below the solar arrays. Excess water during rains shall be drained through storm water drains built in the Plant area and finally let into the main storm water drain leading to the Nallah.

Contractor shall submit detailed design document and Module cleaning system drawings for CLUVPL approval. The Contractor shall lay main & distribution pipelines required for wet cleaning purpose.

#### **21.15 STORM-WATER DRAINAGE NETWORK**

Contractor shall design and provide storm water drainage network consisting of internal drains and peripheral drains taking into account the topography of the plant area, array layout, area drainage patterns and intensity of rainfall as per latest BIS / IRC standards.

For design of drains, the rainfall intensity shall be taken as 100 mm/Hr. All internal drains shall be earthen drain, trapezoidal in section and shall be minimum 600 mm wide at the base with side slope 1V:1.5H.

Contractor shall provide all drain - road intersections with pipe culverts (other than main entrance) / box culverts of adequate size and reinforcement. Pipe culvert/Box culvert shall conform to latest BIS specifications. However, RCC Box culvert shall be provided at the main entrance of the Project site.

Rain Water Harvesting (RWH) system shall be established by the contractor for project site by using rooftop rain water harvesting system, ground water recharge pits /ground water recharge trenches / recharge wells / percolation ponds etc., Collected rain water shall be effectively used by the contractor for gardening and flushing purpose without treatment and in case of drinking purpose with water treatment. Details of rain water harvesting system shall be submitted by contractor along with storm water drainage design & drawing.

#### **21.16 LANDSCAPING DESIGN**

The contractor shall design landscaping / garden etc., aesthetically by considering the aerial view of the each project site causing no shadow on the solar panels.

- ✓ Landscaping work of the Plant premises shall be designed with suitable plant species.
- ✓ Contractor shall provide landscaping using kerb walls, walkways, lawns, plants, palm trees, shrubs, bushes etc...
  - From entrance gate to PESS building
  - Around PESS building and
  - Around PCSS building (if provided)
- ✓ Contractor shall provide a flag pole for flag hoisting in important days in front of PESS building. Interlocking paver block shall be provided for walkways.





- ✓ The landscaping drawings shall be submitted to CLUVPL and got approved before commencement of work.
- ✓ The contractor shall have to maintain the gardens /landscaping during the construction as well as entire O&M period.

CLUVPL reserves the right to modify the landscaping design at any stage as per local site conditions/requirements.





**ANNEXURE C1**  
**SPECIFICATION FOR RCC BUILDING**

**C1.1 GRADE OF CONCRETE AND MATERIAL FOR CONSTRUCTION**

Contractor shall follow material specification as per Cl. 21.1.5 & 21.1.6 of technical specification.

**C1.2 DESIGN REQUIREMENTS:**

The buildings/structure shall be designed for loads and load combination as per Indian Standards (latest revisions):

Dead load (DL)	Dead loads shall be self-weight of all structural and non-structural members as per latest IS 875, Part I
Live load (LL)	Live loads shall be as per latest IS 875, Part II. Load of all equipments shall be considered over and above imposed loads.
Wind load (WL)	The wind load parameters shall be considered as per latest IS 875, Part-III
Earthquake load (SL)	Seismic parameters & Importance Factor shall be based on latest BIS: 1893(Part-1). All structures shall be designed for Seismic forces for Zone III.

Vertical Deflection & Horizontal Sway Limits: The limiting permissible vertical and horizontal deflection for structural members shall be as per latest IS.

RCC building shall be designed based on limit state method of design as given in latest IS: 456 & ductility provision in detailing of RCC structures shall be considered based on latest IS: 13920 for Lateral force resisting elements or the structure.

Building shall be designed based relevant latest BIS standards and National Building Code (NBC) of India.

Foundation shall either be shallow footing or Pile footing based on soil investigation report. In case of shallow footing, minimum depth of footing shall be 1.50 m & minimum thickness of RCC mat shall be 300 mm.

The structural design along with STAAD file, design calculations and detailed construction drawings shall be submitted to CLUVPL for approval, before commencement of work.

**C1.3 PLASTERING**

All internal and external surfaces of wall shall have 15 mm thick plastering in CM 1:5. Ceiling plastering shall be 12mm thick in CM 1:3.

#### C1.4 PAINTING

Painting for various rooms of PESS building shall be as follows:

Rooms	Internal wall finish	Ceiling finish
Office room, SCADA Room, Store room, HT Switchgear room , Equipment area, Gents and ladies toilet, Pantry room, Portico & corridor	Emulsion paint of anti-fungal quality of reputed brand over putty coat	Ceiling Emulsion (White colour)
Battery room	Epoxy based paint	Epoxy based paint

The emulsion paint for all external walls shall be anti-fungal quality of reputed brand suitable for masonry surfaces.

All painting on masonry or concrete surface shall preferably be applied by roller. If applied by brush then same shall be finished off with roller. All paints shall be of approved make and quality. Minimum 2 finishing coats of paint shall be applied over a coat of primer. For painting on concrete, masonry and plastered surface BIS: 2395 shall be followed. For painting on steel work and ferrous metals, relevant BIS shall be followed.

#### C1.5 FALSE CEILING

False ceiling requirement for various rooms of PESS building shall be as follows:

Type of room	AC/False ceiling requirements
Office room	Air conditioned, With false ceiling
Store room	Air conditioned, With false ceiling
SCADA Room	Air conditioned, With false ceiling
HT Switchgear room, Battery room, AC/DC Distribution panel area etc	False ceiling
Pantry room	-
Gents toilet including wash area	-
Ladies toilet including wash area	-

The false ceiling shall be designed aesthetically using approved materials and shall be from reputed Manufacturer.

#### C1.7 ROOFING

Roof of the building shall be Cast-in-situ RCC slab treated with approved chemical waterproofing system to prevent water leakage and seepage issues. Roof shall be finished at a slope of 1:100 towards rain water down take pipe. Roof shall be laid with weatherproof ceramic cool roof tiles of reputed brand.



For accessing roof of the building, an external staircase (Minimum 1.50 m width) shall be provided.

For efficient disposal of rainwater, the run-off gradient for the roof shall not be less than 1:100 and the roof shall be provided with sufficient number of PVC (110 mm dia.) rain water down take pipes, wherever required.

The roof slab shall be projected 300mm from wall face. A parapet wall of 750 mm height shall be provided on terrace using 115mm thick brick wall with stiffeners 230x230mm at a spacing of 2.4m c/c.



**ANNEXURE C2**  
**SPECIFICATION FOR PRE-ENGINEERED BUILDING (PEB)**

**C2.1 GENERAL:**

- The PEB building shall be designed for a minimum life of 25 years. The contractor shall design PEB as per the latest Indian standard codes/international standard and National Building Code (NBC).
- It shall be designed, manufactured, supplied, and erected by the Contractor/PEB agency approved by CLUVPL as per civil sub-contractor selection criteria. All steel materials supplied by the agency shall be in a sound condition, of recent manufacture, free from defects, loose mill scale, slag intrusions, laminations, pitting, flaky, rust, etc. and be of full weight and thickness specified.
- The PEB shall have robust water tightness at all joints and connections. The building shall have a high class durability and performance during the adverse weather conditions also.
- PEB shall be complete with painting, metal facia, metal gutter, rain water down comers, sunshades, openings, etc., along with associated structural steel, cladding and roofing work insulation, Trims & Flashings.
- The architectural and structural drawings of PEB shall be submitted to CLUVPL for approval along with structural design and STAAD file. The building of each type shall be submitted to CLUVPL along with construction methodology for approval, before commencement of work.

**C2.2 DESIGN REQUIREMENTS:**

The structure shall be designed for loads and load combination as per Indian Standards (latest revisions)

Dead load (DL)	Self-Weight of Structure including Purlins, Sheeting, Girts, Bracings, weight of turbo ventilators to be added as Dead load etc.,
Live load (LL)	Live loads shall be considered as per latest BIS-875(Part-2). Load of all equipments shall be considered over and above imposed loads.
Wind Load (WL)	The wind load parameters shall be considered as per latest BIS 875 (Part-3).
Earthquake Load (SL)	Seismic parameters & Importance Factor shall be based on latest BIS: 1893(Part-1). All structures shall be designed for Seismic forces for Zone III.

Vertical Deflection & Horizontal Sway Limits: The limiting permissible vertical and horizontal deflection for structural steel members shall be as per latest BIS 800: 2007.

PEB building shall be provided with RCC pedestals (Min size 300 mm x 300 mm) up to Finished Floor level. Foundation shall either be shallow footing or Pile footing based on soil investigation report. In case of shallow footing, minimum depth of footing shall be 1.50 m & minimum thickness of RCC mat shall be 300 mm.

The structural design along with STAAD file, design calculations and detailed construction drawings shall be submitted to CLUVPL for approval, before commencement of work.

### C2.3 **DESCRIPTION OF PEB STRUCTURE COMPONENTS:**

- a) **Primary Members** - Primary structural framing shall refer to the transverse rigid frames, lean-to rafters and columns canopy rafters, interior columns (beam and column frames), bearing frame rafters and corner columns, and end wall wind columns.
- b) **Secondary Members** - Secondary structural framing shall include the purlins, girts, eave struts, bracing, flange bracing, base angles, clips flashings and other miscellaneous structural parts. Suitable wind bracings, sag rods to be reckoned while designing the structure.
- c) **Sealant** - Sealant used for cladding shall be butyl based two parts poly sulphide or equivalent approved, non-staining materials and be flexible enough not to interface with fit of the sheets.
- d) **Closures** - Solid or closed cell closures matching the profiles of the panel shall be installed along the eaves, rake and other locations.
- e) **Flashing and Trim** - Flashing and / or trim shall be furnished at the rake, corners, eaves, and framed openings and wherever necessary to provide weather tightness and finished appearance. Colour shall be matching with the colour of wall. Material shall be 26 gauge thick conforming to the physical specifications of sheeting.
- f) **Gutters and Down Comers** - Gutters shall be fabricated out of same metal sheet. Material shall be same as that of sheeting. Down comers shall be of PVC designed to ensure proper roof drainage system.

### C2.4 **STRUCTURAL AND MATERIAL SPECIFICATIONS:**

#### C2.4.1 **Primary members** –

Primary members shall be:

- Fabricated from hot rolled structural shapes shall have a minimum yield strength of 250 MPa and shall conform to the physical specifications of IS 2062 or equivalent ASTM specification.

OR

- Fabricated by cold forming process shall have a minimum yield strength of 350 MPa and shall confirm to the physical specifications of IS 811 or equivalent ASTM specification.

OR

- Fabricated from tubular steel sections with minimum yield strength of 310 MPa shall confirm to latest IS 4923 or equivalent ASTM specification.

All structural steel shall be galvanized as per IS 4759. All cold formed structural members shall be hot dip galvanized as per BIS 4759 and the average coating thickness shall be 80 micron and local coating thickness shall be minimum 70 micron.

#### C2.4.2 **Secondary members -**

Purlins, Girts and Eave struts shall be cold formed steel shall have a minimum yield strength of 350 MPa and shall conform to the physical specifications of IS 811 or equivalent ASTM specification. All other secondary members (Bracings, sag rods and ties) shall be hot rolled steel sections with minimum yield strength of 250 MPa.

Secondary members can also be fabricated from tubular steel sections with minimum yield strength of 310 MPa confirming to latest IS 4923 or equivalent ASTM specification.

All structural steel shall be hot dip galvanized as per IS 4759. For cold formed steel, the average coating thickness shall be 80 micron and local coating thickness shall be minimum 70 micron.

#### C2.4.3 **Fasteners & Connections:**

All field connections shall be bolted (unless otherwise specified).

- All primary bolted connections shall be furnished with high strength bolts conforming to the physical specifications of BIS: 1367 (Part III) Gr.8.8 /ASTM A-325 (or equivalent BIS). All high strength bolts, nuts and washers shall be zinc plated with a bronze iridite finish for easy identification.
- All secondary bolted connections shall be furnished with machine bolts conforming to the physical specifications of BIS: 1367 (Part III) Gr.4.6 / ASTM A-307 (or equivalent BIS). Machine bolts, nuts and washers will be zinc plated.
- Anchor/foundation Bolts shall confirm to BIS: 5624.

#### C2.4.4 **Roof and Wall cladding:**

Insulated wall cladding for roofing shall consist of double skin metal cladding with Poly Urethane Foam (PUF). PUF must be made of continuous method PU foam and must be CFC free, self-extinguishing, fire retardant type with density 40 +/-2 kg/m<sup>3</sup> and thermal conductivity 0.019-2.2 W/ (m.k) at 10deg.C. For roof insulation, the PUF shall be of minimum 70mm thick & for wall insulation

(Including room partition wall panels used for room separation) minimum 60mm thick. The PUF panels shall be a factory made & ready for installation at site.

Standard panels shall have both exterior and interior facings of minimum 26 gauge steel galvanized and colour coated having minimum yield strength of 345 MPa and shall conform to the physical specifications of ASTM A-653 or equivalent BIS. The zinc coating shall be by hot dip galvanization process G90 (275 g/ m<sup>2</sup>). The painting shall be baked enamel polyester (white) or silicon polyester of approved colour with a film thickness of 25 microns. The reverse side shall be white with 10 microns film thickness.

Wall panels and partition wall panels shall be clean room PUF panels which can provide aesthetic modern appearance to all the rooms. Panels shall be of approved colour. Panels shall have smooth edges and shall be easy to install (tongue & groove).

## **C2.5 FALSE CEILING**

False ceiling requirement for various rooms of PESS building shall be as follows:

<b>Type of room</b>	<b>AC/False ceiling requirements</b>
Office room, Store room & SCADA room	Air conditioned, With false ceiling
HT Switchgear room, Battery room, AC/DC Distribution panel area, Pantry room and Toilet area	False ceiling

The false ceiling shall be designed aesthetically using approved materials and shall be from reputed Manufacturer.



### APPENDIX C3

#### TIMELINE FOR CRITICAL CIVIL ENGINEERING ACTIVITES

Contractor shall adhere to the following timelines in completing critical civil engineering activities. Contractor shall also ensure these activities are reflected in overall project timeline.

##### **(1) General civil works:**

Sl No.	Name of work	Timeline (Within)
1	Submission of topographical survey report in CCMS	14 days from date of LOA
2	Submission of Mix design report with 14 days cube strength result (Minimum M25) in CCMS	21 days from date of LOA
3	Submission of Soil investigation report in CCMS	30 days from date of LOA
4	Submission of Overall plant layout in CCMS	30 days from date of LOA

##### **(2) Module mounting structure – Pile load test and foundation**

Sl No.	Name of work	Timeline (Within)
1	Submission of MMS Pile test layout for approval in CCMS	14 days from date of LOA
2	Submission of MMS Pile load test report in CCMS on completion of Pile tests	35 days from date of LOA
3	Submission of MMS Foundation drawing in CCMS	45 days from date of LOA

##### **(3) Module mounting structure – General arrangement & fabrication**

Sl No.	Name of work	Timeline (Within)
1	Submission of Module mounting structure (GA drawing) in CCMS	40 days from date of LOA
2	Submission of MMS Fabrication drawings in CCMS	50 days from date of LOA
3	MMS Prototype inspection	60 days from date of LOA

##### **(4) Power Export Sub-station (PESS)**

Sl No.	Name of work	Timeline (Within)
1	Submission of PESS Equipment layout in CCMS	40 days from date of LOA

2	Submission of PESS Architectural drawing in CCMS	45 days from date of LOA
3	Submission of PESS Design document and foundation and plinth/grade beam drawing in CCMS	50 days from date of LOA
4	Submission of PESS Structural drawings in CCMS	60 days from date of LOA

**(5) Power Collection sub-station (PCSS)**

Sl No.	Name of work	Timeline (Within)
1	Submission of PCSS Equipment layout in CCMS	40 days from date of LOA
2	Submission of PCSS Architectural drawing in CCMS	45 days from date of LOA
3	Submission of PCSS Design document and foundation, plinth beam drawing in CCMS	50 days from date of LOA
4	Submission of PCSS Structural drawings in CCMS	60 days from date of LOA

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## SECTION 22.0

### QUALITY ASSURANCE, INSPECTION & TESTING

#### 22.1. Quality Assurance and Quality Control

**22.1.1.** The Manufacturing Quality Plan (MQP) of individual Equipment / System will be mutually discussed and agreed with the Contractor during detailed Engineering. The list of such MQP documents shall be included in the Master Drawing List. (MDL)

**22.1.2.** MQP shall consist of five sections viz.

1. Checking of Raw materials/Bought out items
2. In-process inspection
3. Routine Tests
4. Factory Acceptance Tests (FAT)
5. Packing & Dispatch Checks.

Checks and Tests in each section shall be finalized during detailed Engineering. For FAT, MQP shall be annexed with the detailed test / Check procedures, Forms / Check Sheets to fill up the observations along with Pass Criteria of each test / Check.

**22.1.3.** Following major equipment / Bought Out Items will be inspected in line with the FAT procedures furnished in the corresponding and approved MQP. The cost of carrying out testing will be deemed to be included in the cost of the equipment. FAT shall be performed at the Factory premises or NABL/ILAC accredited labs as applicable and to be Performed by the OEM/LAB and shall be witnessed by CLUVPL Engineers along with the competent Engineers of Contractor / Third party Inspection agency. Approval request for the Inspecting Engineers of Contractor / Third party Inspection agency, together with their CV shall be submitted along with the respective inspection call.

- 1) Solar PV Modules
- 2) Module mounting structure for SPV module.
- 3) Cables - Solar Cables, DC Cables, HT Cables and LT & Control cable.
- 4) String Combiner & Monitoring Box.
- 5) Solar Inverters.
- 6) AC HT Switchgear - Breaker, Isolators, Earthing Devices, C&R Panel, CT and PT.
- 7) Transformers - IDT, HT Power, HT Aux Transformer & NIFPS.
- 8) LT Switchgear - LT Panel, UPS DB and LDB.
- 9) DC System - Battery and Charger.
- 10) Uninterrupted Power Supply (UPS) - Battery and UPS Panel.
- 11) Tariff Energy Metering System.
- 12) Optic Fiber Cables and Accessories.
- 13) SCADA System and communication interface panel.
- 14) Weather Monitoring Station.
- 15) Fire Alarm Panel and repeater panels.
- 16) Any other equipment/system considered by the CLUVPL for FAT during Detailed Engineering.

**22.1.4.** At the end of the inspection, MoM will be made and if found satisfactory by the CLUVPL Engineer, Provisional Material Dispatch Clearance will be issued as a part of MoM.

However, Material Dispatch Clearance Certificate (MDCC) shall be issued from CLUVPL HQ on receipt of request from Contractor, along with the Inspection reports / Documents as per approved MQP and after scrutiny of the same. CLUVPL has the right to cancel the previously given Provisional Material Dispatch clearance, if any discrepancy found in the submitted Reports.

**22.1.5.** No dispatches shall be made by the supplier without obtaining Provisional Material Dispatch Clearance / MDCC from CLUVPL. Wherever reworks are involved, re-inspections shall be conducted and all expenditure towards the same shall be borne by the Contractor.

**22.2. Field Inspection & Testing**

**22.2.1.** Field Quality Plans (FQP) shall detail out all the site activities, tests / checks to be carried out during receipt, unloading, storage, erection of the equipment and have attachments of OEM documents like Erection & commissioning manuals, inspection procedure and other reference documents. FQP will be mutually discussed and finalized preferably in the format suggested by CLUVPL during Detailed Engineering. In these Field Quality Plans, Contractor/CLUVPL shall indicate customer hold points (CHP), i.e., test/checks which shall be carried out in presence of CLUVPL/ Project Manager or his authorized representative and beyond which the work will not proceed without consent of CLUVPL in writing.

**22.3. Drawings & Documents:** During Detailed Engineering the following particulars of the "Quality Assurance, Inspection & Testing" shall be submitted for approval by CLUVPL.

- 1) MQP for All the Individual Equipment / Systems as listed in 22.1.3 above and other equipment / systems as applicable.
- 2) FQP for AC Works
- 3) FQP for DC Works
- 4) FQP for Civil works





## SECTION 23.0 SPARES, TOOLS & TACKLES

### 23.1. SPARES AND CONSUMABLES

- 23.1.1. The Contractor shall be responsible for maintaining the required spares and consumables at site in sufficient quantities as per the recommendation of respective Equipment / System OEMs for startup, commissioning and O&M of the Solar Project along with Power evacuation system.
- 23.1.2. The Mandatory Spares to be kept shall be as per the recommendation of the respective OEMs of the Equipment /System.
- 23.1.3. Mandatory spares, consumables and various other components required for replacements and repairs during O&M period shall be the responsibility of the contractor without any extra cost. Contractor shall complete the supply and maintain the stock of Mandatory spares required before commencement of PG Test. Contractor shall maintain the mandatory spares, consumables & various components of the Project for smooth running of O&M during Performance Guarantee Test Period. During the PG Test and O&M period, if the contractor uses the mandatory spares from their stock, then the same shall be replenished then and there by the contractor without any extra cost.
- 23.1.4. The mandatory spares supplied shall be strictly interchangeable with parts for which they are intended for replacement.
- 23.1.5. The mandatory spares shall be treated, packed and maintained for long storage (as applicable with respect to Expiry date) under the climatic conditions prevailing at the site.

### 23.2. TOOLS AND TACKLES

- 23.2.1. Tools and tackles is not a supply item. A list of tools and tackles which are required for O & M shall be maintained by the Contractor in the project site during the O & M period and the same can be taken back by the Contractor after completion of the O & M period. Apart from the tools and tackles, the Contractor shall also maintain other special equipment if any required for smooth operation and maintenance activities.
- 23.2.2. Such special equipment used by the contractor during operation and maintenance period shall be handed over to CLUVPL at free of cost to ensure smooth takeover of the Project by CLUVPL from the contractor at the end of five years O& M period.

### 23.3. GENERAL REQUIREMENTS OF DRAWINGS AND DOCUMENTS

- 23.3.1. Contractor shall furnish drawings and documents during Detailed Engineering as indicated in each Section which are not exhaustive. The Master Document List (MDL) shall be submitted for approval in line with requirements of the specification as specified in Section 2.
- 23.3.2. General formats and Content: All the drawings shall contain material list, brief description of components, make of bought out component, overall dimensions, dimensions to check the suitability of the equipment, dimensions relevant to other facilities. These drawings shall show sufficient overall dimensions, clearances and space requirements of all apparatus to be furnished, to enable CLUVPL to determine the design and layout of the installation.
- 23.3.3. The Contractor shall not, without CLUVPL's prior written consent, disclose the contract or any provision thereof or any specification, plan, drawing, pattern therewith to any person other than person employed by the Contractor in performance of the contract.

Disclosure to any such employed person shall be made in confidence and shall extend strictly for purpose of performance only.

23.3.4. With the delivery of equipment, following shall be supplied:

- a) All approved drawings & documents relevant to the equipment & Certified dimension drawings including details of all parts subject to wear and breakage.
- b) Instruction in English language for unpacking, assembly and erection of all equipment including handling / unpacking / erection drawings / sketches.
- c) Instruction in English language for operation and maintenance of equipment and control.
- d) Spare parts lists with drawings, specification and manufacturer's catalogue.
- e) Complete list of items detailing individual items with ratings, capacity, services etc.

23.3.5. On successful completion of Performance Guarantee Test Period for the Project, and on completion of each year of O&M Period, the following shall be supplied:

- a) PG Test Evaluation Report.
- b) Operation log book for 1 year
- c) Power export log for 1 year
- d) Inventory of spares at project site
- e) As-Built Drawings – Where ever corrections involved
- f) List and description of major maintenance works done on equipment and buildings
- g) Off Take Constrain Registers

For Closure of the contract, the contractor has to submit Completion Report highlighting all major miles stone events, module & inverter ID list, Spares list with part number, do's and don'ts, special instructions, lessons learnt, Project potential, etc.





## SECTION 24.0

### TESTING & COMMISSIONING, PERFORMANCE GUARANTEE TEST

#### 24.1. TESTING & COMMISSIONING

- 24.1.1** On completion of erection of individual equipment, Contractor or Contractor appointed Testing Agency shall carry out testing, pre commissioning checks, operational checks, instrument and device calibrations, control loop checks, interlock and trip checks, etc. The Test reports of each and every equipment based on a systematically planned procedure as above shall be submitted to CLUVPL Project in charge for approval and clearance for commissioning.
- 24.1.2** The Contractor shall do cleanup of all equipment and area within project site prior to preparing the equipment for Pre-commissioning testing and submit the schedule and the Checklists as per the approved format, of such Pre-commissioning tests to the CLUVPL Project in charge for approval. For each equipment, all the pre - commissioning Checks / tests specifically recommended by manufacturer shall be performed at site. All test results in the Checklist formats containing the details of each test - like the detailed procedure, Testing equipment / Instruments required, safety precautions to be taken before and after the tests, Parameters to be recorded with limit values & actual values and the result of test along with the remarks of the testing Engineer etc. shall be provided to CLUVPL/SECL for verification and acceptance during commissioning of the equipment and Project.
- 24.1.3** Power and control cabling shall be done as per approved scheme and in sections in line with statutory requirement, taking adequate precautions against electrical shocks. As the solar PV modules are capable of producing power on exposure to light, necessary covers shall be supplied for covering the solar PV modules during cabling termination works.
- 24.1.4** Calibration and commissioning of all instruments and control equipment supplied under this contract shall be executed by the Contractor. Hardware and software required for erection of all instruments and control equipment covered under this contract and the same shall be supplied by the Contractor.
- 24.1.5** Pre-commissioning checks, individual loop checks, power initialization, verification of system functioning, trouble shooting, final solutions to application and / or instrument problems etc., are responsibility of Contractor. All the required software and hardware changes, if any, shall also be incorporated as required for successful commissioning to CLUVPL's satisfaction.
- 24.1.6** To identify each equipment / instrument / accessories / Cables etc, tags with appropriate ID Descriptions / Numbers shall be fixed / tied at a suitable place on the equipment / instruments / accessories / Cables after erection by the Contractor. The tags and connecting wires shall be of suitable and durable material and the size of the tags shall be adequate to accommodate tag number.

**24.1.7** Follow up of all the required activities to obtain State / Central Electrical Inspectors approval for the installation and carrying out any changes called for by the Inspector shall be carried out without extra cost to CLUVPL.

**24.1.8** Based on the individual equipment approval status, Statutory clearances and readiness of the required equipment, the startup and commissioning of the Power Project shall be executed by the Contractor in a planned coordinated sequence along with the power evacuation system.

**24.1.9 COMMISSIONING:** Refer Commercial Volume.

**24.1.10 PROVISIONAL TAKE OVER:** Refer Commercial Volume.

**24.2. PERFORMANCE GUARANTEE TEST (PG TEST):** After completion / fulfilled of conditions Agreed during Provisional Take over, the Contractor shall notify in writing to CLUVPL, that the Project is ready for PG Test as per Contract requirements. All auxiliary systems shall be taken into service before commencement of PG Test of the plant. Any special equipment, instrumentation, tools and tackles and manpower required for the successful completion of the PG Test shall be provided by the Contractor free of cost. The accuracy class of the instrumentation shall be as per the relevant clause of specification.

The PG test shall be conducted based on the PG test procedure as briefly described below and the Detailed PG test procedure along with requisite forms /Checklists /Manuals & Calibration Certificates of the Instruments used for PG Test shall be submitted by the contractor for approval by CLUVPL. This test shall be conducted in the presence of CLUVPL and Shall be binding on all the parties of the Contract to determine compliance of the equipment with the functional guarantee.

On verification of the above and approval by CLUVPL, PG Test shall be carried out from a mutually agreed date, (Which shall be scheduled within 2 months from the date of PAC) for a period of 3 months (90 Days) consecutively.

**24.2.1. The procedure for PG Test:** The procedure for PG test is briefly furnished below.

- 1) The Annual Net Energy Export Target (NEET) values furnished in **Section – 1** for the total 40 MW (AC) capacity shall be the design basis for the project. The contractor shall furnish during detailed engineering, the month wise NEET values as per the format provided in Technical Schedule -1 for each 10/20 MW SPP for approval by CLUVPL.
- 2) The Actual Monthly Net Energy Export Value Readings recorded at the Metering Stations at each SECL Sub Stations and the actual Monthly GHI values (derived from cumulative One Minute interval values) measured at each site shall be the Primary Data. These readings shall be noted & monitored on daily basis for PG test period for each site.
- 3) The actual GHI values shall be measured and recorded at respective site as described below.



- a) Installation of Three numbers (One as main Meter second as Standby Meter the third as Check Meter) calibrated Pyranometers along with Data Loggers programmed to measure the actual GHI at the same project location as specified in Section 13 is under the scope of work of the Contractor. The Higher reading Pyranometer out of Three will be designated as Main Meter and the collected values from the main Pyranometer will be considered for normal calculations.
- b) Valid calibration Certificates of all the Pyranometers with calibration traceability to World Radiation Reference (WRR) or World Radiation Centre (WRC) by the OEM / Government Accredited Lab and the details of Data Logger shall be submitted by the Contractor for approval by CLUVPL prior to PAC.
- c) The output of Pyranometers from the PAC and during the PG Test period shall be made available to SCADA through its respective data logger. In addition, provision for downloading the recorded GHI values directly from Data logger shall also be made.
- d) Deviation of daily readings between the 3 Pyranometers shall be within the limit of 2% with reference to the Higher reading and if it exceeds 2%, then the PG Test shall be suspended, data of that particular day(s) shall be discarded, and the PG Test shall be resumed only after rectification / replacement so as to bring down the difference in readings within 2%. Test period shall be extended by same numbers of suspended day(s).
- e) The Highest value of GHI among the actual readings of 3 Pyranometers for the entire period of PG Test will be designated as PG Test GHI values and will be considered for PG Test calculations.

#### 24.2.2. PG Test Calculations:

- 1) Technical Schedule - 2 is the Format for the Data collection during PG Test and to calculate the Corrected Annual Net Energy Export Target (NEET) as applicable and shall be submitted after the PG Test for each 20/10 MW SPP.
- 2) The performance of the capacity of the individual plants shall be monitored monthly by the short fall, if any, in the corrected NEET using the Technical Schedule – 2.
- 3) Following factors shall be considered for computing the Corrected NEET and shortfall (if any)
  - a) Effect of any meteorological parameters shall not be considered except for solar radiation measured in terms of GHI.
  - b) **Grid outage or unavailability of power evacuation system:** Generation loss due to Grid outage or unavailability of power evacuation system for the reason not attributable to the Contractor, the measured GHI of the period of the outage of the power evacuation system shall be excluded to calculate the Monthly Actual Average GHI value.

A separate Register shall be maintained from PAC throughout the contract Period to record such events with relevant details like Timing, Cause and the Measured Average GHI values etc. by the Contractor and submitted to the CLUVPL Site In-charge immediately after the resumption of Grid for approval. Based on the data of such register, Technical Schedule 3A shall be prepared to arrive at the 'Actual Average GHI values Considering Grid Outage' and got approved by CLUVPL after the resumption of Grid.

- c) **Back down /surrender Constrain:** Back down / Surrender of Power might be ordered by the authorities on account of events like consideration of grid security or safety of any equipment or personnel or any other conditions warranting Back down / Surrender of Power. If the reason for the Back down / surrender is not attributable to the Contractor, the Deemed Net Energy Export for such duration of Back down / Surrender shall be calculated as described in Technical Schedule 3B and got approved by CLUVPL on such Back down days.

A separate Register shall be maintained from PAC throughout the contract Period to record such events with relevant details like Back down / Surrender Order references, Timing, the Quantum of Surrendered Power in MW, Measured Average GHI values for the period etc. by the Contractor and submitted to the CLUVPL Site In-charge immediately after the withdrawal of Back down / Surrender for approval. Based on the data of such register, Technical Schedule 3B shall be prepared to arrive at the 'Deemed Generation due to Back-Down for the month'. The Entries shall be got approved by CLUVPL each time after Normalization.

- 4) The PG test of the respective 20/10 MW SPP shall be repeated in case of outage of any one of the following equipment for more than 7 days continuously.
- a) Evacuation System Equipment including Extended Bay & metering at SECL Sub Stations
  - b) Inverter transformer
  - c) Inverter
  - d) SCADA System
  - e) Pyranometer

#### **24.2.3. Evaluation of PG Test Results:**

- 1) If short fall in Net Energy Export is observed in the Monthly PG Test Calculations, the contractor shall analyze the reasons for such shortfalls and submit a report with the proposed necessary corrective actions for strict implementation to improve the generation in the subsequent months and implement the corrective actions without any cost.
- 2) At the end of the PG Test Period in each site, if the Actual Total Net Energy Export recorded by the Joint Meter Reading at respective metering points is greater than or equal to the Corrected NEET values in the PG Test Calculations, then the SPP



shall be considered to be performing as per the design and the PG Test of the respective 20/10 MW SPP shall be considered successful.

- 3) At the end of the PG Test Period of the respective 20/10 MW SPP, if there is a shortfall in the Corrected NEET values in the PG Test Calculations, the Contractor shall repeat the PG Test for another 90 days by following the same procedure furnished above, after taking corrective actions like necessary modifications/replacements/repowering to avoid the short fall in energy. At least 10 days Prior to start of the 2<sup>nd</sup> PG Test , the Contractor shall notify in writing to CLUVPL, that the 20/10 MW SPP is ready for 2<sup>nd</sup> PG Test along with the list of modifications/replacements/repowering carried out. The scheduled Date of Commencement of the second PG Test shall be within 3 months from the end of the First PG Test.
- 4) At the end of the Second PG Test Period of the respective 20/10 MW SPP, if there is a shortfall again in the Corrected NEET values in the 2<sup>nd</sup> PG Test Calculations, the contract shall repeat the PG Test by following the same procedure as was done after the 1<sup>st</sup> PG Test as long as there is a sufficient time to complete the PG Test within one year (365 days) from the date of issue of PAC.
- 5) At the end of the third/last PG Test Period of the respective 20/10 MW SPP, if there is a shortfall in the Corrected NEET, SECL may at its discretion reject the equipment and recover the payments already made or accept the plant with LD for deficiency in the performance of the Project, that shall be levied for the quantum of such short fall as per the calculation method described in Technical Schedule - 2.
- 6) PG Test for all the 20/10 MW SPPs shall be successfully completed within one year from the date of respective PAC of the site.
- 7) In case Contractor could not complete the PG Test of any of the 20/10 MW SPPs within 365 Days from the date of issue of PAC, the period from PAC till completion of one year shall be considered as PG Test Period for that particular site and the Annual Net Exported Energy and Annual GHI values measured during this one year for the respective 20/10 MW SPP shall be used in Technical Schedule - 2 for calculation of Shortfall in Corrected NEET.

**24.3. Final Takeover:** Refer Commercial Volume.





## **SECTION 25.0 OPERATION AND MAINTENANCE (O&M)**

### **25.1.0 GENERAL**

The CONTRACTOR shall carry out O&M activities for the entire Solar PV Power Plant including its associated civil structures, approach roads, Power export substation and control room buildings, Gate complex, Security Buildings Garden etc. The O & M activities also includes the entire power evacuation system comprising of transmission lines (overhead & underground)/ towers en route to the SECL Substation, extension bays & allied equipments till the terminal point of connectivity etc. for a period of 10 years including First year warranty period O&M.

- 25.1.1** Operation work includes day-to-day operation of Solar PV Power Plant including the power evacuation system, maintenance of LT, and HT system up to the terminal point of SECL Substation and maintenance of all Civil Works.
- 25.1.2** The CONTRACTOR shall furnish proposed maintenance (preventive) schedule for the operation and maintenance of the power plant including the complete power evacuation system up to SECL Substation. As the contract period is for 10 years, the long term maintenance/replacement schedule indicating the unit replacement of parts/equipments, if any, shall also be furnished considering the life of such parts/equipments. Equipment overhaul schedule indicating the loss of generation during such periods, if any, and the proposed catch up plans for maintaining the scheduled/committed generation shall also be furnished.
- 25.1.3** The maintenance staff for the Solar PV power plant including the power evacuation system shall be available at all times in the plant premises.
- 25.1.4** The CONTRACTOR shall maintain attendance register for all their staff deployed for carrying out jobs on regular basis and shall be produced for verification on demand by authorized personnel of CLUVPL.
- 25.1.5** The CONTRACTOR shall ensure that all safety measures are taken at the site to avoid the accidents to his employees or his Sub Contractor employees.
- 25.1.6** In order to ensure longevity, safety of the core equipment and optimum performance of the system, the CONTRACTOR shall use only genuine spares of high quality standards.
- 25.1.7** The O&M charges as per price schedule is inclusive of replacement of parts/equipments, spares, consumables, cost towards periodical repowering, etc.
- 25.1.8** Sufficient provisions may be made in the infrastructure, space, etc for the periodical repowering if required in such a way that a buffer generation capacity shall be augmented and maintained to achieve the annual net energy export target values corrected with the measured GHI values at each site .

### **25.2.0 SCOPE**

- 25.2.1** The CONTRACTOR shall provide his operation and maintenance staff for the entire Solar Power Plant including the power evacuation system for day-to-day operation and maintenance. The operation and maintenance personnel shall be qualified, certified by competent authorities and well trained so that they can handle any type of operational

hazards quickly and timely. The responsibility of providing suitable Personal Protection Equipments rests solely with the CONTRACTOR.

**25.2.2** The security of the Solar Power Plant including power evacuation system will rest with the CONTRACTOR, till such time, the operation and maintenance of the power plant and its auxiliaries have been finally taken over by SECL after completion of the contract period.

**25.2.3** The maintenance personnel shall be in a position to check and test all the equipments regularly, so that, preventive maintenance, could be taken well in advance to save any equipment from damage. Abnormal behavior of any equipment shall be brought to the notice of SECL/CLUVPL not later than 2 hours for taking appropriate action.

**25.2.4** All repairing & replacement works are to be completed by the CONTRACTOR within reasonable time from the time of occurrence of fault or defect. If it is not possible to set right the equipment within reasonable time, the CONTRACTOR shall notify SECL/CLUVPL indicating nature of fault & cause of damage etc. within 12 hours from the time of occurrence of the fault.

**25.2.5** During operation and maintenance, if there is any loss or damage to any component of the power plant and the evacuation system due to miss-management/ miss-handling or due to any other reasons, what so ever, the CONTRACTOR shall be responsible for immediate replacement / rectification of the same. The damaged component may be repaired, if it is understood after examination that performance of the components shall not be degraded after repairing, otherwise the defective components shall have to be replaced by new one without any extra cost to SECL.

**25.2.6 The scope of maintenance work shall include the following:**

25.2.5.1 Regular operation and maintenance of the Solar PV Power Plant and Power Evacuation System including water supply system and submission of daily performance data of the power plant. The CONTRACTOR shall maintain log book in this respect to clearly record the date of checking & comments for action taken etc.

25.2.5.2 The scope of operation and maintenance includes all equipments/accessories of the Solar Power Plant and the Power Evacuation System up to the SECL Substation. Proper records of operation of the entire Power Plant System are to be kept as per direction of CLUVPL.

25.2.5.3 Cleaning of the Power Plant including array yard on regular basis.

25.2.5.4 Normal and preventive maintenance of the Power Plant including power evacuation system such as cleaning of module surface, tightening of all electrical connections, Line accessories, Transformers and associated switchgears, Circuit Breakers, protective equipments at extension bays etc.

25.2.5.5 Keeping & recording daily log sheet as per approved format for the Power Plant System to be supplied after commissioning of the Power Plant.

25.2.5.6 Under no circumstances, the operator shall run the power plant damaging the SECL substation or grid.

25.2.5.7 CONTRACTOR employees shall use no part of the power plant building for residential or any other purpose except for running the plant.

25.2.5.8 The CONTRACTOR shall submit monthly Performance report of Solar PV Power Plant indicating cumulative energy export data as per approved format within three days of

the following month. The reporting shall also include any mismatch or abnormality in the performance of the power plant based on SCADA details review

- 25.2.5.9 The CONTRACTOR shall preserve all recorded data in either manual or through computer format and shall submit to CLUVPL every month.
- 25.2.5.10 The CONTRACTOR shall develop & maintain the garden, which will be developed by the CONTRACTOR himself as per landscaping including daily watering and manuring as and when necessary and on regular basis.
- 25.2.5.11 During operation and maintenance period, the CONTRACTOR shall refill the fire extinguishers as per manufacturer's recommendation before expiry.

### **25.3.0 TOOLS AND TACKLES**

Tools and tackles is not a supply item. A list of tools and tackles which are required for O & M of the solar power plant including the power evacuation scheme along with the separate list of special tools supplied along with the equipment, if any, shall be furnished to CLUVPL during commencement of the O&M period. Such tools and tackles shall be maintained by the CONTRACTOR in good condition for use during the O&M period.

### **25.4.0 TESTING INSTRUMENTS FOR ELECTRICAL & ELECTRONICS**

All details like Make, Type, Numbers, Range, Accuracy, etc of onsite testing instruments / equipments shall be furnished to SECL during commencement of the O&M period. Details of equipment / instrument, make, numbers, range, accuracy, etc shall be furnished to CLUVPL.

### **25.5.0 SCOPE OF CIVIL MAINTENANCE**

- 25.5.1 Cleaning of surface drain, sewerage line, drainage outfall, down pipes, soil pipes, water pipe lines.
- 25.5.2 Repairing or replacement, whatever necessary, and cleaning of all joineries in the Pre-Engineered Building of PCSS as and when necessary.
- 25.5.3 Repairing or replacement, whatever necessary, of doors, window fixtures, toilet accessories, etc in PESS and other buildings as and when necessary.
- 25.5.4 Cleaning & maintaining of power plant area clearing all weeds, leaves and other wood rejects. Vegetation removal inside the power plant and also vegetation removal & cutting of trees/branches en route the transmission lines of the power evacuation system up to SECL substation on periodical basis as directed by CLUVPL.
- 25.5.5 Painting of iron parts of array structures posts once in a year.
- 25.5.6 Painting of the buildings, structures/PCSS, PESS, Security room, compound wall, fencing, gates, transmission towers, extension bays/control room in Substation etc once in two years.
- 25.5.7 All minor repair maintenance in case of buildings and all other structures as and when required as per the instructions of Project Manager/CLUVPL.

### **25.6.0 PERFORMANCE EVALUATION AND COMPENSATION FOR SHORTFALL IN ENERGY DURING O&M:**

The performance of each 20/10 MW Solar Power Plant shall be monitored and reviewed by CLUVPL on a monthly basis and the Compensation shall be levied for any short fall in the Annual Net Energy Export from the Solar Power Plant as per the Corrected NEET indicated in Technical Schedule - 4.

**25.6.1 The procedure for Performance Evaluation during O&M:** The procedure is briefly furnished below.

1. The Annual Net Energy Export Target (NEET) values furnished in Section – 1 for the total 40 MW (AC) capacity shall be the design basis of O&M PG Evaluation. Accordingly, the bidder shall furnish the month wise NEET values as per the format provided in Technical Schedule -1 for each 10/20 MW SPP during detailed engineering.
2. The Actual Monthly Net Energy Export Value Readings recorded at the Metering Stations at SECL Sub Stations and the actual GHI values (at One Minute interval) measured at each site location shall be the Primary Data. These readings shall be noted on daily basis for entire O&M PG test period.
3. The actual GHI values shall be measured and recorded at respective site as described below.
  - a) The Higher reading Pyranometer (Compared with Monthly GHI values) will be designated as Main Meter for the Month and the collected values from the main Pyranometer will be considered for normal calculations. Valid calibration Certificates of all the Pyranometers with calibration traceability to World Radiation Reference (WRR) or World Radiation Centre (WRC) by the OEM / Government Accredited Lab shall be submitted by the Contractor for approval by CLUVPL prior to start of each Quarter.
  - b) Deviation of daily readings between the 3 Pyranometers in the same location shall be within the limit of 2% with reference to the Higher reading Pyranometer and if it exceeds 2%, then immediate action for rectification of the cause of this deviation (Cleaning, checking of electrical circuits, Data logger, battery, installing another spare accurate calibrated meter Etc.), so as to bring down the difference in readings within 2%, within one day.
  - c) The Highest value of GHI among the actual readings of 3 Pyranometers recorded during each Quarter of O&M Period will be designated as O&M GHI values and it's respective monthly GHI will be considered for calculations in Technical Schedule - 4.

**25.6.2 O&M Performance Calculations:**

- 1) Technical Schedule - 4 is the Format for the Data collection during O&M and Calculation of compensation for the underperformance, if any, from the Corrected Annual Net Energy Export Target (NEET O&M) as applicable and shall be submitted for each 20/10 MW SPP.
- 2) The performance of the capacity of the individual plants shall be monitored monthly by the short fall, if any, in the NEET O&M using the Technical Schedule - 4.



3) Following factors shall be considered for computing the Corrected NEET O&M and shortfall (if any).

a) Effect of any meteorological parameters shall not be considered except for solar radiation measured in terms of GHI.

b) **Grid outage or un availability of power evacuation system:** Generation loss due to Grid outage or un availability of power evacuation system for the reason not attributable to the Contractor, the measured GHI of the period of the outage of the power evacuation system shall be excluded to calculate the Monthly Actual Average GHI value.

A separate Register shall be maintained during contract Period to record such events with relevant details like Timing, Cause and the Measured Average GHI values etc. by the Contractor and submitted to the CLUVPL Site In-charge immediately after the resumption of Grid for approval. Based on the data of such register, Technical Schedule 3A shall be prepared to arrive at the 'Actual Average GHI values Considering Grid Outage' and got approved by CLUVPL after the resumption of Grid.

c) **Back down /surrender Constrains:** Back down / Surrender of Power might be ordered by the authorities on account of events like consideration of grid security or safety of any equipment or personnel or any other conditions warranting Back down / Surrender of Power. If the reason for the Back down / surrender is not attributable to the Contractor, the Deemed Net Energy Export for such duration of Back down / Surrender shall be calculated as described in Technical Schedule 3B and got approved by CLUVPL on such Back down days.

A separate Register shall be maintained during the contract Period to record such events with relevant details like Back down / Surrender Order references, Timing, the Quantum of Surrendered Power in MW, Measured Average GHI values for the period etc. by the Contractor and submitted to the CLUVPL Site In-charge immediately after the withdrawal of Back down / Surrender for approval. Based on the data of such register, Technical Schedule 3B shall be prepared to arrive at the 'Deemed Generation due to Back-Down for the month'. The Entries shall be got approved by CLUVPL each time after Normalization.

4) In case of outage of any one of the following equipment of respective SPP for more than the stipulated days as indicated below continuously in any Quarter, then the quarterly payment of O&M Contract value for the respective Quarter will be reduced for the quantum of such outage duration.

1. SCADA System - 2 Days
2. Pyranometer / Data Logger - 2 Days

#### 25.6.3 Evaluation of Performance of O&M Services and Levy of Compensation for Shortfall in Energy:



- 1) If short fall in Net Energy Export is observed in the Monthly O&M PG Evaluation Calculations, the contractor shall analyze the reasons for such shortfalls and submit a report with the proposed necessary corrective actions for strict implementation to improve the generation in the subsequent months and implement the corrective actions without any cost.
- 2) At the end of O&M PG Evaluation Period, if the Actual Total Net Energy Export recorded by the Joint Meter Readings at respective metering points is greater than or equal to the Corrected NEET values in the O&M PG Evaluation Calculations, then the respective 20/10 MW SPP shall be considered to be performing as per the design and the O&M shall be considered successful.
- 3) At the end of the O&M PG Evaluation Period of the respective 20/10 MW SPP, if there is a shortfall in the Corrected NEET values in the O&M PG Evaluation Calculations, performance for the Evaluation Period shall be considered as "O&M Failure" and the Contractor shall compensate the loss incurred due to short fall in corrected NEET to SECL as per the Technical Schedule - 4.

#### **25.6.1 OTHERS**

Any Electrical /Civil maintenance work which are not mentioned or included here but necessary for the longevity of the plant shall be carried out by the CONTRACTOR.





## SECTION 26.0

### SUB VENDORS & SUB CONTRACTORS

#### 26.1 SUB VENDORS

26.1.1 The Contractor is responsible for performance/guarantee of the complete project including bought out items and outsourced processes. The equipment / Sub Systems are classified in to two groups as below and listed in Clause 26.1.7

- 1) Class - I items - Main & Critical Equipment / Components / sub Systems
- 2) Class-II items - Essential Equipment / Components / sub Systems

The Contractor shall supply the class I items from the approved Manufacturers only.

26.1.2 The Contractor shall furnish in their bid, the proposed list of sub vendor(s) for each of the bought out items of both class - I and II.

26.1.3 The proposed list of Sub Vendors furnished by the Contractor will be reviewed by CLUVPL and categorized as below:

**a) Category – I: Sub Vendors accepted:**

The Category – I Sub Vendors enumerated shall be based on past experience of SECL/NLCIL/CIL in their projects including PV Solar Power Project Projects.

**b) Category – II: Sub Vendors enlisted for future acceptance:**

The Category – II Sub Vendors enumerated shall be based on the various details regarding capacity, capability, experience etc. of the sub-vendor proposed by the Contractor. It is the responsibility of Contractor to get the details and credentials of the Sub Vendors under category II, compiled and submitted to CLUVPL for scrutiny and acceptance.

The acceptance criteria are mentioned below.

However, CLUVPL reserves the right to accept or reject any of the proposed Sub Vendors based on information available with them.

**c) Category - III: New Sub Vendors:**

Proposing New Sub Vendors by the Contractor after finalization of contract is discouraged and shall be rejected by CLUVPL without assigning any reason. However, CLUVPL reserves the right to accept such Sub Vendors with Conditions, based on the merits & in the overall interest of the project, after establishing that the sub vendor proposed meets the acceptance criteria for Category - II sub vendors. However, price advantage if any, arising out of the inclusion of new sub vendor shall be passed on to CLUVPL. It is the responsibility of the Contractor to establish the quantum of such Price Advantage with valid authenticated documents.

The consolidated list of accepted Sub Vendors & Sub Vendors enlisted for future

acceptance under category I and category II will be made available to the Contractor in the contract agreement.

26.1.4 For all other components/equipment/systems which are not figuring in the bought out items list, Contractor's standard practice of selecting of vendors may be carried out.

26.1.5 **Acceptance criteria for Category - II Sub Vendors:**

26.1.5.1 **For all Mechanical, Electrical and Control & Instrumentation:**

**1) For Class I Items:** Contractor to furnish documentary evidence to show that similar or higher capacity component/equipment /system has been supplied by the vendor or their associate/collaborator and the same has been operating satisfactorily for minimum six months as on the original scheduled date of Tender opening. The documentary evidence shall be in the form of Performance certificates furnished by the end user.

**2) For Class II Items:** Contractor to furnish documentary evidence to show that similar or higher capacity component/equipment /system has been supplied by the vendor or their associate/collaborator. The documentary evidence shall be in the form of Material Receipt Certificate/Site Inspection Report/Installation or erection report etc. from the end user, site/purchaser premises for having received the material.

26.1.5.2 **For structural steel:**

- 1) It should conform to relevant Indian / International Standards.
- 2) It should be of reputed make of supplier to similar construction / infrastructure projects.
- 3) The Contractor should furnish documentary evidence to prove (1) and (2) above.

26.1.5.3 **For Cement and reinforcement steel:**

- 1) It should conform to Indian / International Standard
- 2) It should be of reputed makes supplied to similar construction/ infrastructure projects
- 3) The Contractor should furnish documentary evidence to prove (1) and (2) above

**26.1.6 List of Bought out Items for which Contractor to propose Sub Vendors:**

**A. Class I items:**

Sl.	Equipment list for Class I items	Sub Vendor Name(s)
1	Solar PV modules	
2	Central Inverter	
3	String Combiner & Monitoring Unit	
4	Inverter Duty Transformer, HT Power Trafo	

5	HT Auxiliary Transformer	
6	LT Auxiliary Transformer	
7	HT Indoor switchgear	
8	HT Outdoor Switchgear	
9	Instrument Transformers	
10	HT cables	
11	HT OH Line Tower structures	
12	HT OH Line Conductors	
13	HT OH Line Insulators	
14	DC Cables	
15	LT power cables/Control Cables	
16	Battery Charger	
17	UPS	
18	Batteries	
19	SCADA	
20	Numerical Relays	
21	Transformer Fire protection system / NIFPS	
22	Fire detection alarm panel	
23	ABT Energy Meter	

**B. Class II items:**

Sl.	Equipment list for Class II items	Sub Vendor names
1	Cable termination kits	
2	LED Lamp fixtures for indoor	
3	LED Flood light fittings for outdoor	

**26.2 SUB CONTRACTORS / AGENCIES**

**Acceptance Criteria:**

In case the Contractor is engaging Sub Contractors / Agencies for the PV Solar Project Works in the fields of Civil, Electrical, Control & Instrumentation, Mechanical etc. for the following works, approval shall be obtained from CLUVPL before engaging them as sub- Contractor / Agencies for the works.

- 1) Solar Project Design Consultancy works
- 2) Erection works
- 3) Third party Inspection works
- 4) Third Party Commissioning works
- 5) O&M works
- 6) Security Services



Approval shall be given by CLUVPL, based on the request by the Contractor for the approval along with the following documentary evidence.

- 1) Contract award copy to show that similar works were carried out by the Sub Contractor / Agency as on the original scheduled date of Tender opening.
- 2) Performance certificate (End user's certificate) to show that the job referred above has been completed satisfactorily.



**SECTION 27.0  
ATTACHMENTS**

27.1 The following details referred at the respective Sections are attached in this section.

Sr. No.	Section No.	Title	Description
1	24	Technical Schedule – 1	Month wise Annual Net Energy Export Target (NEET) Values for each site (to be finalised during detailed engineering)
2	24	Technical Schedule – 2	Calculation of PG Test Results & Evaluation Methodology
3	24,25	Technical Schedule – 3	Calculation of Average Generation per Hour on Grid outage/Back Downs/Power Surrender Month
4	25	Technical Schedule – 4	Calculation of O&M Performance Test Results & Methodology for Compensation for Energy Short fall
5	1	Location Details	Bishrampur&Bhatgaon Plot details with Co-Ordinates.
6	21	Civil Drawings	Preliminary Drawings for Tender Purpose

## Technical Schedule – 1

(To be finalized during Detailed Engineering for each site separately)

### MONTH WISE ANNUAL NET ENERGY EXPORT TARGET (NEET) VALUES

SPP Units Locations: Bishrampur(Shivnandanpur, Gorakhnathpur) &Bhatgaon-I&II

Total SPP Units Capacity: 40 MW (AC)

Sl. No.	Month	Estimated GHI as per Meteoronorm (kWh/m <sup>2</sup> )	Net Energy Export Target Values (MU)									
			1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year	4 <sup>th</sup> Year	5 <sup>th</sup> Year	6 <sup>th</sup> Year	7 <sup>th</sup> Year	8 <sup>th</sup> Year	9 <sup>th</sup> Year	10 <sup>th</sup> Year
1	Jan											
2	Feb											
3	Mar											
4	Apr											
5	May											
6	Jun											
7	Jul											
8	Aug											
9	Sep											
10	Oct											
11	Nov											
12	Dec											
<b>Annual Values for each site</b>												

Year	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year	4 <sup>th</sup> Year	5 <sup>th</sup> Year	6 <sup>th</sup> Year	7 <sup>th</sup> Year	8 <sup>th</sup> Year	9 <sup>th</sup> Year	10 <sup>th</sup> Year
<b>Cumulative Annual NEET Values for 40 MW</b>	<b>65.00</b>	<b>64.01</b>	<b>63.57</b>	<b>63.12</b>	<b>62.68</b>	<b>62.24</b>	<b>61.80</b>	<b>61.37</b>	<b>60.94</b>	<b>60.52</b>

Signature and Seal of the Contractor.

**Note:**1). The Annual Net Energy Export Target (NEET) Values for 40 MW specified above shall be the cumulative values of all the 20/10 MW SPPs and added values for 12 months from Jan to Dec and substantiated by respective SPP's PVsyst Simulation Reports. The results in the PVsyst simulation reports shall be equal to or more than the NEET values as furnished above and the furnished values shall be considered for calculating the corrected NEET values.

2). The Annual Net Energy Export Target value for 40 MW SPP shall be the cumulative values of Joint Meter Readings (JMR) measured at the metering points of respective SECL SS.

3) The Contractor shall submit the Technical Schedule -1 for each 20/10 MW (AC) SPP separately along with Annual NEET Values for total 40 MW (AC) SPP in the table above during detailed engineering for approval by CLUVPL.



**Technical Schedule – 2**  
**Calculation of PG Test Results & Evaluation Methodology**

**PG Test Number:**

**SPP Unit Location:**

**Date of Commencement of the PG Test Period:**

**Date of Completion of the PG Test Period:**

S. No.	Description	Unit	Methodology	Month 1	Month 2	Month 3	Month 4	Σ Value (Added Values of Month 1, 2, 3 and 4)
A	Month	(Jan to Dec)						--
B	Total Number Days in the Month	Nos.						--
C	Number of PG Test Days	Nos.						90
D	Estimated Average GHI Values of the month	(kWh/m <sup>2</sup> )	Taken from Technical Schedule 1					
E	Estimated Average GHI Values of the month corrected to the number of PG Test days	(kWh/m <sup>2</sup> )	D x (C/B)					
F	Estimated Net Energy Export Target (NEET) of the Month	(kWh)	Taken from Technical Schedule 1					
G	Estimated Net Energy Export Target (NEET) of the month corrected to the number of PG Test days	(kWh)	F x (C/B)					ΣG
H	Actual Average GHI Values calculated considering Grid Outage	(kWh/m <sup>2</sup> )	Value of (S) taken from Tech Schedule 3A					
I	Actual Total Net Energy Export derived from adding the (JMR) measurements at respective SECL SS	(kWh)						ΣI
J	Corrected Estimated Net Energy Export Target (NEET) Step I - considering Actual GHI	(kWh)	(G) x (H)/(E)					
K	Corrected Estimated Net Energy Export Target (NEET) Step II - Considering Deemed Export due to back-down	(kWh)	J – (T), Value of (T) taken from Tech. Schedule 3B					ΣK
L	Short Fall in Corrected Estimated Net Energy, if	(kWh)	(K – I)					ΣL



	any, during PG Test Period		(Corrected Estimate - Actual)				
<b>Calculation of Yearly Short fall in corrected NEET</b>							
M	Annual Net Energy Export Target (NEET)	(kWh)	Taken from Technical Schedule 1				
N	Yearly Short Fall in Corrected NEET	(kWh)	$M \times (\Sigma L / \Sigma G)$				
O	*PG LD Multiplying Factor						
P	Applicable LD	(INR)	$N \times O$				

**Note:** 1. The data shall be filled in appropriately by the contractor from the Joint Meter Readings (JMR) taken as the PG Test progresses. These Records are to be maintained throughout the PG Test Period by the Contractor and submitted to CLUVPL for approval on completion of PG Test period.

2. If the Actual Net Energy Export recorded during the (JMR) measurements at respective SECL SS metering point ( $\Sigma I$ ) is greater than or equal to the corrected NEET values ( $\Sigma K$ ) for the PG Period in the above PG Test Calculations, then the respective 20/10 MW SPP shall be considered to be performing as per the design and the PG Test shall be considered successful.

3. If Actual measured Net Energy Export ( $\Sigma I$ ) is less than the Corrected NEET ( $\Sigma K$ ) in the above Calculations, then the PG Test for respective 20/10 MW SPP shall be considered a failure and liquidated damages on account of short fall in Energy during PG test period shall be levied ( $P = N \times O$ ).

\*PG LD Multiplying Factor shall be .....

Signature of the Contractor

Approval by CLUVPL



**Technical Schedule – 3A**

**Calculation of Actual Average GHI Values considering Grid Outage**

**Billing Cycle Month:**

	For All days				For Grid Outage Days					
Sl. No	Grid Outage	Estimated Daily average GHI value	Estimated Net Energy Export	Measured Average GHI Values	Grid Outage Start Time	Grid Outage End Time	Duration of Grid Outage	Total Actual GHI During Grid Outage	Actual Average GHI Values calculated considering Grid Outage= E-I	Approval by CLUVPL
		(kWh/m <sup>2</sup> )	(kWh)	(kWh/m <sup>2</sup> / Day)	(hh:mm)	(hh:mm)	(Hours)	(kWh/m <sup>2</sup> )	(kWh/m <sup>2</sup> )	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)=(g)-(f)	(i)	(S)	
1	YES/NO									
....										
31										
<b>Monthly Value</b>				<b>Sum = E</b>				<b>Sum=I</b>		

**Actual Average GHI Values calculated considering Grid Outage(kWh/m<sup>2</sup>), S = (E-I)**



**Technical Schedule – 3B**

**Calculation of Average Generation per Hour on Back Downs/ Power Surrender Month**

**Billing Cycle Month:**

Sl. No.	Date	Generation Start time	Generation End time	Hours of Generation	Back-down Reason & Request Ref	Back-down Start time	Back-down End time	Back-Down Hours	Percentage of Back down	Effective Back Down Hours	Approval by CLUVPL
		(hh:mm)	(hh:mm)	(hh:mm)		(hh:mm)	(hh:mm)	(hh:mm)	(%)	K= (j/100) X i	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
1											
.....											
XX											
				SUM (e) = A						SUM (k) = B	

**Note:**

- Total Hours of Generation in the Month (Hrs) : A = \_\_\_\_\_
- Total Effective Back-Down Hours in the Month (Hrs) : B = \_\_\_\_\_
- Total Effective Hours of Generation in the Month (Hrs) : C = (A - B): \_\_\_\_\_
- Net Energy Export for the Month (Taken from Row (l) of Tech Schedule - 2/4) (kWh) : D = \_\_\_\_\_
- Average Export per hour during the Month (kWh) : E = D / C: \_\_\_\_\_
- Deemed Export due to back-down for the Month (kWh) : T = B x E: \_\_\_\_\_



**Technical Schedule – 4**

**Calculation of O&M Performance Test Results & Methodology for Compensation for Energy Short fall**

**O&M Year (Y) #:**

**To be Submitted for each SPP Unit Location:**

**Date of Commencement of the O&M Period:**

**Date of Completion of the O&M Period:**

S. No.	Description	Unit	Methodology	Month 1	....	.....	Month 12	Σ Value (Added values of Month1 to Month12)
A	Month							
B	Total Number Days in the Month	Nos.						
C	Number of O&M PERFORMANCE Test Days	Nos.						
D	Estimated Average GHI Values of the month	(kWh/m <sup>2</sup> )	Taken from Technical Schedule 1					
E	Estimated Average GHI Values of the month corrected to the number of O&M PERFORMANCE Test days	(kWh/m <sup>2</sup> )	D x (C/B)					
F	Estimated Net Energy Export Target (NEET) of the Month	(kWh)	Taken from Technical Schedule 1					
G	Estimated Net Energy Export Target (NEET) of the month corrected to the number of O&M PERFORMANCE Test days	(kWh)	F x (C/B)					
H	Actual Average GHI Values calculated considering Grid Outage	(kWh/m <sup>2</sup> )	Value of (S) taken from Tech Schedule 3A					
H1	Estimated Net Energy Export Target (NEET) of the Month for the O&M year (Y)	(kWh)	(H / E) x F x PGF <sup>#</sup>					
I	Actual Total Net Energy Export derived from adding the measurements at SECL SS	(kWh)						
J	Corrected Estimated Net Energy Export Target (NEET) Step I - considering Actual GHI	(kWh)	(G) x (H1)/(E)					
K	Corrected Estimated Net Energy Export Target (NEET) Step II - Considering Deemed Export due to back-down	(kWh)	J – (T), Value of (T) taken from Tech. Schedule 3B					

L	Short Fall in Corrected Estimated Net Energy, if any, during O&M PERFORMANCE Test Period	(kWh)	(K – I) (Corrected Estimate - Actual)					$\Sigma L$
<p><b>Note:</b>  # PGF=Performance Guarantee Factor = Actual Net Energy Export during PG test / Corrected NEET during PG Test. = (<math>\Sigma I / \Sigma K</math>) of Technical Schedule 2 and the value of PGF will be limited to the value of 1 even if it is more than 1.  Compensation per unit (kWh) for shortfall in Corrected Net Energy Export Target during O&amp;M period is on yearly basis.  In case <math>K &lt; \text{or} = I</math> then no liquidated damages for the corresponding O&amp;M period.  In case <math>K &gt; I</math> then liquidated damages for the corresponding O&amp;M period shall be calculated and levied as below.</p>								
M	Yearly Short Fall in Energy	(kWh)	$\Sigma L$					
N	Applicable Tariff	(INR/kWh)						
O	Yearly loss of Revenue and applicable Compensation	(INR)	M x N					

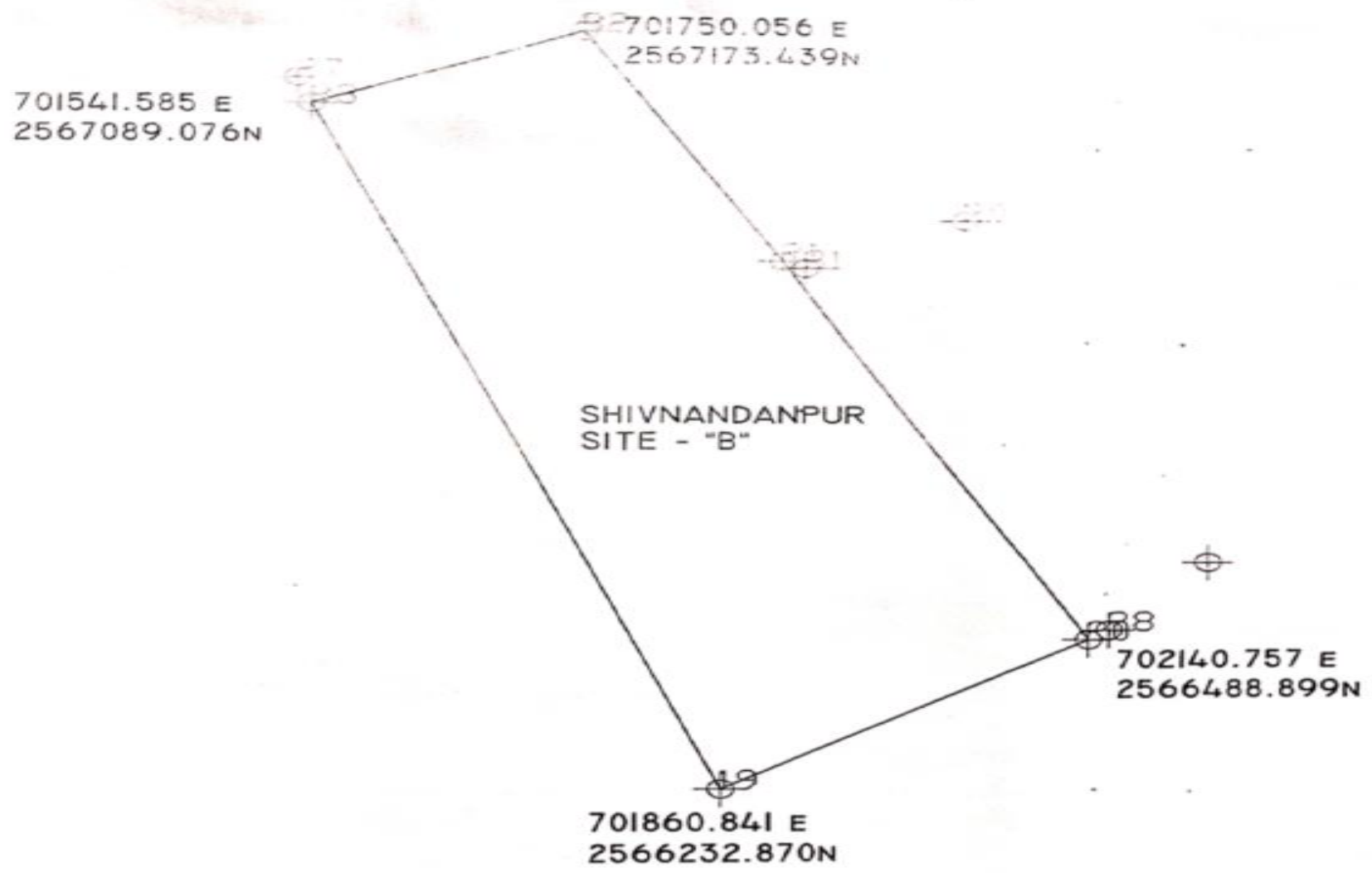
- Note: 1. The Year wise Net Energy Export Target (NEET) for O&M period of 10 years is as specified in Technical Schedule - 1 of the Respective 20/10 MW SPP.  
2. The data shall be filled in appropriately by the contractor from the joint meter readings taken as the O&M progresses. These Records are to be maintained throughout the O&M Period by the Contractor and submitted to CLUVPL for approval on completion of each O&M Year till the completion of 10 years of O&M Period.  
3. If the Actual Total Net Energy Export measured at metering point ( $\Sigma I$ ) is greater than or equal to the corrected NEET value ( $\Sigma K$ ) in the above O&M Performance Test Calculations, then the respective 20/10 MW SPP shall be considered to be performing as per the design and the O&M Performance Test shall be considered successful.  
4. Short fall in corrected NEET ( $\Sigma L$  is positive), if any during O&M Performance period, the contractor shall pay the compensation for such shortfall at the applicable tariff (**N**), Rs.6.80/- and as calculated in row (**O**) above.

Signature of the Contractor

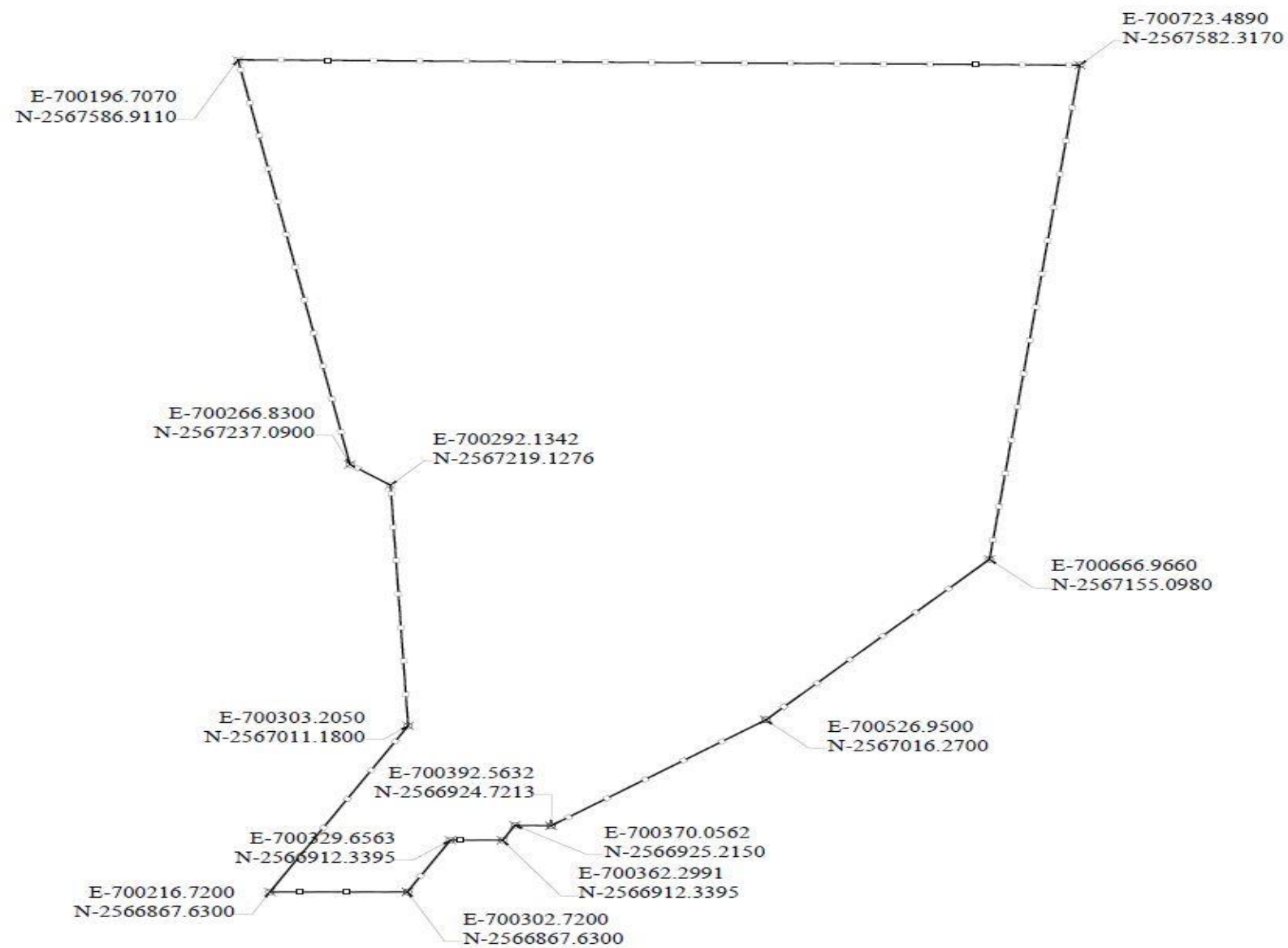
Approval by CLUVPL



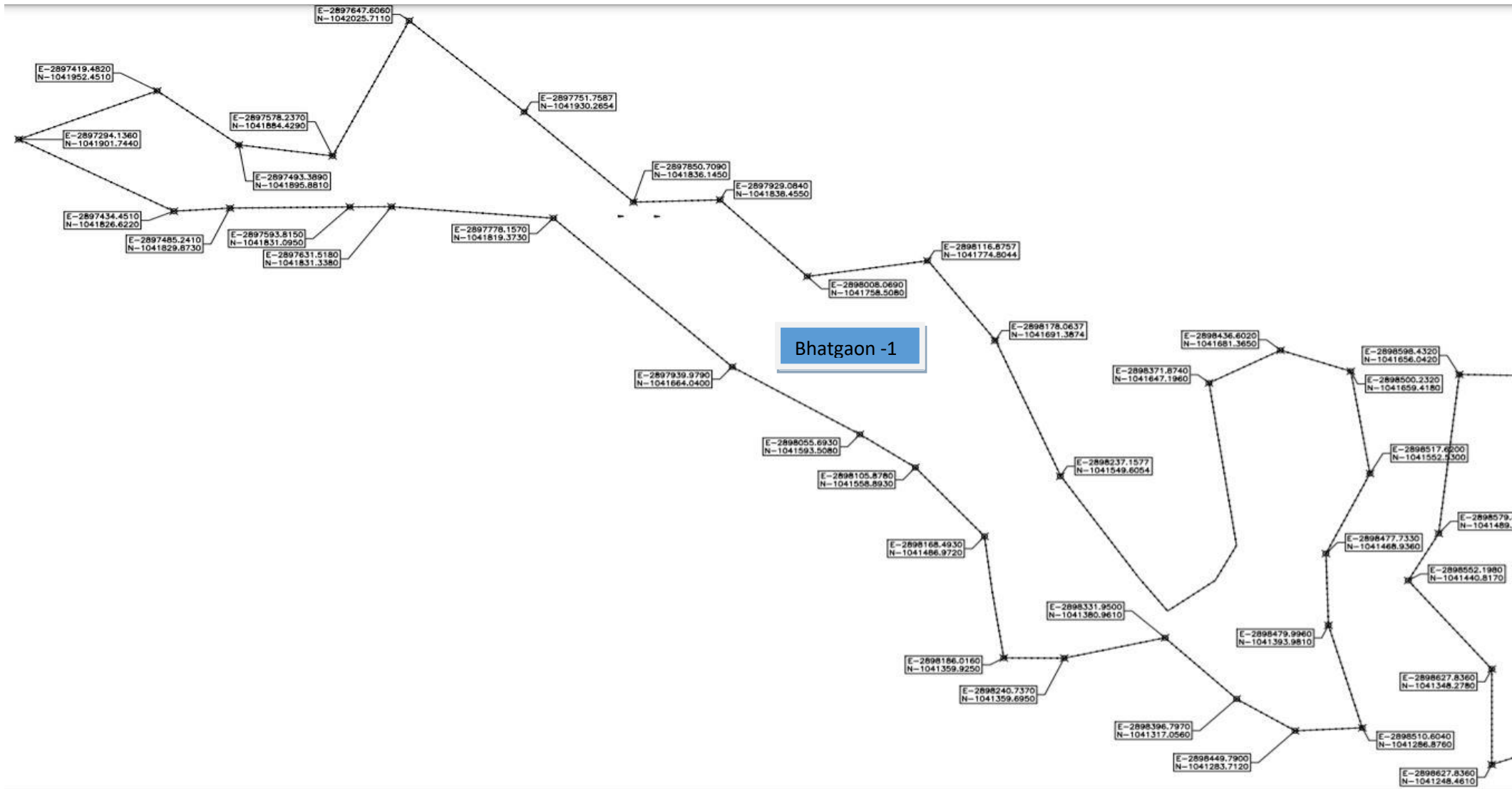
**BISHRAMPUR -1 (SHIVNANDANPUR SITE)**



**BISHRAMPUR -2 (GORAKNATHPUR SITE)**



# BHATGAON -1 SITE

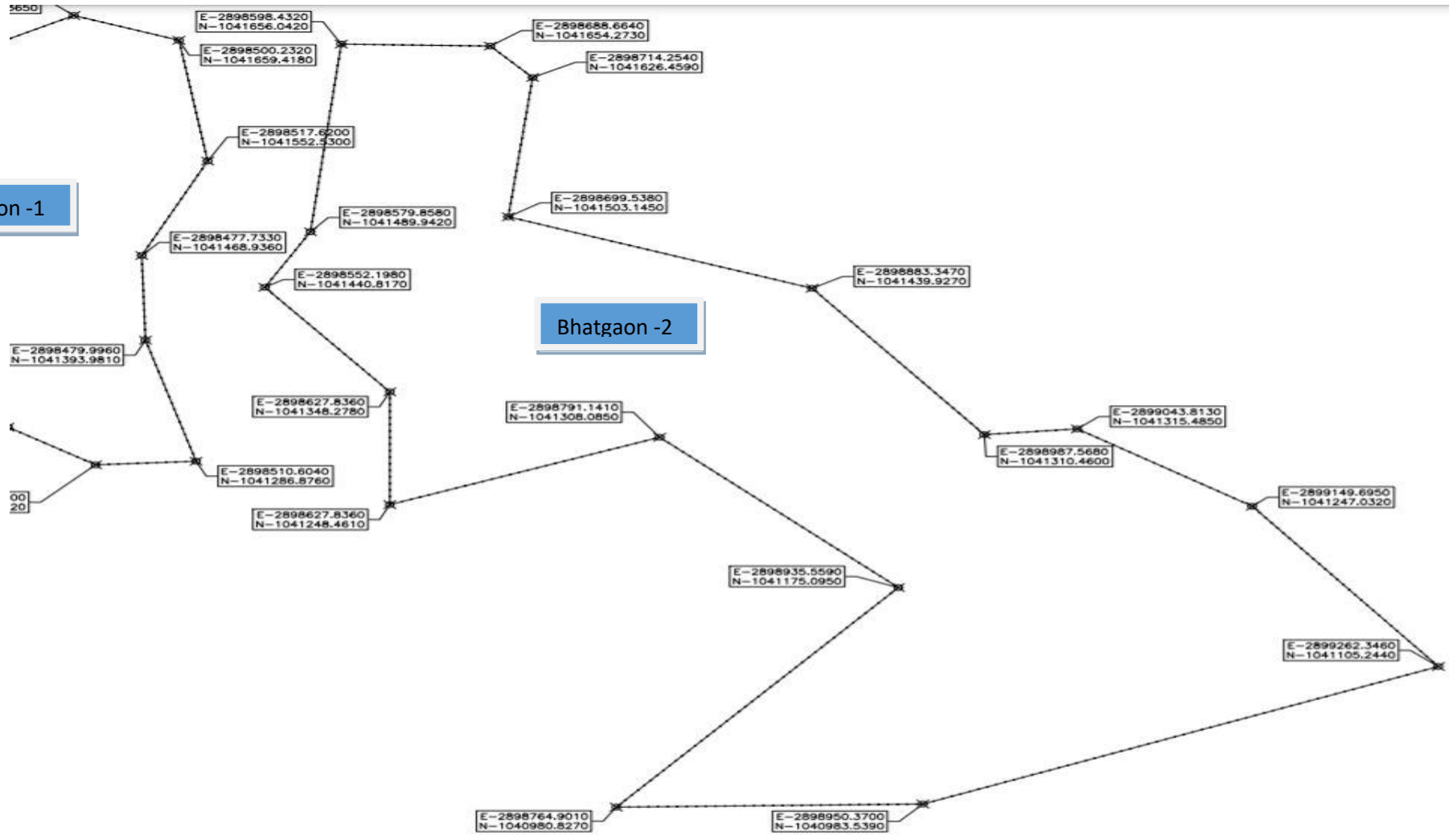


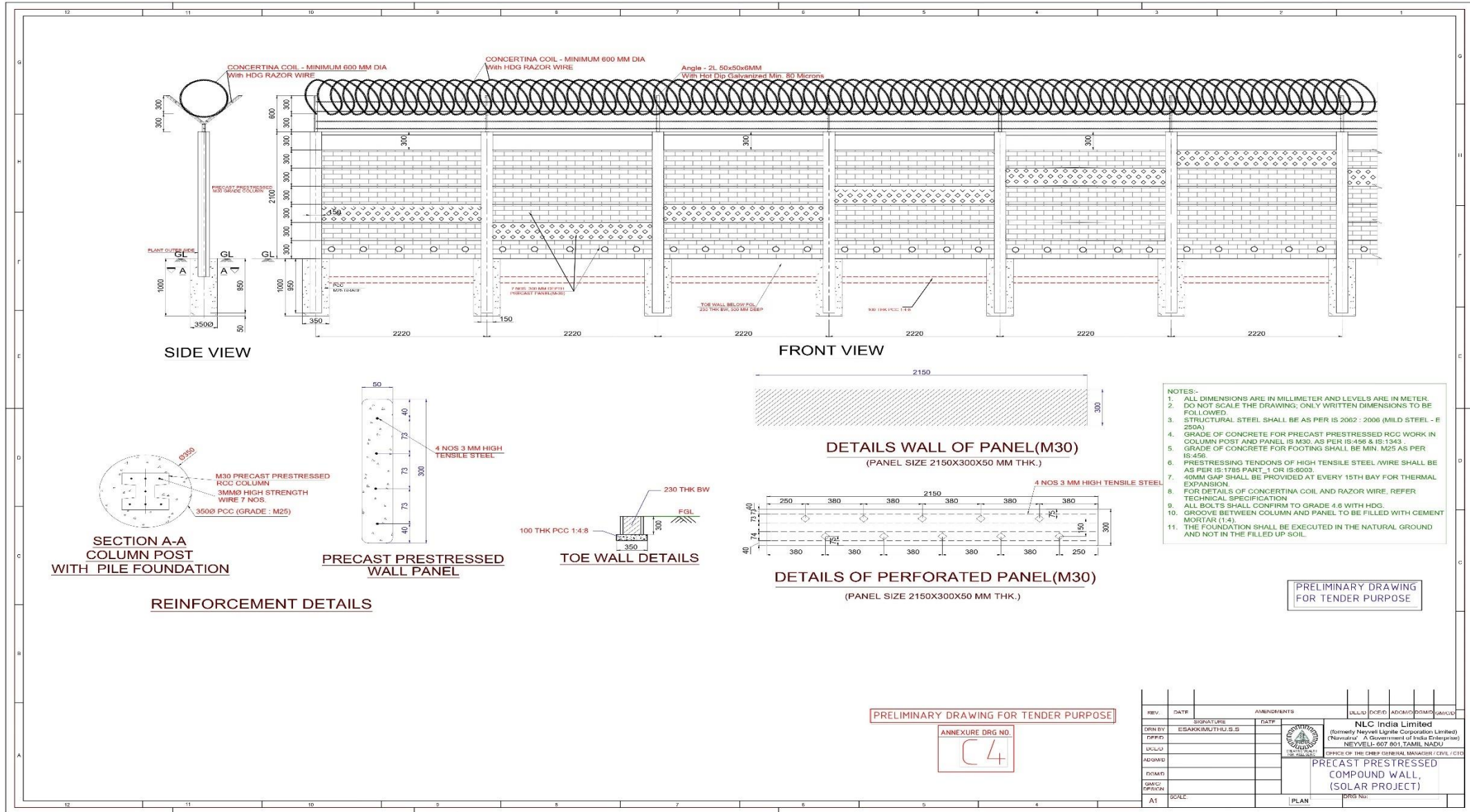


# BHATGAON -2 SITE

Bhatgaon -1

Bhatgaon -2



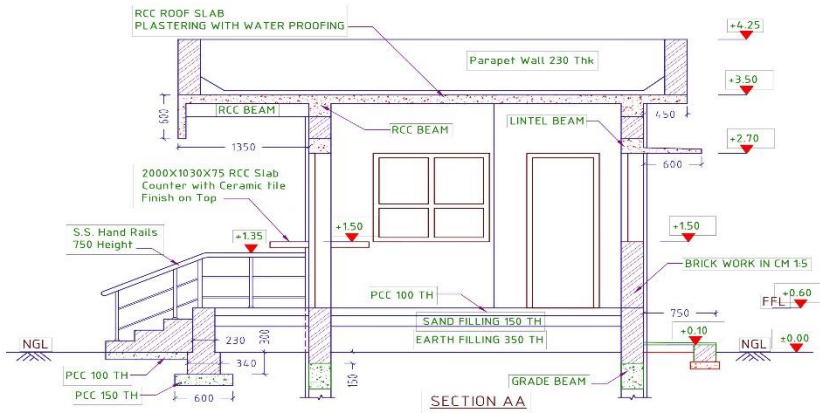




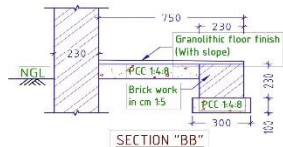




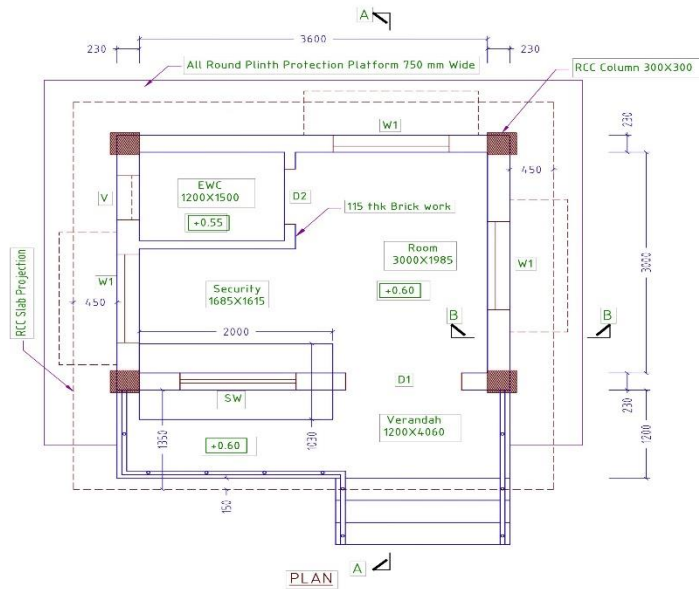
ELEVATION



SECTION AA



SECTION "BB"



PLAN

SCHEDULE OF FINISHES				
SL No.	Area	Flooring & Skirting (150 mm Height)	Wall (Internal)	Wall (External)
1.	Security Room	Vitrified Ceramic tiles	2 Coats of Emulsion Over a coat of Primer	2 Coats of Emulsion Over a coat of Primer
	Verandah	Antiskid ceramic tiles		
2.	Toilet	Anti Skid Ceramic Tiles conforming to IS 13630 & IS 15622	Ceramic Tile Dadoing up to 2.1 m Height conforming to IS 13630 & IS 15622	2 Coats of Weather Proof Exterior Paint Over a Coat of Primer

- NOTES**
- ALL DIMENSIONS ARE IN MM AND LEVELS ARE IN METRES UNLESS OTHERWISE SPECIFIED.
  - EL ±0.00 CORRESPONDS TO FGL
  - ALL WALLS SHALL BE 230 THICK BRICK WITH CM15
  - DOORS AND WINDOWS AND VENTILATORS SHALL BE PROVIDED WITH ELECTRO COLOUR DYED (15MICRON METER THICKNESS) FOR ALUMINIUM FRAMEWORK.
  - ALL INSIDE & EXTERNAL PLASTER SHALL BE 15MM THICK WITH CEMENT SAND MORTAR 1:5 (1 CEMENT - 5 FINE SAND).
  - GRADE OF RCC SHALL BE M25 AND GRADE OF P.C.C SHALL BE M7.5 (U.N.O)
  - THE CUT LINTEL BEAM WITH SUNSHADE SHALL BE PROVIDED FOR DOORS & WINDOWS
  - THE MINIMUM COMPRESSIVE STRENGTH OF BRICK SHALL BE 5.0N/SQ.MM AS PER IS:1077 & BRICK WORK SHALL CONFORM TO IS 2212
  - PLINTH PROTECTION TO A WIDTH OF 0.75M WITH 75MM THICK OF CEMENT CONCRETE 1:2:4 OVER 75MM BED OF DRY BRICK BALLAST 40MM NOMINAL SIZE WELL RAMMED AND CONSOLIDATED AND GROUTED WITH FINE SAND INCLUDING FINISHING THE TOP WITH SUITABLE SLOPE.
  - EXPOSED SURFACE OF THE BRICK WALL FOR STEPS SHALL BE PLASTERED WITH 15mm THK. CM 1:4
  - BASEMENT FILLING SHALL BE PLACED IN SUCCESSIVE HORIZONTAL LAYERS NOT EXCEEDING 300mm COMPACTION THICKNESS.
  - EXISTING GROUND LEVEL / FILLED UP LEVEL SHALL BE COMPACTED TO HAVE 90% PROTORS MDD BEFORE COMMENCEMENT OF BASE OF BRICK WALL.
  - RCC COUNTER SHALL BE 75mm THK WITH Y8 BARS SPACED AT 150 C/C IN BOTHWAYS IN SINGLE LAYERS.
  - ACTUAL OPENING SIZES SHALL BE CHECKED AT SIZE BEFORE FABRICATION OF DOORS, WINDOWS, ROLLING SHUTTERS, LOUVERS Etc.
  - MINIMUM THICKNESS OF ALUMINIUM SECTION SHALL BE (15MICRON METER) THICKNESS CONFORMING TO IS 5733 & IS 1285
  - GLAZING SHALL BE OF 6mm THICK CLEAR FLOAT GLASS FOR ALL OPENINGS
  - DPC OF 50mm THICK SHALL BE PROVIDED WITH M15 GRADE AND SHALL CONFIRMS TO IS 1609-1991 & IS IS 3067-1988
  - CEILING PLASTERING SHALL BE 12mm THICK IN CM13
  - DOORS & WINDOWS AND VENTILATORS SHALL BE PROVIDED WITH ELECTRO COLOUR DYED (15MICRON METER THICKNESS) FOR ALUMINIUM FRAMEWORK.
  - ANTI TERMITE TREATMENT SHALL BE DONE AS PER MANUFACTURES&VENDORS SPECIFICATION.

**JOINERY SCHEDULE:-**

1. D1 - Aluminium Door Frame with Glazed Single Door Shutter.....	1200X2100
2. D2 - FRP Door.....	800X2100
3. W1 - Powder Coated Aluminium Frame with Glazed Window with MS Grill Work.....	1200X1200
4. SW - Powder Coated Aluminium Frame with Glazed Window with MS Grill Work (Sliding Type).....	1200X2100
5. V - Powder Coated Aluminium Frame with Glazed Ventilator with MS Grill Work.....	600X450

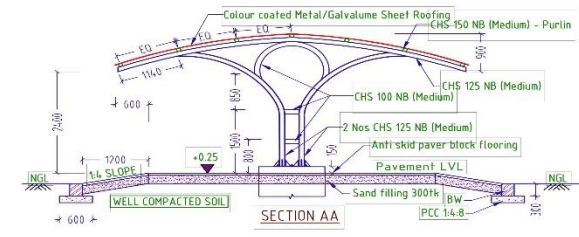
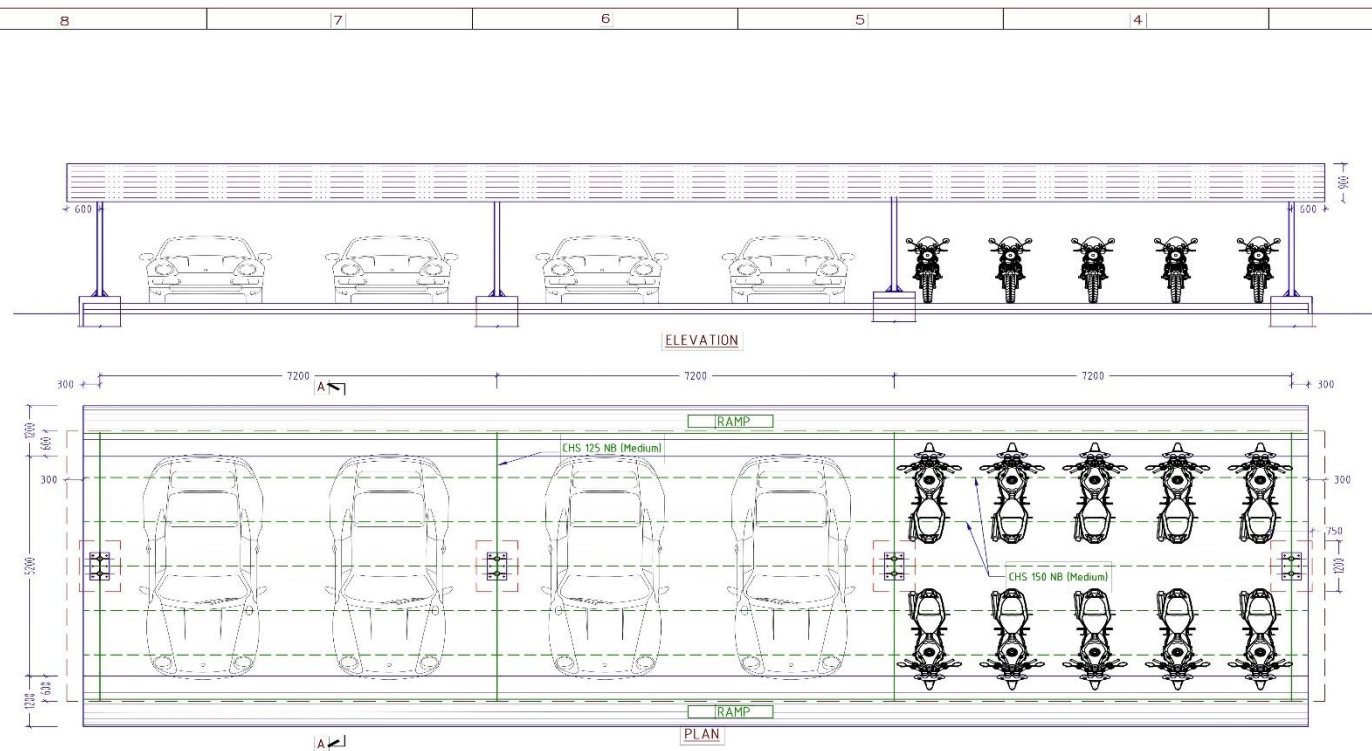
**Specification for Roof Weathering Course**  
 Roof of the Security building shall be Cast-in-situ RCC slab treated with approved chemical waterproofing system to prevent water leakage and seepage issues. Roof shall be finished at a slope of 1:100 towards rain water down take pipe. Roof shall be laid with weatherproof ceramic cool roof tiles of reputed brand.

**LEGEND:**  
 NGL - Natural Ground Level  
 FFL - Finished Floor Level

PRELIMINARY DRAWING FOR TENDER PURPOSE

ANNEXURE DRG NO. C6

SIGNATURE		DATE	 <b>NLC India Limited</b> (formerly Neyveli Lignite Corporation Limited) (Navratna' - A Government of India Enterprise) NEYVELI- 607 801, TAMIL NADU OFFICE OF THE CHIEF GENERAL MANAGER / CIVIL / CTO
DRN BY	ESAKKIMUTHU.S.S		
ACMD			
CMD			
ADGM/D			
DGMD			
CGM/CS DESIGN			
SCALE		ARCHITECTURAL DETAILS	DRG No.
A2	1:100, 1:40, 1:20		



PRELIMINARY DRAWING FOR TENDER PURPOSE ONLY

ANNEXURE DRG NO. C7

**NOTE:**  
 1. ALL DIMENSIONS ARE IN mm AND LEVELS ARE IN METRE.  
 2. CHS - CIRCULAR HOLLOW SECTION.  
 3. ALL CHS SHALL CONFIRM TO IS-1161 WITH YST-310 N/MM2.  
 4. ALL WELD SHALL BE 4MM FILLET WELD ALL ROUND.  
 5. FOUNDATION DEPTH GIVEN IS TENTATIVE AND SHALL BE DECIDED BASED ON FINAL SOIL INVESTIGATION REPORT  
 6. ALL FACILITIES SHOWN IN THE DRAWING ARE INDICATIVE ONLY AND SHALL BE FINALIZED DURING DETAILED ENGINEERING ON APPROVAL OF NLCIL  
 7. STRUCTURE SHALL BE AESTHETICALLY DESIGNED WITH ARCHITECTURAL FEATURES.  
 8. ANTI-TERMITE TREATMENT SHALL BE PROVIDED.  
 9. PROVIDE WIND TIES OVER ROOF SHEETING.  
 10. FOR STRUCTURAL STEEL MEMBERS TWO COATS OF ANTI-CORROSIVE PAINTING SHALL BE DONE OVER PRIME COAT.

REV.	DATE	AMENDMENTS	DEE/D	DCE/D	ADGM/C	DGM/D	DGM/C
DRN BY	SIGNATURE		DATE				
DEE/D	ESAKKIMUTHU.S.S						
DCE/D							
ADGM/D							
DGM/D							
DGM/C							
A3	SCALE:	1:100, 1:75, 1:20	ARCHITECTURE & STRUCTURAL DETAILS		DRG No:		



**NLC India Limited**  
 (formerly Neyveli Lignite Corporation Limited)  
 ('Navratna' - A Government of India Enterprise)  
 NEYVELI- 607 801, TAMIL NADU

OFFICE OF THE CHIEF GENERAL MANAGER / CIVIL / CTO

PARKING SHED  
 SOLAR PROJECT