



Solar Energy Corporation of India Limited
(A Government of India Enterprise)
CIN: U40106DL2011GOI225263

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Request for Bids

For

**Design, Engineering, Supply, Construction, Erection, Testing &
Commissioning of 160 MW Solar-Wind Hybrid Power Plant with
BESS including 10 Years Plant
O&M under International competitive bidding**

At

Ramagiri, Anantapur district, Andhra Pradesh, India

RfB No. [SECI/C&P/RfB/2018/160MWH/WB/01](#)

Dated: 17/08/2018

PROCUREMENT DOCUMENT

Request for Bids

Plant Design, Supply, and Installation

International Competitive Procurement

(Two-Envelope Bidding Process with e-Procurement)

(Without Prequalification)

Bidding Document Summary

Specific Procurement Notice - Request for Bids (RFB)

The template attached is the Specific Procurement Notice for Request for Bids for a two-envelope e-Procurement Bidding process without prequalification.

Bidding Document: Request for Bids - Plant (Design, Supply and Installation)

(Two-Envelope Bidding Process with e-Procurement without Prequalification)

PART 1 – BIDDING PROCEDURES

Section I - Instructions to Bidders (ITB)

This Section provides relevant information to help Bidders prepare their Bids. It is based on a two-envelope e-Procurement Bidding process when prequalification has not taken place. Information is also provided on the submission, opening, and evaluation of Bids and on the award of Contracts. **Section I contains provisions that are to be used without modification.**

Section II - Bid Data Sheet (BDS)

This Section consists of provisions that are specific to each procurement and that supplement the information or requirements included in Section I, Instructions to Bidders.

Section III - Evaluation and Qualification Criteria

This Section specifies the criteria to determine the Most Advantageous Bid. The Most Advantageous Bid is the Bid of the Bidder that meets the qualification criteria and whose Bid has been determined to be:

- (a) substantially responsive to the bidding document, and
- (b) the lowest evaluated bid value per KWh

Section IV - Bidding Forms

This Section includes the forms to be completed and submitted by the Bidder as part of its Bid.

Section V - Eligible Countries

This Section contains information regarding eligible countries.

Section VI - Fraud and Corruption -

This section includes the Fraud and Corruption provisions which apply to this Bidding process.

PART 2 – EMPLOYER’S REQUIREMENTS

Section VII - Employer’s Requirements

This Section contains the Specification, the Drawings, and supplementary information that describe the Plant and Installation Services to be procured.

PART 3 – CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section VIII - General Conditions of Contract (GCC)

This Section contains the general clauses to be applied in all contracts. **The text of the clauses in this Section shall not be modified.**

Section IX - Particular Conditions of Contract (PCC)

This Section consists of clauses specific to each contract. The contents of this Section modify or supplement the General Conditions and shall be prepared by the Employer.

Section X - Contract Forms

This Section contains the Letter of Acceptance, Contract Agreement and other relevant forms.

Specific Procurement Notice

Request for Bids

Plant

Design, Supply and Installation

E-Procurement Notice
(Two-Envelope e-Procurement Bidding Process without Prequalification)

Employer: Solar Energy Corporation of India Limited (SECI), New Delhi

Project: Innovation in Solar Power and Hybrid Technologies Project

Contract title: Design, Engineering, Supply, Construction, Erection, Testing & Commissioning of 160 MW Solar-Wind Hybrid Power Plant with BESS including 10 Years Plant O&M under International competitive bidding at Ramagiri, Anantapur district, Andhra Pradesh

Country: India

Loan No. /Credit No. / Grant No:

RFB No: SECI/C&P/RfB/2018/160MWH/WB/01

Issued on: 17/08/2018

1. Solar Energy Corporation of India Limited (SECI) has applied for financing from the World Bank toward the cost of the Project of Innovation in Solar Power and Hybrid Technologies and intends to apply part of the proceeds toward payments under the Contract for the Design, Engineering, Supply, Construction, Erection, Testing & Commissioning of 160 MW Solar-Wind Hybrid Power Plant with BESS including 10 Years Plant O&M at Ramagiri, Anantapur district, Andhra Pradesh under International competitive bidding.
2. SECI now invites online Bids from eligible Bidders for Design, Engineering, Supply, Construction, Erection, Testing & Commissioning of 160 MW Solar-Wind Hybrid Power Plant with BESS including 10 Years Plant O&M at Ramagiri, Anantapur district, Andhra Pradesh under International competitive bidding shown in Table below. Bidders are advised to note the clauses on eligibility (Section I Clause 4) and minimum qualification criteria (Section III – Evaluation and Qualification Criteria), to qualify for the award of the contract.

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3. Bidding will be conducted through international competitive procurement using a Request for Bids (RFB) as specified in the World Bank's "Procurement Regulations for IPF Borrowers- Procurement in Investment Projects Financing", July 2016 revised November 2017 ("Procurement Regulations"), and is open to all eligible Bidders as defined in the Procurement Regulations.
 4. The Bidding document in English is available online at TCIL portal <https://www.tcil-india-electronictender.com> from **17/08/2018 to 01/10/2018** free of cost. Bidders will be required to register in the website, which is also free of cost. The bidders would be responsible for ensuring that any addenda available on the website is also downloaded and incorporated.
 5. For submission of the bids, the bidder is required to have Digital Signature Certificate (DSC) from one of the authorized Certifying Authorities, authorized by Government of India for issuing DSC. Bidders can see the list of licensed CA's from the link (www.cca.gov.in). Aspiring bidders who have not obtained the user ID and password for participating in e-procurement in this Project, may obtain the same from the website: <https://www.tcil-india-electronictender.com>. (Bidders are required to refer the TCIL website). A non-refundable fee of **INR 5400/- (Indian Rupees Fifty Four hundred only) or USD 100 (100 US Dollars only)** (Inclusive of GST/Taxes) or equivalent amount in a freely convertible, is required to be paid. The method of payment will be Demand Draft / Banker's Cheque or through online payment gateway (As mentioned in the TCIL website). Payment documents are to be submitted subsequently as per the procedure described in paragraph 8 below.
 6. Bids must be submitted online <https://www.tcil-india-electronictender.com> on or before **01/10/2018 upto 1400 Hours**. Any bid or modifications to bid (including discount) received outside e-procurement system will not be considered. The electronic bidding system would not allow any late submission of bids. The "TECHNICAL PART" of the Bids will be publicly opened online in the presence of the Bidders' designated representatives and anyone who chooses to attend at the address below on **01/10/2018 from 1500 Hours**. The "Financial Part" of the Bids shall remain unopened in the e-procurement system until the second public Bid opening for the financial part.
 7. All Bids must be accompanied by a Bid Security of the **INR 10 Crs (Indian Rupees Ten Crores only) or USD 1.5 M (US Dollars One point Five Million only)** as specified for the contract in the table below in case of a Bid Security. The Bid Security documents are to be submitted subsequently as per the procedure described in paragraph 8 below.
 8. The bidders are required to submit (a) original payment documents towards the cost of registration on e-procurement website (if not previously registered); and (b) **original bid security in approved form**(c) **Written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 21.3/Power of Attorney & copy of Board Resolution for such authorization** (d) **In case of a bid submitted by a JV, JV agreement or Letter of Intent to form the JV in accordance with ITB 4.1'** to Manager (C&P), Solar Energy Corporation of India Limited, D3, Wing A, 1st Floor, Prius Platinum Building, Saket District Centre, Saket, New Delhi 110017 before the opening of

the Technical Part of Bid given above, either by registered post/speed post/ courier or by hand, failing which such bids will be declared non-responsive and will not be opened.

9. A pre-bid meeting will be held on **31/08/2018 at 1100 Hours.** at the office of SECI to clarify the issues and to answer questions on any matter that may be raised at that stage as stated in ITB Clause 7.4 of 'Instructions to Bidders' of the bidding document. Bidders are advised to download the bidding document prior to the pre-bid meeting in order for bidders to have a good understanding of the scope of the requirements under this contract for discussion and clarification at the pre-bid meeting.
10. Other details can be seen in the bidding documents. The Employer shall not be held liable for any delays due to system failure beyond its control. Even though the system will attempt to notify the bidders of any bid updates, the Employer shall not be liable for any information not received by the bidder. It is the bidders' responsibility to verify the website for the latest information related to this bid.
11. Attention is drawn to the Procurement Regulations requiring the Borrower to disclose information on the successful bidder's beneficial ownership, as part of the Contract Award Notice, using the Beneficial Ownership Disclosure Form as included in the bidding document.
12. The address (es) referred to above is (are):

**Solar Energy Corporation of India Limited
D3, Wing A, 1st Floor, Prius Platinum Building,
Saket District Centre, Saket, New Delhi 110017**

Kind Attn.: Mr Sandeep Kumar, Manager (C&P)

Telephone Nos.: - 0091-(0)11-71980290/256

E mail: contracts@seci.co.in

Standard Procurement Document

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PART 1 – Bidding Procedures

Section I - Instructions to Bidders

Section I - Instructions to Bidders

A. General

- 1. Scope of Bid**

 - 1.1 In connection with the Specific Procurement Notice - Request for Bids (RFB), specified in the Bid Data Sheet (BDS), the Employer, as specified **in the BDS**, issues this bidding document for the Design, Supply and Installation of Plant as specified in Section VII, Employer's Requirements. The name, identification and number of lots (contracts) of this RFB are specified **in the BDS**.
 - 1.2 Throughout this bidding document:

 - (a) the term "in writing" means communicated in written form (e.g. by mail, e-mail, fax, including if specified **in the BDS**, distributed or received through the electronic-procurement system used by the Employer) with proof of receipt;
 - (b) if the context so requires, "singular" means "plural" and vice versa; and
 - (c) "Day" means calendar day, unless otherwise specified as "Business Day." A Business Day is any day that is an official working day of the Borrower. It excludes the Borrower's official public holidays.
- 2. Source of Funds**

 - 2.1 The Borrower or Recipient (hereinafter called "Borrower") indicated **in the BDS** has applied for or received financing (hereinafter called "funds") from the World Bank (hereinafter called "the Bank") in an amount specified **in BDS**, toward the project named **in BDS**. The Borrower intends to apply a portion of the funds to eligible payments under the contract(s) for which this bidding document is issued.
 - 2.2 Payment by the Bank will be made only at the request of the Borrower and upon approval by the Bank in accordance with the terms and conditions of the Loan (or other financing) Agreement. The Loan (or other financing) Agreement prohibits a withdrawal from the loan account for the purpose of any payment to persons or entities, or for any import of goods, equipment, plant, or materials, if such payment or import is prohibited by a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations. No party other than the Borrower shall derive any rights from

the Loan (or other financing) Agreement or have any claim to the proceeds of the Loan (or other financing).

3. Fraud and Corruption

- 3.1 The Bank requires compliance with the Bank's Anti-Corruption Guidelines and its prevailing sanctions policies and procedures as set forth in the WBG's Sanctions Framework, as set forth in Section VI.
- 3.2 In further pursuance of this policy, bidders shall permit and shall cause their agents (where declared or not), subcontractors, subconsultants, service providers, suppliers, and their personnel, to permit the Bank to inspect all accounts, records and other documents relating to any initial selection process, prequalification process, bid submission, proposal submission and contract performance (in the case of award), and to have them audited by auditors appointed by the Bank.

4. Eligible Bidders

- 4.1 A Bidder may be a firm that is a private entity, a state-owned enterprise or institution subject to ITB 4.6, or any combination of such entities in the form of a joint venture (JV) under an existing agreement or with the intent to enter into such an agreement supported by a letter of intent. In the case of a joint venture, all members shall be jointly and severally liable for the execution of the entire Contract in accordance with the Contract terms. The JV shall nominate a Representative who shall have the authority to conduct all business for and on behalf of any and all the members of the JV during the Bidding process and, in the event the JV is awarded the Contract, during contract execution. Unless specified **in the BDS**, there is no limit on the number of members in a JV.
- 4.2 A Bidder shall not have a conflict of interest. Any Bidder found to have a conflict of interest shall be disqualified. A Bidder may be considered to have a conflict of interest for the purpose of this Bidding process, if the Bidder:
- (a) directly or indirectly controls, is controlled by or is under common control with another Bidder; or
 - (b) receives or has received any direct or indirect subsidy from another Bidder; or
 - (c) has the same legal representative as another Bidder; or
 - (d) has a relationship with another Bidder, directly or through common third parties, that puts it in a position to influence

the Bid of another Bidder, or influence the decisions of the Employer regarding this Bidding process; or

- (e) or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the Plant and Installation Services that are the subject of the Bid; or
- (f) or any of its affiliates has been hired (or is proposed to be hired) by the Employer or Borrower as Project Manager for the Contract implementation; or
- (g) would be providing goods, works, or non-consulting services resulting from or directly related to consulting services for the preparation or implementation of the project specified in the BDS ITB 2.1 that it provided or were provided by any affiliate that directly or indirectly controls, is controlled by, or is under common control with that firm; or
- (h) has a close business or family relationship with a professional staff of the Borrower (or of the project implementing agency, or of a recipient of a part of the loan) who: (i) are directly or indirectly involved in the preparation of the bidding document or specifications of the Contract, and/or the Bid evaluation process of such Contract; or (ii) would be involved in the implementation or supervision of such contract unless the conflict stemming from such relationship has been resolved in a manner acceptable to the Bank throughout the Bidding process and execution of the Contract.

4.3 A firm that is a Bidder (either individually or as a JV member) shall not participate as a Bidder or as JV member in more than one Bid except for permitted alternative Bids. Such participation shall result in the disqualification of all Bids in which the firm is involved. However, this does not limit the participation of a Bidder as subcontractor in another Bid or of a firm as a subcontractor in more than one Bid.

4.4 A Bidder may have the nationality of any country, subject to the restrictions pursuant to ITB 4.8. A Bidder shall be deemed to have the nationality of a country if the Bidder is constituted, incorporated or registered in and operates in conformity with the provisions of the laws of that country, as evidenced by its articles of incorporation (or equivalent documents of constitution or association) and its registration documents, as the case may be. This criterion also shall apply to the determination of the

nationality of proposed subcontractors or subconsultants for any part of the Contract including related Services.

- 4.5 A Bidder that has been sanctioned by the Bank, pursuant to the Bank's Anti-Corruption Guidelines, in accordance with its prevailing sanctions policies and procedures as set forth in the WBG's Sanctions Framework as described in Section VI paragraph 2.2 d., shall be ineligible to be prequalified for, initially selected for, bid for, propose for, or be awarded a Bank-financed contract or benefit from a Bank-financed contract, financially or otherwise, during such period of time as the Bank shall have determined. The list of debarred firms and individuals is available at the electronic address specified in the BDS.
- 4.6 Bidders that are state-owned enterprises or institutions in the Employer's Country may be eligible to compete and be awarded a Contract(s) only if they can establish, in a manner acceptable to the Bank, that they (i) are legally and financially autonomous (ii) operate under commercial law, and (iii) are not under supervision of the Employer.
- 4.7 A Bidder shall not be under suspension from Bidding by the Employer as the result of the operation of a Bid-Securing Declaration or Proposal-Securing Declaration.
- 4.8 Firms and individuals may be ineligible if so indicated in Section V and (a) as a matter of law or official regulations, the Borrower's country prohibits commercial relations with that country, provided that the Bank is satisfied that such exclusion does not preclude effective competition for the supply of goods or the contracting of works or services required; or (b) by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, the Borrower's country prohibits any import of goods or contracting of works or services from that country, or any payments to any country, person, or entity in that country. Where the procurement is implemented across jurisdictional boundaries (and more than one country is a Borrower, and is involved in the procurement), then exclusion of a firm or individual on the basis of ITB 4.8 (a) above by any country may be applied to that procurement across other countries involved, if the Bank and the Borrowers involved in the procurement agree.
- 4.9 A Bidder shall provide such documentary evidence of eligibility satisfactory to the Employer, as the Employer shall reasonably request.

- 4.10 A firm that is under a sanction of debarment by the Borrower from being awarded a contract is eligible to participate in this procurement, unless the Bank, at the Borrower's request, is satisfied that the debarment; (a) relates to fraud or corruption, and (b) followed a judicial or administrative proceeding that afforded the firm adequate due process.
- 5. Eligible Plant and Installation Services**
- 5.1 The Plant and Installation Services to be supplied under the Contract and financed by the Bank may have their origin in any country in accordance with Section V, Eligible Countries.
- 5.2 For purposes of ITB 5.1 above, "origin" means the place where the plant, or component parts thereof are mined, grown, produced or manufactured, and from which the services are provided. Plant components are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that is substantially in its basic characteristics or in purpose or utility from its components.

B. Contents of Bidding Document

- 6. Sections of Bidding Document**
- 6.1 The bidding document consists of Parts 1, 2, and 3, which include all the sections indicated below, and should be read in conjunction with any Addenda issued in accordance with ITB 8.

PART 1. Bidding Procedures

- Section I - Instructions to Bidders (ITB)
- Section II - Bid Data Sheet (BDS)
- Section III - Evaluation and Qualification Criteria
- Section IV - Bidding Forms
- Section V - Eligible Countries
- Section VI - Fraud and Corruption

PART 2. Employer's Requirements

- Section VII -Employer's Requirements

PART 3. Conditions of Contract and Contract Forms

- Section VIII - General Conditions of Contract (GCC)
- Section IX -Particular Conditions of Contract (PCC)
- Section X -Contract Forms

- 6.2 The Specific Procurement Notice-Request for Bids (RFB) issued by the Employer is not part of the bidding document.
- 6.3 Unless obtained directly from the Employer, the Employer is not responsible for the completeness of the document, responses to requests for clarification, the Minutes of the pre-Bid meeting (if any), or Addenda to the bidding document in accordance with ITB 8. In case of any contradiction, documents obtained directly from the Employer shall prevail.
- 6.4 The Bidder is expected to examine all instructions, forms, terms, and specifications in the bidding document and to furnish with its Bid all information or documentation as is required by the bidding document.
- 7. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting**
- 7.1 A Bidder requiring any clarification of the bidding document shall contact the Employer in writing at the Employer's address indicated **in the BDS** or raise his enquiries during the pre-Bid meeting if provided for in accordance with ITB 7.4. The Employer will respond in writing to any request for clarification, provided that such request is received prior to the deadline for submission of Bids within a period specified **in the BDS**. The Employer shall forward copies of its response to all Bidders who have acquired the bidding document in accordance with ITB 6.3, including a description of the inquiry but without identifying its source. If so specified **in the BDS**, the Employer shall also promptly publish its response at the web page identified **in the BDS**. Should the clarification result in changes to the essential elements of the bidding document, the Employer shall amend the bidding document following the procedure under ITB 8 and ITB 23.2.
- 7.2 The Bidder is advised to visit and examine the site where the plant is to be installed 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 provision of Plant and Installation Services. The costs of visiting the site shall be at the Bidder's own expense.
- 7.3 The Bidder and any of its personnel or agents will be granted permission by the Employer to enter upon its premises and lands for the purpose of such visit, but only upon the express condition that the Bidder, its personnel, and agents will release and indemnify the Employer and its personnel and agents from and against all liability in respect thereof, and will be responsible for death or personal injury, loss of or damage to property, and any

other loss, damage, costs, and expenses incurred as a result of the inspection.

- 7.4 If so specified **in the BDS**, the Bidder's designated representative is invited to attend a pre-Bid meeting and/or a site visit. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.
- 7.5 The Bidder is requested to submit any questions in writing, to reach the Employer not later than one week before the meeting.
- 7.6 Minutes of the pre-Bid meeting, including the text of the questions raised without identifying the source, and the responses given, together with any responses prepared after the meeting, will be transmitted promptly to all Bidders who have acquired the bidding document in accordance with ITB 6.3. If so specified **in the BDS**, the Employer shall also promptly publish the Minutes of the pre-Bid meeting at the web page identified **in the BDS**. Any modification to the bidding document that may become necessary as a result of the pre-Bid meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to ITB 8 and not through the minutes of the pre-Bid meeting. Nonattendance at the pre-Bid meeting will not be a cause for disqualification of a Bidder.

8. Amendment of Bidding Document

- 8.1 At any time prior to the deadline for submission of Bids, the Employer may amend the bidding document by issuing addenda.
- 8.2 Any addendum issued shall be part of the bidding document and shall be communicated in writing to all who have obtained the bidding document from the Employer in accordance with ITB 6.3. The Employer shall also promptly publish the addendum on the Employer's web page in accordance with ITB 7.1.
- 8.3 To give prospective Bidders reasonable time in which to take an addendum into account in preparing their Bids, the Employer may, at its discretion, extend the deadline for the submission of bids, pursuant to ITB 23.2.

C. Preparation of Bids

9. Cost of Bidding

- 9.1 The Bidder shall bear all costs associated with the preparation and submission of its Bid, and the Employer shall not be responsible or liable for those costs, regardless of the conduct or outcome of the Bidding process.

10. Language of Bid

- 10.1 The Bid, as well as all correspondence and documents relating to the Bid exchanged by the Bidder and the Employer, shall be

written in the language specified **in the BDS**. Supporting documents and printed literature that are part of the Bid may be in another language provided they are accompanied by an accurate translation of the relevant passages in the language specified **in the BDS**, in which case, for purposes of interpretation of the Bid, such translation shall govern.

**11. Documents
Comprising
the Bid**

11.1 The Bid shall comprise the following:

- (a) **Letter of Bid** prepared in accordance with ITB12.1;
- (b) **Price Schedules** completed in accordance with ITB 12 and ITB 17;
- (c) **Bid Security** or **Bid Securing Declaration**, in accordance with ITB 20;
- (d) **Alternative Bid**, if permissible, in accordance with ITB 13;
- (e) **Authorization**: written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 21.3;
- (f) **Eligibility of Plant and Installation Services**: documentary evidence established in accordance with ITB 14.1 that the Plant and Installation Services offered by the Bidder in its Bid or in any alternative Bid, if permitted, are eligible;
- (g) **Bidder's Eligibility and Qualifications**: documentary evidence in accordance with ITB 15.1 establishing the Bidder's eligibility and qualifications to perform the Contract if its Bid is accepted;
- (h) **Conformity**: documentary evidence in accordance to ITB 16 that the Plant and Installation Services offered by the Bidder conform to the bidding document;
- (i) **Subcontractors**: list of subcontractors in accordance with ITB 16.2; and
- (j) any other document required **in the BDS**.

11.2 In addition to the requirements under ITB 11.1, Bids submitted by a JV shall include a copy of the Joint Venture Agreement entered into by all members. Alternatively, a letter of intent to execute a Joint Venture Agreement in the event of a successful

Bid shall be signed by all members and submitted with the Bid, together with a copy of the proposed Agreement.

- 11.3 The Bidder shall furnish in the Letter of Bid information on commissions and gratuities, if any, paid or to be paid to agents or any other party relating to this Bid

12. Letter of Bid and Price Schedules

- 12.1 The Letter of Bid and Price Schedules shall be prepared, using the relevant forms furnished in Section IV, Bidding Forms. The forms must be completed as instructed in each form without any alterations to the text, and no substitutes shall be accepted except as provided under ITB 21.3. All blank spaces shall be filled in with the information requested.

13. Alternative Bids

- 13.1 Unless otherwise specified **in the BDS**, alternative Bids shall not be considered.
- 13.2 When alternatives to the Time Schedule are explicitly invited, a statement to that effect will be included **in the BDS**, and the method of evaluating different time schedules will be described in Section III, Evaluation and Qualification Criteria.
- 13.3 Except as provided under ITB 13.4 below, Bidders wishing to offer technical alternatives to the Employer's requirements as described in the bidding document must also provide: (i) a price at which they are prepared to offer a Plant meeting the Employer's requirements; and (ii) all information necessary for a complete evaluation of the alternatives by the Employer, including drawings, design calculations, technical specifications, breakdown of prices, and proposed installation methodology and other relevant details. Only the technical alternatives, if any, of the Bidder with the Most Advantageous Bid conforming to the basic technical requirements shall be considered by the Employer.
- 13.4 When Bidders are invited **in the BDS** to submit alternative technical solutions for specified parts of the facilities, such parts will be identified **in the BDS**, as will the method for their evaluation, and described in Section VII, Employer's Requirements.

14. Documents Establishing the Eligibility of the Plant and Installation Services

- 14.1 To establish the eligibility of the Plant and Installation Services in accordance with ITB 5, Bidders shall complete the country of origin declarations in the Price Schedule Forms, included in Section IV, Bidding Forms.

15. Documents Establishing the Eligibility and Qualifications of the Bidder	15.1 To establish its eligibility and qualifications to perform the Contract in accordance with Section III, Evaluation and Qualification Criteria, the Bidder shall provide the information requested in the corresponding information sheets included in Section IV, Bidding Forms.
16. Documents Establishing the Conformity of the Plant and Installation Services	16.1 The Bidder shall furnish the information stipulated in Section IV, Bidding Forms in sufficient detail to demonstrate substantial responsiveness of the Bidders' proposal to the work requirements and the completion time. 16.2 For major items of Plant and Installation Services as listed by the Employer in Section III, Evaluation and Qualification Criteria, which the Bidder intends to purchase or subcontract, the Bidder shall give details of the name and nationality of the proposed Subcontractors, including manufacturers, for each of those items. In addition, the Bidder shall include in its Bid information establishing compliance with the requirements specified by the Employer for these items. Quoted rates and prices will be deemed to apply to whichever Subcontractor is appointed, and no adjustment of the rates and prices will be permitted. 16.3 The Bidder shall be responsible for ensuring that any Subcontractor proposed complies with the requirements of ITB 4, and that any plant, or services to be provided by the Subcontractor comply with the requirements of ITB 5 and ITB 15.1.
17. Bid Prices and Discounts	17.1 Unless otherwise specified in the BDS , Bidders shall quote for the entire Plant and Installation Services on a "single responsibility" basis. The total Bid price shall include all the Contractor's obligations mentioned in or to be reasonably inferred from the bidding document in respect of the design, manufacture, including procurement and subcontracting (if any), delivery, construction, installation and completion of the Plant. This includes all requirements under the Contractor's responsibilities for testing, pre-commissioning and commissioning of the plant and, where so required by the bidding document, the acquisition of all permits, approvals and licenses, etc.; the operation, maintenance and training services and such other items and services as specified in the bidding document, all in accordance with the requirements of the General Conditions. Items against which no price is entered by the Bidder will not be

paid for by the Employer when executed and shall be deemed to be covered by the prices for other items.

- 17.2 Bidders are required to quote the price for the commercial, contractual and technical obligations outlined in the bidding document.
- 17.3 Bidders shall give a breakdown of the prices in the manner and detail called for in the Price Schedules included in Section IV, Bidding Forms.

Depending on the scope of the Contract, the Price Schedules may comprise up to the six (6) schedules listed below. Separate numbered Schedules included in Section IV, Bidding Forms, from those numbered 1 to 4 below, shall be used for each of the elements of the Plant and Installation Services. The total amount from each Schedule corresponding to an element of the Plant and Installation Services shall be summarized in the schedule titled Grand Summary, (Schedule 5), giving the total Bid price(s) to be entered in the Letter of Bid. Bidders shall note that the plant and equipment included in Schedule Nos. 1 and 2 below exclude materials used for civil, building and other construction works. All such materials shall be included and priced under Schedule No. 4, Installation Services. The Schedules comprise:

Schedule No. 1: Plant (including Mandatory Spare Parts)
Supplied from Abroad

Schedule No. 2: Plant (including Mandatory Spare Parts)
Supplied from within the Employer's
Country

Schedule No. 3: Design Services

Schedule No. 4: Installation Services

Schedule No. 5: Grand Summary (Schedule Nos.1 to 4)

Schedule No. 6: Recommended Spare Parts

- 17.5. In the Schedules, Bidders shall give the required details and a breakdown of their prices as follows:

- (a) Plant to be supplied from abroad (Schedule No. 1):

The price of the Plant shall be quoted on CIP-named place of destination basis as specified **in the BDS**.

- (b) Plant manufactured within the Employer's Country (Schedule No. 2):
 - (i) The price of the plant shall be quoted on an EXW Incoterm basis (such as "ex-works," "ex-factory," "ex-warehouse" or "off-the-shelf," as applicable);
 - (ii) Sales tax and all other taxes payable in the Employer's Country on the plant if the contract is awarded to the Bidder;
 - (c) Design Services (Schedule No. 3);
 - (d) Installation Services shall be quoted separately (Schedule No. 4) and shall include rates or prices for local transportation to named place of final destination as specified **in the BDS**, insurance and other services incidental to delivery of the plant, all labor, contractor's equipment, temporary works, materials, consumables and all matters and things of whatsoever nature, including operations and maintenance services, the provision of operations and maintenance manuals, training, etc., where identified in the bidding document, as necessary for the proper execution of the installation and other services, including all taxes, duties, levies and charges payable in the Employer's Country as of twenty-eight (28) days prior to the deadline for submission of Bids;
 - (e) Recommended spare parts shall be quoted separately (Schedule 6) as specified in either subparagraph (a) or (b) above in accordance with the origin of the spare parts.
- 17.6 The terms EXW, CIP, and other similar terms shall be governed by the rules prescribed in the current edition of Incoterms, published by the International Chamber of Commerce, as specified **in the BDS**.
- 17.7 The prices shall be either fixed or adjustable as specified **in the BDS**.
- 17.8 In the case of **Fixed Price**, prices quoted by the Bidder shall be fixed during the Bidder's performance of the contract and not subject to variation on any account. A Bid submitted with an adjustable price quotation will be treated as non-responsive and rejected.
- 17.9 In the case of **Adjustable Price**, prices quoted by the Bidder shall be subject to adjustment during performance of the contract to reflect changes in the cost elements such as labor, material,

transport and contractor's equipment in accordance with the procedures specified in the corresponding Appendix to the Contract Agreement. A Bid submitted with a fixed price quotation will not be rejected, but the price adjustment will be treated as zero. Bidders are required to indicate the source of labor and material indices in the corresponding Form in Section IV, Bidding Forms.

17.10 If so indicated in ITB 1.1, Bids are being invited for individual lots (contracts) or for any combination of lots (packages). Bidders wishing to offer any price reduction (discount) for the award of more than one Contract shall specify in their Letter of Bid the price reductions applicable to each package, or alternatively, to individual Contracts within the package, and the manner in which the price reductions will apply.

17.11 Bidders wishing to offer any unconditional discount shall specify in their Letter of Bid the offered discounts and the manner in which price discounts will apply.

**18. Currencies of
Bid and
Payment**

18.1 The currency(ies) of the Bid and the currency(ies) of payments shall be the same. The Bidder shall quote in the currency of the Employer's country the portion of the Bid price that corresponds to expenditures incurred in the currency of the Employer's Country, unless otherwise specified **in the BDS**.

18.2 The Bidder may express the Bid price in any currency. If the Bidder wishes to be paid in a combination of amounts in different currencies, it may quote its price accordingly but shall use no more than three foreign currencies in addition to the currency of the Employer's Country.

**19. Period of
Validity of
Bids**

19.1 Bids shall remain valid for the Bid Validity period specified **in the BDS**. The Bid Validity period starts from the Bid submission deadline (as prescribed by the Employer in accordance with ITB 23.1). A Bid valid for a shorter period shall be rejected by the Employer as nonresponsive.

19.2 In exceptional circumstances, prior to the expiration of the Bid validity period, the Employer may request Bidders to extend the period of validity of their Bids. The request and the responses shall be made in writing. If a Bid Security is requested in accordance with ITB 20, the Bidder granting the request shall also extend the Bid Security for twenty-eight (28) days beyond the deadline of the extended validity period. A Bidder may refuse the request without forfeiting its Bid Security. A Bidder

granting the request shall not be required or permitted to modify its Bid, except as provided in ITB 19.3.

19.3 If the award is delayed by a period exceeding fifty-six (56) days beyond the expiry of the initial Bid validity period, the Contract price shall be determined as follows:

- (a) in the case of **fixed price** contracts, the Contract price shall be the Bid price adjusted by the factor or factors specified **in the BDS**;
- (b) in the case of **adjustable price** contracts, no adjustment shall be made; or
- (c) in any case, Bid evaluation shall be based on the Bid price without taking into consideration the applicable correction from those indicated above.

20. Bid Security

20.1 The Bidder shall furnish as part of its Bid, either a Bid-Securing Declaration or a Bid Security as specified **in the BDS**, in original form and, in the case of a Bid Security, in the amount and currency specified **in the BDS**.

20.2 A Bid-Securing Declaration shall use the form included in Section IV Bidding Forms.

20.3 If a Bid Security is specified pursuant to ITB 20.1, the Bid security shall be a demand guarantee in any of the following forms at the Bidder's option:

- (a) an unconditional guarantee issued by a bank or non-bank financial institution (such as an insurance, bonding or surety company);
- (b) an irrevocable letter of credit;
- (c) a cashier's or certified check; or
- (d) another security indicated **in the BDS**,

from a reputable source from an eligible country. If an unconditional guarantee is issued by a non-bank financial institution located outside the Employer's Country the issuing non-bank financial institution shall have a correspondent financial institution located in the Employer's Country to make it enforceable unless the Employer has agreed in writing, prior to Bid submission, that a correspondent financial institution is not required. In the case of a bank guarantee, the Bid Security shall be submitted either using the Bid Security Form included in Section IV, Bidding Forms, or in another substantially similar

format approved by the Employer prior to Bid submission. The Bid Security shall be valid for twenty-eight (28) days beyond the original validity period of the Bid, or beyond any period of extension if requested under ITB 19.2.

- 20.4 If a Bid Security or a Bid-Securing Declaration is specified pursuant to ITB 20.1, any Bid not accompanied by a substantially responsive Bid Security or Bid-Securing Declaration shall be rejected by the Employer as nonresponsive.
- 20.5 If a Bid Security is specified pursuant to ITB 20.1, the Bid Security of unsuccessful Bidders shall be returned as promptly as possible upon the successful Bidder's furnishing of the Performance Security pursuant to ITB 47.
- 20.6 The Bid Security of the successful Bidder shall be returned as promptly as possible once the successful Bidder has signed the Contract and furnished the required Performance Security.
- 20.7 The Bid Security may be forfeited or the Bid-Securing Declaration executed:
 - (a) if a Bidder withdraws its Bid during the period of Bid validity specified by the Bidder on the Letter of Bid; or
 - (b) if the successful Bidder fails to:
 - (i) sign the Contract in accordance with ITB 46; or
 - (ii) furnish a Performance Security in accordance with ITB 47.
- 20.8 The Bid Security or the Bid-Securing Declaration of a JV shall be in the name of the JV that submits the Bid. If the JV has not been legally constituted into a legally enforceable JV at the time of bidding, the Bid Security or the Bid Securing Declaration shall be in the names of all future members as named in the letter of intent referred to in ITB 4.1 and ITB 11.2.
- 20.9 If a Bid Security is not required **in the BDS**: and
 - (a) if a Bidder withdraws its Bid during the period of Bid validity specified by the Bidder on the Letter of Bid, except as provided in ITB 19.2; or
 - (b) if the successful Bidder fails to:
 - (i) sign the Contract in accordance with ITB 46; or

- (ii) furnish a Performance Security in accordance with ITB 47;

the Borrower may, if provided for **in the BDS**, declare the Bidder disqualified to be awarded a contract by the Employer for a period of time as stated **in the BDS**.

**21. Format and
Signing of
Bid**

- 21.1 The Bidder shall prepare one original of the documents comprising the bid as described in ITB 11 and clearly mark it “Original.” Alternative Bids, if permitted in accordance with ITB 13, shall be clearly marked “Alternative”. In addition, the Bidder shall submit copies of the Bid, in the number specified **in the BDS** and clearly mark them “Copy.” In the event of any discrepancy between the original and the copies, the original shall prevail.
- 21.2 Bidders shall mark as “CONFIDENTIAL” information in their Bids which is confidential to their business. This may include proprietary information, trade secrets or commercial or financially sensitive information.
- 21.3 The original and all copies of the Bid shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder. This authorization shall consist of a written confirmation as specified **in the BDS** and shall be attached to the Bid. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the Bid where entries or amendments have been made shall be signed or initialed by the person signing the Bid.
- 21.4 In the case that the Bidder is a JV, the Bid shall be signed by an authorized representative of the JV on behalf of the JV, and so as to be legally binding on all the members as evidenced by a power of attorney signed by their legally authorized representatives.
- 21.5 Any interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the Bid.

D. Submission and Opening of Bids

**22. Submission,
Sealing and
Marking of
Bids**

- 22.1 The Bidder shall deliver the Bid in a single, sealed envelope (one (1) envelope process). Within the single envelope the Bidder shall place the following separate, sealed envelopes:
 - (a) in an envelope marked “ORIGINAL”, all documents comprising the Bid, as described in ITB 11; and

- (b) in an envelope marked “COPIES”, all required copies of the Bid; and
- (c) if alternative Bids are permitted in accordance with ITB 13, and if relevant:
 - (i) in an envelope marked “ORIGINAL–ALTERNATIVE BID” the alternative Bid; and
 - (ii) in the envelope marked “COPIES – ALTERNATIVE BID” all required copies of the alternative Bid.

22.2 The inner and outer envelopes shall:

- (a) bear the name and address of the Bidder;
- (b) be addressed to the Employer in accordance with ITB 23.1;
- (c) bear the specific identification of this Bidding process indicated in accordance with ITB 1.1; and
- (d) bear a warning not to open before the time and date for Bid opening.

22.3 If all envelopes are not sealed and marked as required, the Employer will assume no responsibility for the misplacement or premature opening of the Bid.

23. Deadline for Submission of Bids

23.1 Bids must be received by the Employer at the address and no later than the date and time indicated **in the BDS**. When so specified **in the BDS**, Bidders shall have the option of submitting their Bids electronically. Bidders submitting Bids electronically shall follow the electronic Bid submission procedures specified **in the BDS**.

23.2 The Employer may, at its discretion, extend the deadline for the submission of Bids by amending the bidding document in accordance with ITB 8, in which case all rights and obligations of the Employer and Bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.

24. Late Bids

24.1 The Employer shall not consider any Bid that arrives after the deadline for submission of Bids, in accordance with ITB 23. Any Bid received by the Employer after the deadline for submission of Bids shall be declared late, rejected, and returned unopened to the Bidder.

25. Withdrawal, Substitution, and

25.1 A Bidder may withdraw, substitute, or modify its bid after it has been submitted by sending a written notice, duly signed by an authorized representative, and shall include a copy of the

**Modification
of Bids**

authorization in accordance with ITB 21.3, (except that withdrawal notices do not require copies). The corresponding substitution or modification of the Bid must accompany the respective written notice. All notices must be:

- (a) prepared and submitted in accordance with ITB 21 and ITB 22 (except that withdrawals notices do not require copies), and in addition, the respective envelopes shall be clearly marked “Withdrawal,” “Substitution,” “Modification”; and
- (b) received by the Employer prior to the deadline prescribed for submission of Bids, in accordance with ITB 23.

25.2 Bids requested to be withdrawn in accordance with ITB 25.1 shall be returned unopened to the Bidders.

25.3 No Bid may be withdrawn, substituted, or modified in the interval between the deadline for submission of Bids and the expiration of the period of Bid validity specified by the Bidder on the Letter of Bid or any extension thereof.

26. Bid Opening

26.1 Except as in the cases specified in ITB 24 and ITB 25.2, the Employer shall publicly open and read out in accordance with ITB 26.5 all Bids received by the deadline at the date, time and place specified **in the BDS** in the presence of Bidders’ designated representatives and anyone who choose to attend. Any specific electronic Bid opening procedures required if electronic Bidding is permitted in accordance with ITB 23.1, shall be as specified **in the BDS**.

26.2 First, the written notice of withdrawal in the envelopes marked “Withdrawal” shall be opened and read out and the envelope with the corresponding Bid shall not be opened, but returned to the Bidder. No bid withdrawal shall be permitted unless the corresponding withdrawal notice contains a valid authorization to request the withdrawal and is read out at Bid opening.

26.3 Next, envelopes marked “Substitution” shall be opened and read out and exchanged with the corresponding Bid being substituted, and the substituted Bid shall not be opened, but returned to the Bidder. No Bid substitution shall be permitted unless the corresponding substitution notice contains a valid authorization to request the substitution and is read out at Bid opening.

26.4 Next, envelopes marked “Modification” shall be opened and read out with the corresponding Bid. No Bid modification shall be permitted unless the corresponding modification notice

contains a valid authorization to request the modification and is read out at Bid opening.

- 26.5 Next, all remaining envelopes shall be opened one at a time, reading out: the name of the Bidder and the Bid Price(s), including any discounts and alternative Bids, and indicating whether there is a modification; the presence or absence of a Bid Security or Bid-Securing Declaration, if required; and any other details as the Employer may consider appropriate.
- 26.6 Only Bids, alternative Bids and discounts that are opened and read out at Bid opening shall be considered further. The Letter of Bid and the Price Schedules are to be initialed by representatives of the Employer attending Bid opening in the manner specified **in the BDS**.
- 26.7 The Employer shall neither discuss the merits of any Bid nor reject any Bid (except for late Bids, in accordance with ITB 24.1).
- 26.8 The Employer shall prepare a record of the Bid opening that shall include, as a minimum:
- (a) the name of the Bidder and whether there is a withdrawal, substitution, or modification;
 - (b) the Bid Price, per lot if applicable, including any discounts;
 - (c) any alternative Bids; and
 - (d) the presence or absence of a Bid Security or a Bid-Securing Declaration.
- 26.9 The Bidders' representatives who are present shall be requested to sign the record. The omission of a Bidder's signature on the record shall not invalidate the contents and effect of the record. A copy of the record shall be distributed to all Bidders.

E. Evaluation and Comparison of Bids

- 27. Confidentiality** 27.1 Information relating to the evaluation of Bids and recommendation of contract award, shall not be disclosed to Bidders or any other persons not officially concerned with the Bidding process until information on Intention to Award the Contract is transmitted to all Bidders in accordance with ITB 42.

27.2 Any effort by a Bidder to influence the Employer in the evaluation of the bids or Contract award decisions may result in the rejection of its Bid.

27.3 Notwithstanding ITB 27.2, from the time of Bid opening to the time of Contract Award, if any Bidder wishes to contact the Employer on any matter related to the Bidding process, it should do so in writing.

28. Clarification of Bids

28.1 To assist in the examination, evaluation, and comparison of the Bids, and qualification of the Bidders, the Employer may, at its discretion, ask any Bidder for a clarification of its Bid. Any clarification submitted by a Bidder that is not in response to a request by the Employer shall not be considered. The Employer's request for clarification and the response shall be in writing. No change in the prices or substance of the Bid shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Bids, in accordance with ITB 32.

28.2 If a Bidder does not provide clarifications of its Bid by the date and time set in the Employer's request for clarification, its Bid may be rejected.

29. Deviations, Reservations, and Omissions

29.1 During the evaluation of Bids, the following definitions apply:

- (a) "Deviation" is a departure from the requirements specified in the bidding document;
- (b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the bidding document; and
- (c) "Omission" is the failure to submit part or all of the information or documentation required in the bidding document.

30. Determination of Responsiveness

30.1 The Employer's determination of a Bid's responsiveness is to be based on the contents of the Bid itself, as defined in ITB11.

30.2 A substantially responsive Bid is one that meets the requirements of the bidding document without material deviation, reservation, or omission. A material deviation, reservation, or omission is one that:

- (a) if accepted, would:

- (i) affect in any substantial way the scope, quality, or performance of the Plant and Installation Services specified in the Contract; or
 - (ii) limit in any substantial way, inconsistent with the bidding document, the Employer's rights or the Bidder's obligations under the proposed Contract; or
- (b) if rectified, would unfairly affect the competitive position of other Bidders presenting substantially responsive Bids.

30.3 The Employer shall examine the technical aspects of the Bid in particular, to confirm that all requirements of Section VII, Employer's Requirements have been met without any material deviation, reservation, or omission.

30.4 If a Bid is not substantially responsive to the requirements of the bidding document, it shall be rejected by the Employer and may not subsequently be made responsive by correction of the material deviation, reservation, or omission.

**31. Nonmaterial
Nonconformi
ties**

31.1 Provided that a Bid is substantially responsive, the Employer may waive any nonconformity in the Bid that does not constitute a material deviation, reservation or omission.

31.2 Provided that a Bid is substantially responsive, the Employer may request that the Bidder submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities in the Bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any aspect of the price of the Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.

31.3 Provided that a Bid is substantially responsive, the Employer shall rectify quantifiable nonmaterial nonconformities related to the Bid Price. To this effect, the Bid Price shall be adjusted, for comparison purposes only, to reflect the price of a missing or non-conforming item or component in the manner specified **in the BDS.**

**32. Correction of
Arithmetical
Errors**

32.1 Provided that the Bid is substantially responsive, the Employer shall correct arithmetical errors on the following basis:

- (a) where there are errors between the total of the amounts given under the column for the price breakdown and the amount given under the Total Price, the former shall prevail and the latter will be corrected accordingly;

- (b) where there are errors between the total of the amounts of Schedule Nos. 1 to 4 and the amount given in Schedule No. 5 (Grand Summary), the former shall prevail and the latter will be corrected accordingly; and
- (c) if there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.

32.2 Bidders shall be requested to accept correction of arithmetical errors. Failure to accept the correction in accordance with ITB 32.1, shall result in the rejection of the Bid.

33. Conversion to Single Currency

33.1 For evaluation and comparison purposes, the currency(ies) of the Bid shall be converted into a single currency as specified **in the BDS**.

34. Margin of Preference

34.1 No margin of domestic preference shall apply.

35. Evaluation of Bids

35.1 The Employer shall use the criteria and methodologies listed in this ITB and Section III, Evaluation and Qualification criteria. No other evaluation criteria or methodologies shall be permitted. By applying the criteria and methodologies the Employer shall determine the Most Advantageous Bid. This is the Bid of the Bidder that meets the qualification criteria and that has been determined to be:

- (a) substantially responsive to the bidding document; and
- (b) the lowest evaluated cost.

35.2 **Technical Evaluation.** The Employer will carry out a detailed technical evaluation of the Bids not previously rejected to determine whether the technical aspects are in compliance with the bidding document. The Bid that does not meet minimum acceptable standards of completeness, consistency and detail, and the specified minimum (or maximum, as the case may be) requirements for specified functional guarantees, will be rejected for non-responsiveness. In order to reach its determination, the Employer will examine and compare the technical aspects of the Bids on the basis of the information supplied by the Bidders, taking into account the following:

- (a) overall completeness and compliance with the Employer's Requirements; conformity of the Plant and Installation Services offered with specified performance

criteria, including conformity with the specified minimum (or maximum, as the case may be) requirement corresponding to each functional guarantee, as indicated in the Specification and in Section III, Evaluation and Qualification Criteria; suitability of the Plant and Installation Services offered in relation to the environmental and climatic conditions prevailing at the site; and quality, function and operation of any process control concept included in the Bid;

- (b) type, quantity and long-term availability of mandatory and recommended spare parts and maintenance services; and
- (c) other relevant factors, if any, listed in Section III, Evaluation and Qualification Criteria.

35.3 Where alternative technical solutions have been allowed in accordance with ITB 13, and offered by the Bidder, the Employer will make a similar evaluation of the alternatives. Where alternatives have not been allowed but have been offered, they shall be ignored.

35.4 **Economic Evaluation.** To evaluate a Bid, the Employer shall consider the following:

- (a) the Bid price, excluding provisional sums and the provision, if any, for contingencies in the Price Schedules;
- (b) price adjustment for correction of arithmetic errors in accordance with ITB 32.1;
- (c) price adjustment due to discounts offered in accordance with ITB 17.11;
- (d) price adjustment due to quantifiable nonmaterial nonconformities in accordance with ITB 31.3;
- (e) converting the amount resulting from applying (a) to (c) above, if relevant, to a single currency in accordance with ITB 33; and
- (f) the evaluation factors specified **in the BDS** and in Section III, Evaluation and Qualification Criteria.

35.5 If price adjustment is allowed in accordance with ITB 17.7, the estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in Bid evaluation.

- 35.6 If this bidding document allows Bidders to quote separate prices for different lots (contracts), and the award to a single Bidder of multiple lots (contracts), the methodology to determine the lowest evaluated cost of the lot (contract) combinations, including any discounts offered in the Letter of Bid, is specified in Section III, Evaluation and Qualification Criteria.
- 36. Comparison of Bids** 36.1 The Employer shall compare the evaluated costs of all substantially responsive Bids established in accordance with ITB 35.4 to determine the Bid that has the lowest evaluated cost.
- 37. Abnormally Low Bids** 37.1 An Abnormally Low Bid is one where the Bid price, in combination with other elements of the Bid, appears so low that it raises material concerns as to the capability of the Bidder to perform the Contract for the offered Bid Price.
- 37.2 In the event of identification of a potentially Abnormally Low Bid, the Employer shall seek written clarifications from the Bidder, including detailed price analyses of its Bid price in correlation to the subject matter of the contract, scope, proposed methodology, schedule, allocation of risks and responsibilities and any other requirements of the bidding document.
- 37.3 After evaluation of the price analyses, in the event that the Employer determines that the Bidder has failed to demonstrate its capability to deliver the contract for the offered tender price, the Employer shall reject the Bid.
- 38. Unbalanced or Front Loaded Bids** 38.1 If the Bid that is evaluated as the lowest evaluated cost is, in the Employer's opinion, seriously unbalanced or front loaded the Employer may require the Bidder to provide written clarifications. Clarifications may include detailed price analyses to demonstrate the consistency of the Bid prices with the scope of works, proposed methodology, schedule and any other requirements of the bidding document.
- 38.2 After the evaluation of the information and detailed price analyses presented by the Bidder, the Employer may:
- (a) accept the Bid; or
 - (b) if appropriate, require that the total amount of the Performance Security be increased, at the expense of the Bidder, to a level not exceeding twenty percent (20%) of the Contract Price; or
 - (c) reject the Bid.

**39. Eligibility
and
Qualification
of the Bidder**

- 39.1 The Employer shall determine to its satisfaction whether the Bidder that is selected as having submitted the lowest evaluated cost and substantially responsive Bid is eligible and meets the qualifying criteria specified in Section III, Evaluation and Qualification Criteria.
- 39.2 The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB 15.1. The determination shall not take into consideration the qualifications of other firms such as the Bidder's subsidiaries, parent entities, affiliates, subcontractors (other than Specialized Subcontractors if permitted in the bidding document) or any other firm(s) different from the Bidder.
- 39.3 An affirmative determination shall be a prerequisite for award of the Contract to the Bidder. A negative determination shall result in disqualification of the Bid, in which event the Employer shall proceed to the Bidder who offers a substantially responsive Bid with the next lowest evaluated cost to make a similar determination of that Bidder's qualifications to perform satisfactorily.
- 39.4 The capabilities of the manufacturers and subcontractors proposed in its Bid to be used by the Bidder with the Most Advantageous Bid for identified major items of supply or services will also be evaluated for acceptability in accordance with Section III, Evaluation and Qualification Criteria. Their participation should be confirmed with a letter of intent between the parties, as needed. Should a manufacturer or subcontractor be determined to be unacceptable, the Bid will not be rejected, but the Bidder will be required to substitute an acceptable manufacturer or subcontractor without any change to the Bid price. Prior to signing the Contract, the corresponding Appendix to the Contract Agreement shall be completed, listing the approved manufacturers or subcontractors for each item concerned.

**40. Employer's
right to
Accept Any
Bid and to
Reject Any
or All Bids**

- 40.1 The Employer reserves the right to accept or reject any Bid, and to annul the Bidding process and reject all Bids at any time prior to Contract Award, without thereby incurring any liability to Bidders. In case of annulment, all Bids submitted and specifically, Bid securities shall be promptly returned to the Bidders.

**41. Standstill
Period**

- 41.1 The Contract shall not be awarded earlier than the expiry of the Standstill Period. The Standstill Period shall be ten (10) Business Days unless extended in accordance with ITB 45. The Standstill

Period commences the day after the date the Employer has transmitted to each Bidder the Notification of Intention to Award the Contract. Where only one Bid is submitted, or if this contract is in response to an emergency situation recognized by the Bank, the Standstill Period shall not apply.

42. Notification of Intention to Award

- 42.1 The Employer shall send to each Bidder the Notification of Intention to Award the Contract to the successful Bidder. The Notification of Intention to Award shall contain, at a minimum, the following information:
- (a) the name and address of the Bidder submitting the successful Bid;
 - (b) the Contract price of the successful Bid;
 - (c) the names of all Bidders who submitted Bids, and their Bid prices as readout, and as evaluated;
 - (d) a statement of the reason(s) the Bid (of the unsuccessful Bidder to whom the notification is addressed) was unsuccessful, unless the price information in c) above already reveals the reason;
 - (e) the expiry date of the Standstill Period; and
 - (f) instructions on how to request a debriefing and/or submit a complaint during the standstill period.

F. Award of Contract

43. Award Criteria

- 43.1 Subject to ITB 40, the Employer shall award the Contract to the successful Bidder. This is the Bidder whose Bid has been determined to be the Most Advantageous Bid. This is the Bid of the Bidder that meets the qualification criteria and whose Bid has been determined to be:
- (a) substantially responsive to the bidding document; and
 - (b) the lowest evaluated cost.

44. Notification of Award

- 44.1 Prior to the expiration of the Bid Validity Period, and upon expiry of the Standstill Period, specified in ITB 41.1 or any extension thereof, and upon satisfactorily addressing any complaint that has been filed within the Standstill Period, the Employer shall notify the successful Bidder, in writing, that its Bid has been accepted. The notification of award (hereinafter and in the Contract Forms called the “Letter of Acceptance”) shall specify the sum that the Employer will pay the Contractor

in consideration of the execution of the contract (hereinafter and in the Conditions of Contract and Contract Forms called “the Contract Price”).

44.2 Within ten (10) Business Days after the date of transmission of the Letter of Acceptance, the Employer shall publish the Contract Award Notice which shall contain, at a minimum, the following information:

- (a) name and address of the Employer;
- (b) name and reference number of the contract being awarded, and the selection method used;
- (c) names of all Bidders that submitted Bids, and their Bid prices as read out at Bid opening, and as evaluated;
- (d) names of all Bidders whose Bids were rejected either as nonresponsive or as not meeting qualification criteria, or were not evaluated, with the reasons therefor;
- (e) the name of the successful Bidder, the final total contract price, the contract duration and a summary of its scope; and
- (f) successful Bidder’s Beneficial Ownership Disclosure Form, if specified in BDS ITB 46.1.

44.3 The Contract Award Notice shall be published on the Employer’s website with free access if available, or in at least one newspaper of national circulation in the Employer’s Country, or in the official gazette. The Employer shall also publish the contract award notice in UNDB online.

44.4 Until a formal contract is prepared and executed, the Letter of Acceptance shall constitute a binding Contract

45. Debriefing by the Employer

45.1 On receipt of the Employer’s Notification of Intention to Award referred to in ITB 42, an unsuccessful Bidder has three (3) Business Days to make a written request to the Employer for a debriefing. The Employer shall provide a debriefing to all unsuccessful Bidders whose request is received within this deadline.

45.2 Where a request for debriefing is received within the deadline, the Employer shall provide a debriefing within five (5) Business Days, unless the Employer decides, for justifiable reasons, to provide the debriefing outside this timeframe. In that case, the standstill period shall automatically be extended until five (5) Business Days after such debriefing is provided. If more than

one debriefing is so delayed, the standstill period shall not end earlier than five (5) Business Days after the last debriefing takes place. The Employer shall promptly inform, by the quickest means available, all Bidders of the extended standstill period.

45.3 Where a request for debriefing is received by the Employer later than the three (3)-Business Day deadline, the Employer should provide the debriefing as soon as practicable, and normally no later than fifteen (15) Business Days from the date of publication of Public Notice of Award of contract. Requests for debriefing received outside the three (3)-day deadline shall not lead to extension of the standstill period.

45.4 Debriefings of unsuccessful Bidders may be done in writing or verbally. The Bidder shall bear their own costs of attending such a debriefing meeting.

**46. Signing of
Contract**

46.1 The Employer shall send to the successful Bidder the Letter of Acceptance including the Contract Agreement, and, if specified in the BDS, a request to submit the Beneficial Ownership Disclosure Form providing additional information on its beneficial ownership. The Beneficial Ownership Disclosure Form, if so requested, shall be submitted within eight (8) Business Days of receiving this request.

46.2 The successful Bidder shall sign, date and return to the Employer, the Contract Agreement within twenty-eight (28) days of its receipt.

46.3 Notwithstanding ITB 46.2 above, in case signing of the Contract Agreement is prevented by any export restrictions attributable to the Employer, to the country of the Employer, or to the use of the Plant and Installation Services to be supplied, where such export restrictions arise from trade regulations from a country supplying those Plant and Installation Services, the Bidder shall not be bound by its Bid, always provided, however, that the Bidder can demonstrate to the satisfaction of the Employer and of the Bank that signing of the Contract Agreement has not been prevented by any lack of diligence on the part of the Bidder in completing any formalities, including applying for permits, authorizations and licenses necessary for the export of the Plant and Installation Services under the terms of the Contract.

**47. Performance
Security**

47.1 Within twenty-eight (28) days of the receipt of the Letter of Acceptance from the Employer, the successful Bidder shall furnish the Performance Security in accordance with the General Conditions GCC 13.3, subject to ITB 38, using for that purpose the Performance Security Form included in Section X, Contract Forms, or another form acceptable to the Employer. If the Performance Security furnished by the successful Bidder is in

the form of a bond, it shall be issued by a bonding or insurance company that has been determined by the successful Bidder to be acceptable to the Employer. A foreign institution providing a bond shall have a correspondent financial institution located in the Employer's Country, unless the Employer has agreed in writing that a correspondent financial institution is not required.

- 47.2 Failure of the successful Bidder to submit the above-mentioned Performance Security or sign the Contract shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security. In that event the Employer may award the Contract to the Bidder offering the next Most Advantageous Bid.

**48. Procurement
Related
Complaint**

- 48.1 The procedures for making a Procurement-related Complaint are as specified in the BDS.

Section II - Bid Data Sheet

The following specific data for the Facilities to be procured shall complement, supplement, or amend the provisions in the Instructions to Bidders (ITB) Whenever there is a conflict, the provisions herein shall prevail over those in ITB

A. General	
ITB 1.1	The reference number of the Request for Bids (RFB) is: SECI/C&P/RfB/2018/160MWH/WB/01 The Employer & Owner is: Solar Energy Corporation of India Limited (SECI), New Delhi, India The name of the RFB is: Design, Engineering, Supply, Construction, Erection, Testing & Commissioning of 160 MW Solar-Wind Hybrid Power Plant with BESS including 10 Years Plant O&M under International competitive bidding at Ramagiri, Anantapur district, Andhra Pradesh, India. The bidders shall note that this is a composite contract covering the entire scope of services of the Plant facility above (In line with Section VII, Employers requirement) & any bid offering incomplete scope of services will be summarily rejected. No partial bids are allowed.
ITB 1.2 (a)	The Employer shall use the e-procurement system specified in BDS 7.1.
ITB 2.1	The Borrower is: Solar Energy Corporation of India Limited (SECI), New Delhi, India The amount of the financing is: US\$ 200 Million (World Bank & CTF) The name of the Project is: Innovation in Solar Power and Hybrid Technologies Project
ITB 3.2	In ITB 3.2 replace the words ‘(where declared or not)’ with ‘(whether declared or not)’.

ITB 4.1	Maximum number of members in the Joint Venture (JV) shall be: 03 (Three) Add the following at the end of ITB Clause 4.1 (i) One of the partners shall be nominated as Lead Partner, and this authorization shall be evidenced by submitting a Power of Attorney signed by legally authorized signatories of all the partners (Section IV. Bidding Forms). (ii) The bid, and, in case of successful bid, the specified Form of Agreement/Letter of Intent (LOI) shall be signed as to be legally binding on all partners. However, in case bid is submitted by a JV with the intent to enter into such an agreement, it shall submit a letter of intent as per proforma given in Section IV. Bidding Form, and in case of successful bid, the specified Form of Agreement shall be signed as to be legally binding on all partners. (iii) The joint venture agreement should indicate precisely the responsibility of all members of JV in respect of planning, design, manufacturing, supply, installation, commissioning and training. All members of JV should have active participation in execution during the currency of the Contract. This should not be varied/modified subsequently without prior approval of the Employer.
ITB 4.5	A list of debarred firms and individuals is available on the Bank's external website: http://www.worldbank.org/debarr.
B. Bidding Document	
ITB 7.4	A Pre-Bid meeting shall take place at the following date, time and place: Date: 31/08/2018 Time: 1100 Hours Place: Solar Energy Corporation of India Limited, D - 3, 1st Floor, Wing - A, Prius Platinum, District Centre, Saket, New Delhi - 110 017, India. A site visit shall be organized by the Employer at a suitable date based on the discussion of the Pre-Bid meeting.
C. Preparation of Bids	
ITB 10.1	The language of the Bid is: English. All correspondence exchange shall be in English. Language for translation of supporting documents and printed literature is English.

ITB 12.3	For submission of original documents, the Employer's address is: Attention: Mr Sandeep Kumar, Manager (C&P) Address: Solar Energy Corporation of India Limited, D - 3, 1st Floor, Wing - A, Prius Platinum, District Centre, Saket, New Delhi - 110 017 Country: INDIA
ITB 13.1	Alternative Bids shall not be considered.
ITB 13.2	Alternatives to the Time Schedule shall not be permitted. If alternatives to the Time Schedule are permitted, the evaluation method will be as specified in Section III, Evaluation and Qualification Criteria: NA
ITB 13.4	Alternative technical solutions shall be permitted for the following parts of the Plant and Installation Services. as further detailed in the Specification: NA If alternative technical solutions are permitted, the evaluation method will be as specified in Section III, Evaluation and Qualification Criteria: NA
ITB 17.5.1	Add a new Sub-Clause 17.5.1 as below: “Deemed Export Benefits Bidders may like to ascertain availability of deemed export or other benefits. They shall solely be responsible for obtaining such benefits, and in case of failure to receive such benefits for any reasons whatsoever; the Employer will not compensate the Bidder. The Bidder shall furnish along with their bid, a declaration to this effect. As per GST Act and subsequent rules and the Foreign Trade Policy 2015-2020, supplies covered under the Project through International Competitive Bidding shall be treated as Deemed Export and therefore GST levied/paid in respect of supply of the goods regarded as Deemed Export, refund can be claimed for GST. Government of India has notified class of persons who will be entitled to claim refund of taxes paid on notified supplies of Goods or Services. Bidders who have considered Deemed Export benefit while submitting their bids, shall be responsible to claim refund of taxes from the Govt, for which employer shall furnish necessary details and undertaking that Employer shall not claim input tax credit on those supplies. As per notification, the Supplier is entitled to claim refund of GST, the same shall be their responsibility. Further, the necessary documents / certificates as may be required to claim refund shall be provided by the Employer to the Supplier. Where the Bidder has quoted taking into account such benefits, he must give all information required for issue of Project Authority/ Payment/Other certificates in terms of the Foreign Trade Policy or GST law/Notifications. In

	case, bidder has not indicated information such as import content or has indicated to be furnished later, the same shall be construed that the import content is Nil. The Project Authority/ Payment/Other Certificates will be issued on this basis of agreements reached before award of the contract in line with the information furnished. If the bidder has considered the deemed export benefits in its bid, the bidder shall confirm and certify that SECI will not be required to undertake any responsibilities of the deemed export scheme or the benefits available during contract execution except issuing the required certificates.
ITB 17.6	The Incoterms edition is: 2010
ITB 17.7	The prices quoted by the Bidder shall not be subject to adjustment during the performance of the Contract.
ITB 18.1	The currencies of the bid shall be as follows: (a) Plant and Mandatory Spare Parts Supplied from Abroad (Schedule No. 1/SOR 1) & Plant and Mandatory Spare Parts Supplied from Within the Employer's Country (Schedule 2/SOR 2) under BDS ITB Sub-Clause 17.5 (a) and (b) shall be quoted entirely in the currency of any country. If the Bidder wishes to be paid in a combination of amounts in different currencies, it may quote its price accordingly, but use no more than three foreign currencies. (b) Design Services (Schedule 3/SOR 3) covered under BDS ITB Sub-Clause 17.5 (c) and Local/Inland transportation including In-transit insurance and loading till site, Installation, Erection, Testing and Commissioning including Performance Testing & Civil and allied works (Schedule 4/SOR 4) covered under BDS ITB Sub-Clause 17.5 (d) shall be quoted in Employer's local currency only (INR). However, Foreign Bidders, in addition to the Indian Rupee Component may also quote a portion in foreign currency to cover the expenditures towards expatriate personnel and imported equipment for the Services to be performed at site. A provision of which is given in the Schedule 3 & Schedule 4 (c) Operation & Maintenance (O&M) (Schedule 5/SOR 5) covered under BDS ITB Sub-Clause 17.5 (e) shall be quoted in the currency of the employer (INR).
ITB 19.1	The Bid validity period shall be 180 days .
ITB 19.3 (a)	The bid price shall be adjusted by the following factor: 0.13% (zero-point one three percent) per week of the bid price for delay in award of contract.
ITB 19.3 (b)	In ITB 19.3 (b) delete the word 'or'.

ITB 20.1	In ITB 20.1 insert the words ‘part of the Technical’ between the words ‘furnish as’ and ‘part of its Bid’
ITB 20.1	A Bid Security shall be required. A Bid-Securing Declaration shall not be required. If a Bid Security shall be required, the amount and currency of the Bid Security shall be INR 10 Crs (Indian Rupees Ten Crores only) or USD 1.5 M (US Dollars One Point Five Million only).
ITB 20.3	“The bid security shall, at the bidder’s option, be in the form of a crossed bank draft/pay orders/banks certified cheque or a bank guarantee as per BG format in Section IV from a reputable source from an eligible country.
ITB 20.3 (c)	Replace the existing ITB Sub-clause 20.3 (c) with the following: “20.3(c) a cashier’s or certified check or demand draft:
ITB 20.3 (d)	Other types of acceptable securities: None
ITB 20.5	In ITB 20.5 replace the referred clause ‘ITB 47’ with ‘ITB 50’.
ITB 20.7 (a)	In ITB 20.7 (a) replace the words ‘Letter of Bid’ with ‘Letter of Bid – Technical Part and repeated in the Letter of Bid - Financial Part’.
ITB 20.7 (b)	In ITB 20.7(b)(i) replace the referred clause ‘ITB 46’ with ‘ITB 49’ In ITB 20.7(b)(ii) replace the referred clause ‘ITB 47’ with ‘ITB 50’
ITB 20.8	In ITB 20.8 replace the referred clause ‘ITB 11.2’ with ‘ITB 11.5’
ITB 20.9	In ITB 20.9 (a) replace words ‘Letter of Bid’ with ‘Letter of Bid – Technical Part and repeated in the Letter of Bid - Financial Part’. In ITB 20.9 (b) replace the referred clause ‘ITB 46’ with ‘ITB 49’; and replace the referred clause ‘ITB 47’ with ‘ITB 50’
ITB 28.1	In ITB 28.1 replace the referred clause ‘ITB 32’ with ‘ITB 36’

**Changes to ITB Conditions related to E-procurement Aspects as
Part of BDS**

ITB 7. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting	7.1 Electronic –Procurement System The Employer shall use the following electronic-procurement system to manage this Bidding process: ETS Portal of M/s Telecommunications Consultants India Limited (TCIL), New Delhi Web page: https://www.tcil-india-electronictender.com The electronic bidding system provides for online clarifications. A Bidder requiring any clarification of the Bidding Document may notify the Employer online or raise its inquiries during the pre-Bid meeting if provided for in accordance with ITB 7.4. Clarifications requested through any other mode shall not be considered by the Employer. The Employer will respond to any request for clarification, provided that such request is received no later than 10 days, prior to the deadline for submission of bids. Description of clarification sought and the response of the Employer shall be uploaded for information of all Bidders without identifying the source of request for clarification. Should the clarification result in changes to the essential elements of the Bidding Document, the Employer shall amend the Bidding Document following the procedure under BDS 8.1, 8.2 & ITB 8.3 and BDS 23.2. It is the bidder's responsibility to check on the e-procurement system, for any addendum/ amendment/ corrigendum to the bidding document. 7.5 The Bidder is requested, to submit any questions only through the e-procurement portal, not later than one week before the meeting. Clarifications requested through any other mode shall not be considered by the Employer. 7.6 Minutes of the pre-Bid meeting, including the text of the questions raised without identifying the source, and the responses given, together with any responses prepared after the meeting, shall be uploaded on the e-procurement system for information of all Bidders without identifying the source of request for clarification. Any modification to the bidding document that may become necessary as a result of the pre-Bid meeting shall be made by the Employer exclusively through the issue of an Addendum following the procedure under BDS 8.1, 8.2 & ITB 8.3 and BDS 23.2, and not through the minutes of the pre-Bid meeting. Nonattendance at the pre-Bid meeting will not be a cause for disqualification of a Bidder.

ITB 8. Amendment of Bidding Document	8.1 At any time prior to the deadline for submission of bids, the Employer may amend the Bidding Document by issuing addenda. The addendum will appear on the e-procurement system under https://www.tcil-india-electronictender.com and email notification is also automatically sent to those bidders who have started working on this tender. In addition, any changes to tender document, pre-bid clarifications, extension of deadline for the submission of bids, addendum and corrigendum to the tender shall be published online in the e-Procurement portal. Bidders are informed to check the portal at regular intervals for any such amendments to the tender. 8.2 Any addendum thus issued shall be part of the Bidding Document and shall be deemed to have been communicated to all the bidders.
C. Preparation of Bids	
ITB 11. Documents Comprising the Bid	11.1 The Bid shall comprise two Parts, namely the Technical Part and the Financial Part. These two Parts shall be submitted simultaneously. 11.2 The Technical Part shall contain the following: (a) Letter of Bid - Technical Part prepared in accordance with ITB12; (b) Bid Security or Bid Securing Declaration, in accordance with ITB 20; (c) Alternative Bid - Technical Part, if permissible, in accordance with ITB 13; (d) Authorization: written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 21.3, and in accordance with ITB 21.4 in case of a JV; (e) Eligibility of Plant and Installation Services: documentary evidence established in accordance with ITB 14.1 that the Plant and Installation Services offered by the Bidder in its Bid or in any alternative Bid, if permitted, are eligible; (f) Bidder's Eligibility and Qualifications: documentary evidence in accordance with ITB 15.1 establishing the Bidder's eligibility and qualifications to perform the Contract if its Bid is accepted; (g) Conformity: in the technical proposal, documentary evidence in accordance to ITB 16 that the Plant and Installation Services offered by the Bidder conform to the bidding document;

	(h) Subcontractors: list of subcontractors in accordance with ITB 16.2; and 11.3 The Financial Part shall contain the following: (a) Letter of Bid – Financial Part: prepared in accordance with ITB 12 and ITB 17; (b) Price Schedules completed online in accordance with ITB 12 and ITB 17; (c) Alternative Bid - Financial Part: if permissible in accordance with ITB 13; and 11.4 The Technical Part shall not include any information related to the Bid price. Where material financial information related to the Bid price is contained in the Technical Part the Bid shall be declared non-responsive 11.5 In addition to the requirements under ITB 11.2, Bids submitted by a JV shall include a copy of the Joint Venture Agreement entered into by all members. Alternatively, a letter of intent to execute a Joint Venture Agreement in the event of a successful Bid shall be signed by all members and submitted with the Bid, together with a copy of the proposed Agreement. 11.6 The Bidder shall furnish in the Letter of Bid – Financial Part information on commissions and gratuities, if any, paid or to be paid to agents or any other party relating to this Bid
ITB 12. Process of Bid Preparation and Submission	12.1 The Letter of Bid – Technical Part, Letter of Bid – Financial Part, and Price Schedules shall be prepared, using the relevant forms furnished in Section IV, Bidding Forms. The forms must be completed as instructed in each form without any alterations to the text, and no substitutes shall be accepted except as provided under ITB 21.3. All blank spaces shall be filled in with the information requested. 12.2 Entire Bid including the Letter of Bid – Technical Part, Letter of Bid – Financial Part, and filled-up Price Schedules shall be submitted online on e-procurement system specified in ITB 7.1. Details and process of online submission of the tender and relevant documents are given in the website mentioned above. Scanned copies of documents listed in ITB clauses 11 and 12.3 should also be uploaded on this website. 12.3 Submission of Original Documents: The bidders are required to separately submit (i) (i) original bid security , in approved form,

with the office **specified in the BDS**, before the opening of the technical part of the Bid, either by registered/speed post/courier or by hand, failing which such bids will be declared non-responsive and will not be opened. Hard copy of rest of the bid or any other document are not to be submitted.

Note for Bidders: Bidders have to submit the bids on the e-procurement portal along with the relevant required documents. For this purpose, the bidders shall fill up online, the forms that are available for online filling on the e-procurement portal. The rest of the forms shall be download by the bidders and filled up. The filled-up pages shall then be scanned and uploaded on the e-procurement portal along with the scanned copies of the supporting documents.

The Electronic Form of the bid for the Price Part/Second Envelope, as available on the TCIL portal as a summary of the total Project price, is “Termed as ELECTRONIC FORM”

Detailed Price Bid (in Excel version) comprising of various Price schedules/Schedule of Rates (SOR) is “Termed as MAIN BID”. As part of the Electronic Encrypted functionality, the contents of both the ‘Electronic Forms’ and the ‘Main-Bid’ are securely encrypted using a Pass-Phrase created by the Bidder himself. Unlike a ‘password’, a Pass-Phrase can be a multi-word sentence with spaces between words (e.g. I love this World). A Pass-Phrase is easier to remember, and more difficult to break. It is mandatory that a separate Pass-Phrase be created for each Bid-Part. This method of bid-encryption does not have the security and data-integrity related vulnerabilities which are inherent in e-tendering systems which use Public-Key of the specified officer of a Buyer organization for bid-encryption. Bid-encryption in ETS is such that the Bids cannot be decrypted before the Public Online Tender Opening Event (TOE), even if there is connivance between the concerned tender-opening officers of the Buyer organization and the personnel of e-tendering service provider.

CAUTION: All bidders must fill Electronic Form for each bid-part sincerely and carefully and avoid any discrepancy between information given in the Electronic Form™ and the corresponding Main-Bid.

If any variation is noted between the price mentioned in the Electronic Form and the Main Bid (Excel Version), the price mentioned in the Main Bid shall prevail.

In case of any discrepancy between the values mentioned in figures and in words, the value mentioned in words will prevail.

	The bidder shall make sure that the Pass-Phrase to decrypt the relevant Bid-Part is submitted into the ‘Time Locked Electronic Key Box (EKB)’ after the deadline of Bid Submission and before the commencement of the Online TOE of Technical Bid. The process of submission of this Pass-Phrase in the ‘Time Locked Electronic Key Box’ is done in a secure manner by first encrypting this Pass-Phrase with the designated keys provided by the Owner.
ITB 17. Bid Prices and Discounts	17.1 Bidders shall quote for the following components or services on a single responsibility basis: Complete plant facility including Design, Engineering, Supply, Construction, Erection, Testing & Commissioning of 160 MW Solar-Wind Hybrid Power Plant with BESS including 10 Years Plant O&M under International competitive bidding at Ramagiri, Anantapur district, Andhra Pradesh, India. The prices and discounts quoted by the Bidder in the Letter of Bid – Financial Part and in the Price Schedules shall conform to the requirements specified below. This includes all requirements under the Contractor’s responsibilities for testing, pre-commissioning and commissioning of the plant and, where so required by the bidding document, the acquisition of all permits, approvals and licenses, etc.; the operation, maintenance and training services and such other items and services as specified in the bidding document, all in accordance with the requirements of the General Conditions. Items against which no price is entered by the Bidder will not be paid for by the Employer when executed and shall be deemed to be covered by the prices for other items. Corrections if any, in the bid can be carried out by editing the information before electronic submission on e-procurement portal. 17.2 Bidders are required to quote the price for the commercial, contractual and technical obligations outlined in the bidding document. 17.3 Bidders shall give a breakdown of the prices in the manner and detail called for in the Price Schedules included in Section IV, Bidding Forms. 17.4 The Price Schedules will comprise the schedules listed below. Separate numbered Schedules included in Section IV, Bidding Forms, as mentioned below, shall be used for each of the elements of the Plant and Installation Services. The total amount from each

	Schedule corresponding to an element of the Plant and Installation Services shall be summarized in the schedule titled Grand Summary, (Schedule 7), giving the total bid price(s) to be entered in the Letter of Bid. Schedule 1 Plant and Mandatory Spare Parts Supplied from Abroad. Schedule 2 Plant and Mandatory Spare Parts Supplied from Within the Employer's Country. Schedule 3 Design Services. Schedule 4 Installation and Other Services. Schedule 5 Operation & Maintenance Schedule 6 Energy Generation for Plant facility in KWh Schedule 7 Grand Total Summary (Schedule Nos.1 to 5) Bidders shall note that the Plant and Equipment including mandatory Spares included in Schedule Nos. 1 and 2 above exclude materials used for civil, building and other construction works. Accordingly, all such works and materials shall be included and priced under Schedule No. 4, Installation & other Services. The bidder shall not carry out any modification or changes in any other cell. 17.5 In the Schedules, Bidders shall give the required details and a breakdown of their prices as follows: (a) Plant to be supplied from Aboard (Schedule No 1) : (i) CIP Entry Border Point/ CIF Indian Port of Entry. (ii) Final destination: Ramagiri, Anantapur district, Andhra Pradesh, India Bidder shall also be responsible and be liable for the payment of unloading, Custom clearances & Customs duty (i.e. Basic Customs duty, Cess, Safeguard Duty, GST etc.) on CIF Indian Port of Entry component of the Goods to be supplied from abroad. (b) Plant manufactured within the Employer's Country (Schedule No. 2):

	(i) The price of the plant shall be quoted on an EXW Incoterm basis (such as “ex-works,” “ex-factory,” “ex-warehouse” or “off-the-shelf,” as applicable); (ii) GST and all other taxes payable in the Employer’s Country on the plant if the contract is awarded to the Bidder; (c) Design Services (Schedule No. 3); with applicable taxes. (d) Installation Services shall be quoted separately (Schedule No. 4) and shall include rates or prices for local transportation to named place of final destination as specified in the BDS 17.5 (a) ii, insurance and other services incidental to delivery of the plant, all labor, contractor’s equipment, temporary works, materials, consumables and all matters and things of whatsoever nature, including operations and maintenance services, the provision of operations and maintenance manuals, training, etc., where identified in the bidding document, as necessary for the proper execution of the installation and other services, including all taxes, duties, levies and charges payable in the Employer’s Country as of twenty-eight (28) days prior to the deadline for submission of Bids; (e) Comprehensive Operation & Maintenance (O&M) charges for total 10 years period shall be quoted in Schedule 5/SOR 5. (f) The Energy Generation for 10 years period for the Plant facility in KWh is to be quoted in Schedule No 6/Schedule of Generation (SOG). The yearly Energy generation & thereby the total Energy generation for 10 years for the Solar Plant is already mentioned under SOG & bidders are required to provide the yearly Energy generation & thereby the total Energy generation for 10 years for the Wind Plant as verified by NIWE. Bidders may like to ascertain availability of tax/duty exemption benefits available in India to the contracts financed under World Bank loan/credits. They are solely responsible for obtaining such benefits which they have considered in their bid and in case of failure to receive such benefits for reasons whatsoever, the Employer will not compensate the bidder (contractor). The bidder shall furnish along with his bid a declaration to this effect in the Declaration Format provided in Section IV of the bidding documents. Where the bidder has quoted taking into account such benefits, it must give all information required for issue of certificates in terms of the Government of India’s relevant notifications as per form

	stipulated in Section IV. In case the bidder has not provided the required information or has indicated to be furnished later on in the Declaration Format, the same shall be construed that the goods/plant and equipment for which certificate is required is Nil. To the extent the Employer determines the quantity indicated therein are reasonable keeping in view the quantities in bill of quantities, construction program and methodology, the certificates will be issued within 60 days of signing of the contract and no subsequent changes will be permitted. In case of materials pertaining to Variation items and quantities the certificate shall be issued only on request from the contractor when in need and duly certified by the Project Manager. No certificate will be issued for items where no quantity/capacity of equipment is indicated in the statement. If the bidder has considered the tax/duty exemption for materials/plant and equipment to be bought for the work, the bidder shall confirm and certify that the Employer will not be required to undertake any responsibilities of the Government of India Scheme or the said exemptions being available during the contract execution, except issuing the required certificate. The bids which do not conform to the above provisions or any condition by the bidder which makes the bid subject to availability of tax/duty exemption for materials/plant and equipment or compensation on withdrawal of any variations to the said exemptions will be treated as non-responsive and rejected. Any delay in procurement of the materials/plant and equipment as a result of the above shall not be a cause for granting any extension of time.
ITB 21. Format and Signing of Bid	Replace existing clauses by the following: 21.1 The Bidder shall prepare the Bid as per details given in ITB 11 and ITB 22. 21.2 Bidders shall mark as “CONFIDENTIAL” information in their Bids which is confidential to their business. This may include proprietary information, trade secrets, or commercial or financially sensitive information. 21.3 The bid shall be signed by a person duly authorized to sign on behalf of the Bidder. The written confirmation of authorization to sign on behalf of the Bidder shall consist of: Power of Attorney as per the governing law of bidder’s country 21.4 In case the Bidder is a JV, the Bid shall be signed by an authorized representative of the JV on behalf of the JV, and so as to be legally

	binding on all the members as evidenced by a power of attorney signed by their legally authorized representatives. Documents establishing authority to sign the bid on behalf of the JV shall be uploaded along with the bid. 21.5 Corrections if any in the bid can be carried out by editing the information before electronic submission on e-procurement portal.
D. Online Submission and Opening of Bids	
ITB 22. Preparation of Bids	Replace existing clauses by the following: 22.1 Class of DSC required is: Class 3. Bids, both Technical and Financial Parts, shall be submitted online on the e-procurement system specified in BDS 7.1. Detailed guidelines for viewing bids and submission of online bids are given on the website. The Request for Bids under this Project is published on this website. Any citizen or prospective bidder can logon to this website and view the Request for Bids and can view the details of works for which bids are invited. A prospective bidder can submit its bid online; however, the bidder is required to have enrolment/registration in the website, and should have valid Digital Signature Certificate (DSC) in the form of smart card/e-token obtained from any certifying agency authorised by the Government of India. The bidder should register in the website using the relevant option available. Then the Digital Signature registration has to be done with the e-token, after logging into the website. The bidder can then login the website through the secured login by entering the password of the e-token & the user id/ password chosen during registration. After getting the bid schedules, the Bidder should go through them carefully and submit the specified documents, along with the bid, otherwise the bid will be rejected. 22.2 The completed bid comprising of documents indicated in ITB 12, should be uploaded on the e-procurement portal along with scanned copies of requisite certificates as are mentioned in different sections in the bidding document and scanned copy of the bid security or bid securing declaration as the case may be. 22.3 All the documents are required to be signed digitally by the bidder. After electronic on-line bid submission, the system generates a unique bid identification number which is time stamped as per server time. This shall be treated as acknowledgement of bid submission. 22.4 Physical, e-mail, Telex, Cable or Facsimile bids will be rejected as non-responsive.

ITB 23. Deadline for Submission of Bids	23.1 The deadline for online uploading Technical and Financial Parts of the Bids is: Date: 01/10/2018 Time: 1400 Hours
ITB 24. Late Bids	Replace existing clauses by the following: 24.1 The electronic bidding system would not allow any late submission of bids after due date & time as per server time.
ITB 25. Withdrawal, Substitution, and Modification of Bids	25.1 A Bidder may modify its bid by using appropriate option for bid modification on the e-procurement portal, before the deadline for submission of bids. For bid modification and consequential re-submission, the bidder is not required to withdraw the bid submitted earlier. The last modified bid submitted by the bidder within the bid submission time shall be considered as the bid. For this purpose, modification/withdrawal by other means will not be accepted. In online system of bid submission, the modification and consequential re-submission of bids is allowed any number of times. A bidder may withdraw its bid by using appropriate option for bid withdrawal, before the deadline for submission of bids, however, if the bid is withdrawn, re-submission of the bid is allowed within the bid submission deadline. (25.2 Bids requested to be withdrawn in accordance with ITB 25.1 shall not be opened. 25.3 No Bid may be withdrawn, substituted, or modified in the interval between the deadline for submission of Bids and the expiration of the period of Bid validity specified by the Bidder on the Letter of Bid – Technical Part and repeated in the Letter of Bid - Financial Part, or any extension thereof.
E. Public Opening of Technical Parts of Bids	
ITB 26. Public Opening of Technical Parts of Bids	26.1 The online Bid opening of the Technical Part of the bid submitted documents shall take place at: Solar Energy Corporation of India Limited, D - 3, 1st Floor, Wing - A, Prius Platinum, District Centre, Saket, New Delhi - 110 017 Date: 01/10/2018 Time: 1500 Hours

	The Employer shall publicly open Technical Parts of all bids received by the deadline at the date, time and place as mentioned above in the presence of Bidders' designated representatives and anyone who choose to attend, and this could also be viewed by the bidders online. The Financial Parts of the bids shall remain unopened in the e-procurement system, until the subsequent public opening, following the evaluation of the Technical Parts of the Bids. In all cases, original documents submitted as specified in ITB 12.3 shall be first scrutinized, and Bids that do not comply with the provisions of ITB 12.3 will be declared non-responsive and will not be opened. Thereafter bidder's names and such other details as the Employer may consider appropriate, will be notified online at the time of bid opening of the Technical Part of the bids. In the event of the specified date of bid opening being declared a holiday for the Employer, the bids shall be opened at the same time and venue on the next working day 26.2 The electronic summary of the bid opening will be generated and uploaded online. The Employer will also prepare minutes of the Bid opening, including the information disclosed such as (a) the name of the Bidder; (b) presence or absence of a Bid Security, Technical Part, and upload the same for viewing online. 26.3 Only Technical Parts of Bids, and Alternative Bids – Technical Parts if permitted in ITB 13, that are opened at Bid opening shall be considered further for evaluation.
F. Evaluation of Bids – General Provisions	
ITB 27. Confidentiality	27.1 Information relating to the evaluation of Bids and recommendation of contract award, shall not be disclosed to Bidders or any other persons not officially concerned with the Bidding process until information on Intention to Award the Contract is transmitted to all Bidders in accordance with ITB 42. In cases where ITB 42 is not applicable, such information shall not be disclosed until Notification of Award is transmitted in accordance with ITB 44. 27.2 Any effort by a Bidder to influence the Employer in the evaluation of the bids or Contract award decisions may result in the rejection of its Bid. 27.3 Notwithstanding 27.2, from the time of Bid opening to the time of Contract Award, if any Bidder wishes to contact the Employer on any matter related to the Bidding process, it should do so in writing.

ITB 30. Determination of Responsiveness	30.1 The Employer's determination of a Bid's responsiveness is to be based on the contents of the Bid itself, as defined in ITB11. 30.2 A substantially responsive Bid is one that meets the requirements of the bidding document without material deviation, reservation, or omission. A material deviation, reservation, or omission is one that: (c) if accepted, would: (i) affect in any substantial way the scope, quality, or performance of the Plant and Installation Services specified in the Contract; or (ii) limit in any substantial way, inconsistent with the bidding document, the Employer's rights or the Bidder's obligations under the proposed Contract; or (d) if rectified, would unfairly affect the competitive position of other Bidders presenting substantially responsive Bids. 30.3 The Employer shall examine the technical aspects of the Bid in particular, to confirm that all requirements of Section VII, Employer's Requirements have been met without any material deviation, reservation, or omission. 30.4 If a Bid is not substantially responsive to the requirements of the bidding document, it shall be rejected by the Employer and may not subsequently be made responsive by correction of the material deviation, reservation, or omission.
ITB 31. Nonmaterial Nonconformities	31.1 Provided that a Bid is substantially responsive, the Employer may waive any nonconformity in the Bid that does not constitute a material deviation, reservation or omission. 31.2 Provided that a Bid is substantially responsive, the Employer may request that the Bidder submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities in the Bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any aspect of the price of the Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid. 31.3 The adjustment shall be based on the highest price of the item or component as quoted in other substantially responsive Bids. If the price of the item or component

	cannot be derived from the price of other substantially responsive Bids, the Employer shall use its best estimate. Provided that a Bid is substantially responsive, the Employer shall rectify quantifiable nonmaterial nonconformities related to the Bid Price.
ITB 32. Correction of Arithmetical Errors	32.1 Provided that the bid is substantially responsive, the Employer shall correct arithmetical errors on the following basis: (a) If there is a discrepancy between the unit price and the total price, which is obtained by multiplying the unit price and quantity, or between subtotals and the total price, the unit or subtotal price shall prevail, and the total price shall be corrected. (b) Where there are errors between the total of the amounts of Schedule No-1 to 5 and the amount given in Schedule No.-7 (Grand Summary), the former shall prevail and the later will be corrected accordingly; and (c) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above. (d) If the Bidder that submitted the lowest evaluated bid does not accept the correction of errors, its bid shall be declared non-responsive
ITB 33. Conversion to Single Currency	33.1 The currency that shall be used for Bid evaluation and comparison purposes to convert (at the selling exchange rate) all Bid prices expressed in various currencies into a single currency is: Indian Rupees (INR) The source of exchange rate shall be: Reserve Bank of India (RBI) reference rates. The date for the exchange rate shall be: Deadline for online submission of Bids as per ITB 23.1 For evaluation and comparison purposes, the currency(ies) of the Bid shall be converted into a single currency as specified in the BDS.
ITB 34. Margin of Preference	No margin of domestic preference shall apply.
G. Evaluation of Technical Parts of Bids	

ITB 35. Evaluation of Technical Parts of Bids	Replace existing clauses by the following: 35.1 The Employer shall use the criteria and methodologies listed in this ITB and Section III, Evaluation and Qualification criteria. No other evaluation criteria or methodologies shall be permitted. 35.2 Technical Evaluation. The Employer will carry out a detailed technical evaluation of the Bids not previously rejected to determine whether the technical aspects are in compliance with the bidding document. The Bid that does not meet minimum acceptable standards of completeness, consistency and detail, and the specified minimum (or maximum, as the case may be) requirements for specified functional guarantees, will be rejected for non-responsiveness. In order to reach its determination, the Employer will examine and compare the technical aspects of the Bids on the basis of the information supplied by the Bidders, taking into account the following: (a) overall completeness and compliance with the Employer's Requirements; conformity of the Plant and Installation Services offered with specified performance criteria, including conformity with the specified minimum (or maximum, as the case may be) requirement corresponding to each functional guarantee, as indicated in the Specification and in Section III, Evaluation and Qualification Criteria; suitability of the Plant and Installation Services offered in relation to the environmental and climatic conditions prevailing at the site; and quality, function and operation of any process control concept included in the Bid; (b) type, quantity and long-term availability of mandatory and recommended spare parts and maintenance services; and (c) other relevant factors, if any, listed in Section III, Evaluation and Qualification Criteria. 35.3 Where alternative technical solutions have been allowed in accordance with ITB 13, and offered by the Bidder, the Employer will make a similar evaluation of the technical parts of the alternatives. Where alternatives have not been allowed but have been offered, they shall be ignored.

Add following sub clauses to the clause 35:

Public opening of Financial Parts:

35.4 Following the completion of the evaluation of the Technical Parts of the Bids, and the Bank has issued its no objection (if applicable), the Employer shall notify in writing those Bidders whose Bids were considered non-responsive to the bidding document or failed to meet the Qualification Criteria, advising them of the following information:

- (a) the grounds on which their Technical Part of Bid failed to meet the requirements of the bidding document;
- (b) their Financial Part of Bid shall not be opened; and
- (c) notify them of the date and time for public opening of Financial Parts of the Bids.

35.5 The Employer shall, simultaneously, notify in writing those Bidders whose Technical Part have been evaluated as substantially responsive to the bidding document and met all Qualifying Criteria, advising them of the following information:

- (a) their Bid has been evaluated as substantially responsive to the bidding document and met the Qualification Criteria;
- (b) their Financial Part of Bid will be opened at the public opening of the Financial Parts; and Following the completion of the evaluation of the Technical Parts of the Bids, the Employer will notify all Bidders of the location, date and time of the public opening of Financial Parts.

In addition to the above the Employer shall publish a notice of the public opening of the Financial Parts of the Bid on its website www.seci.co.in notify them of the date and time of the second public opening of the Financial Parts of the Bids, as specified in the BDS.

35.6 The opening date should allow Bidders sufficient time to make arrangements for attending the opening. The Financial Part of the Bids shall be opened publicly in the presence of Bidders' designated representatives and anyone who chooses to attend, and this could also be viewed by the bidders online. The bidder's names, the Bid prices, the total amount of each bid, per lot (contract) if applicable, including any discounts, and such other details as the Employer may consider appropriate, will be notified online by the Employer at the time of bid opening.

	In the event of the specified date of bid opening being declared a holiday for the Employer, the bids will be opened at the appointed time and location on the next working day. 35.7 The electronic summary of the bid opening will be generated and uploaded online. The Employer will also prepare minutes of the Bid opening, including the information disclosed and upload the same for viewing online. Only Financial Parts of Bids and discounts that are opened at Bid opening shall be considered further for evaluation. Evaluation of Financial Parts: 35.8 The Employer shall use the criteria and methodologies listed in this ITB and Section III, Evaluation and Qualification criteria. No other evaluation criteria or methodologies shall be permitted. By applying the criteria and methodologies the Employer shall determine the Most Advantageous Bid. 35.9 To evaluate the Financial Part, the Employer shall consider the following: (a) the Bid price, excluding Provisional Sums and the provision, if any, for contingencies in the Price Schedules; (b) price adjustment for correction of arithmetic errors in accordance with ITB 32 - not used; (c) price adjustment due to discounts offered in accordance with ITB 17.11; (d) price adjustment due to quantifiable nonmaterial nonconformities in accordance with ITB 31; (e) converting the amount resulting from applying (a) to (c) above, if relevant, to a single currency in accordance with ITB 33; and (f) The adjustments shall be determined using the following criteria, from amongst those set out in Section III, Evaluation and Qualification Criteria: Deviation in Time for Completion: No Life cycle costs: the projected operating and maintenance costs during the life of the goods or equipment: No Functional Guarantees of the Facilities: Yes Work, services, facilities, etc., to be provided by the Employer: No

	35.10 If price adjustment is allowed in accordance with ITB 17.7, the estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in Bid evaluation. 35.11 If this bidding document allows Bidders to quote separate prices for different lots (contracts), and the award to a single Bidder of multiple lots (contracts), the methodology to determine the lowest evaluated cost of the lot (contract) combinations, including any discounts offered in the Letter of Bid – Financial Part, is specified in Section III, Evaluation and Qualification Criteria Most Advantageous Bid: 35.12 Having compared the evaluated costs of Bids, the Employer shall determine the Most Advantageous Bid. The Most Advantageous Bid is the Bid of the Bidder that meets the Qualification Criteria and whose Bid has been determined to be: (a) substantially responsive to the bidding document; and (b) the lowest evaluated cost. The capabilities of the manufacturers and subcontractors proposed in its Bid to be used by the Bidder with the Most Advantageous Bid for identified major items of supply or services will also be evaluated for acceptability in accordance with Section III, Evaluation and Qualification Criteria. Their participation should be confirmed with a letter of intent between the parties, as needed. Should a manufacturer or subcontractor be determined to be unacceptable, the Bid will not be rejected, but the Bidder will be required to substitute an acceptable manufacturer or subcontractor without any change to the Bid price. Prior to signing the Contract, the corresponding Appendix to the Contract Agreement shall be completed, listing the approved manufacturers or subcontractors for each item concerned.
ITB 36. Comparison of Financial Parts	Replace ITB 35.4 with 35.8 – 35.11

ITB 39. Eligibility and Qualification of the Bidder	Replace existing clauses by the following: 39.1 The Employer shall determine to its satisfaction whether the eligible Bidders that have submitted substantially responsive Bid - Technical Parts meet the qualifying criteria specified in Section III, Evaluation and Qualification Criteria. 39.2 The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB 15. The determination shall not take into consideration the qualifications of other firms such as the Bidder's subsidiaries, parent entities, affiliates, subcontractors (other than Specialized Subcontractors if permitted in the bidding document), or any other firm different from the Bidder. 39.3 If a Bidder does not meet the qualifying criteria specified in Section III, Evaluation and Qualification Criteria, its Bid shall be rejected by the Employer and may not subsequently be made responsive by correction of the material deviation, reservation, or omission. 39.4 Only Bids that are both substantially responsive to the bidding document, and meet all Qualification Criteria shall have the Financial Parts of their Bids opened at the second public opening.
ITB 43. Award Criteria	Replace existing clauses by the following: 43.1 Subject to ITB 40, the Employer shall award the Contract to the successful Bidder. This is the Bidder whose Bid has been determined to be the Most Advantageous Bid as specified in ITB 35.12.
ITB 44. Notification of Award	Replace existing clauses by the following: 41.1 Prior to the expiration of the Bid Validity Period, and upon expiry of the Standstill Period, specified in ITB 44.1 or any extension thereof, and upon satisfactorily addressing any complaint that has been filed within the Standstill Period, the Employer shall notify the successful Bidder, in writing, that its Bid has been accepted. The notification of award (hereinafter and in the Contract Forms called the "Letter of Acceptance") shall specify the sum that the Employer will pay the

	Contractor in consideration of the execution of the contract (hereinafter and in the Conditions of Contract and Contract Forms called “the Contract Price”). 41.2 Within ten (10) Business Days after the date of transmission of the Letter of Acceptance, the Employer shall publish the Contract Award Notice which shall contain, at a minimum, the following information: (a) name and address of the Employer; (b) name and reference number of the contract being awarded, and the selection method used; (c) names of all Bidders that submitted Bids, and their Bid prices as read out at Bid opening, and as evaluated; (d) names of all Bidders whose Bids were rejected either as nonresponsive or as not meeting qualification criteria, or were not evaluated, with the reasons therefor; (e) the name of the successful Bidder, the final total contract price, the contract duration and a summary of its scope; and (f) successful Bidder’s Beneficial Ownership Disclosure Form, if specified in BDS ITB 49.1. 41.3 The Contract Award Notice shall be published on a National website (GoI website http://tenders.gov.in or GoI Central Public Procurement Portal https://eprocure.gov.in/cpppp/) or on the Employer’s website with free access if available, or in at least one newspaper of national circulation in the Employer’s Country, or in the official gazette. The Employer shall also publish the contract award notice in UNDB online. 41.4 Until a formal contract is prepared and executed, the Letter of Acceptance shall constitute a binding Contract
ITB 46. Signing of Contract	Add following to the existing clause 46.1: 46.1 The successful Bidder shall submit the Beneficial Ownership Disclosure Form. Replace existing clauses by the following 46.2: 46.2 The successful Bidder shall sign, date and return to the Employer, the Contract Agreement within twenty-eight (28) days of its receipt along with (a) the performance security in accordance with ITB Clause 47; and (b) if the successful bidder is a JV, the JV

	agreement duly signed by all the members, if it had submitted only a letter of intent to execute the JV agreement.
ITB 47. Performance Security	Add following to the existing clause 47.1: 47.1 The performance security of a Joint Venture shall be in the name of the Joint Venture specifying the names of all members.
ITB 48. Procurement Related Complaint	Replace existing clauses by the following: 48.1 The procedures for making a Procurement-related Complaint are detailed in the “Procurement Regulations for IPF Borrowers (Annex III).” If a Bidder wishes to make a Procurement-related Complaint, the Bidder should submit its complaint following these procedures, in writing (by the quickest means available, that is either by email or fax), to: Kind attention: Mr Sanjay Sharma, GM (C&P) Solar Energy Corporation of India Limited D3, Wing A, Ist Floor, Prius Platinum Building, Saket District Centre, Saket, New Delhi 110017 Telephone Nos.: - 0091-(0)11-71980290/256 E mail: contracts@seci.co.in Bidders may refer the “Complaint handling Procedure for Procurement” given at the following link on the Employer’s website at www.seci.co.in. http://seci.co.in/other_page.php?page=documents_faq&mmid=5 In summary, a Procurement-related Complaint may challenge any of the following: the terms of the Bidding Documents; and the Employer’s decision to award the contract. 48.2 The procedures for making a Procurement-related Complaint are as specified in the BDS.

Section III - Evaluation and Qualification Criteria

This Section contains all the criteria that the Employer shall use to evaluate Bids and qualify Bidders. No other factors, methods or criteria shall be used other than those specified in this bidding document.

The Bidder shall provide all the information requested in the forms included in Section IV, Bidding Forms.

In line with the two-envelope bidding process, this section includes Evaluation and Qualification Criteria:

- (i) Technical Part; and
- (ii) Financial Part

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The Employer shall use the criteria and methodologies listed in this Section to evaluate Bids. By applying the criteria and methodologies, the Employer shall determine the Most Advantageous Bid. This is the Bid of the Bidder that meets the qualification criteria and whose Bid has been determined to be:

- (a) substantially responsive to the bidding document; and
- (b) the lowest Evaluated Bid Values per kWh (EBV kWh).

1. Evaluation – Technical Part

1.1 Technical Evaluation:

The Employer will carry out a detailed technical evaluation of the Bids to determine whether the technical aspects are in compliance with the bidding document. The Bid that does not meet minimum acceptable standards of completeness, consistency and detail, and the specified minimum (or maximum, as the case may be) requirements for specified functional guarantees, will be rejected for non-responsiveness.

Evaluation of the Bidder's Technical Proposal will include apart from others (i) an examination of the technical aspects of the Bid in particular to confirm that all requirements of Section VII, Purchaser's Requirements have been met without any material deviation, reservation, or omission; (ii) that the bid is technically complete and responsive in terms of ITB 35; and (iii) an assessment of the Bidder's experience and technical capacity in terms of ITB 39 for timely supply of plant and installation services and achievement of specified performance parameters etc.

Where alternative technical solutions have been allowed in accordance with ITB 13, and offered by the Bidder, the Employer will make a similar evaluation of the alternatives. Where alternatives have not been allowed but have been offered, they shall be ignored.

In addition to the criteria listed in ITB 35.2 (a) – (b) the following factors shall apply: NA

1.1 Economic Evaluation/Financial Evaluation:

Evaluated Bid Values per kWh (EBV kWh) for all the Bidders shall be compared to determine the lowest evaluated bid value per kWh & the lowest (L1) evaluated Bid as such, will be selected for the Notification of intent to Award. The detailed evaluation methodology is explained below which defines the ratio between Evaluated Bid Value (EBV) and Energy Generation (Guaranteed Solar Energy generation in kWh for 10 years + NIWE certified Wind Energy generation in kWh for 10 years) of the Plant Facility for 10 years (GS+GW).

Evaluated Bid Values per kWh = (Evaluated Bid Value)/ Energy Generation (Guaranteed Solar Energy generation in kWh for 10 years + NIWE certified Wind Energy generation in kWh for 10 years) of the Plant Facility for 10 years (GS+GW).

$$EBV kWh = \frac{EBV}{GS + GW}$$

A. Evaluated Bid Value (EBV)

The Evaluated Bid Value (EBV) shall be calculated using the following method:

- i. Contract Value i.e., Total sum of:
 - The price comprising of Plant and Mandatory Spare Parts Supplied from Abroad including custom duty as per Schedule No 1/SOR 1, Plus
 - Ex Works basis Supply of Plant and Mandatory Spare Parts Supplied from Within the Employer's Country including GST as per Schedule No 2/SOR 2, Plus
 - Design Services including GST/Taxation as per Schedule No 3/SOR 3, Plus
 - Freight (Inland) & Transportation charges for delivery at site and Insurance of all Equipments and materials including mandatory spares and any other supplies specified in the Bidding Documents, providing all services i.e. unloading, storage, handling at site, Civil works, Erection, Installation, Testing and Commissioning, performance testing in respect of all the equipment's supplied and any other services specified in the Bidding Documents including Goods & Service Tax / Taxation as per the Technical Scope of Work for the Plant Facilities (Solar, Wind, BESS and Common Infra) as per Schedule No 4/SOR 4, plus
 - Net Present Value (NPV) of O&M Price including GST/Taxation for the 10 years O&M period for the plant facilities to be calculated at a discounting rate as per Price Schedule No 5/SOR 5

B. Energy Generation**Wind Plant (GW)**

- i. Bidders are required to submit the Independent Energy Yield Assessment Report for Wind Plant prepared by NIWE based on the criteria specified in the Bidding Document under Section VII, Employer's requirement.
- ii. Bidders are required to fill up in the Schedule of Generation (SOG) under Section IV for Wind Energy Generation in KWh for 10 years which is duly certified by NIWE. The value of Wind Energy Generation in kWh for 10 years for 40 MW (+10%) Wind Power Plant for long term at P90 (10 Years) level and CUF not less than 25%, shall be duly certified by NIWE and the same shall be considered for the evaluation purpose only.
- iii. The formula for the calculation of Capacity Utilization Factor (CUF) is provided under Section VII, Employer's requirement.

- iv. The Bidders shall get the Wind Energy Generation in kWh for 10 years certified by NIWE prior to submission of bid.
- v. The decision of NIWE regarding Wind Energy Generation in kWh for 10 years for proposed WTG models by the bidders shall be final and binding on the bidders and same shall be considered for the evaluation purpose.
- vi. The Wind Energy Generation in kWh for proposed models as mentioned in the SOG under Section IV of the bidding documents should match with the Wind Energy Generation in kWh as per NIWE Independent EYA report. In case of non-conformity of generation with the above conditions or mismatch of SOG and NIWE Independent EYA report, the bid shall be rejected , as this Wind Energy Generation in kWh for 10 years mentioned is one of the parameters for the Bid evaluation.
- vii. The Wind Energy Generation in kWh for 10 years as above shall remain unchanged and the bidders shall not be allowed to alter/modify it during entire bidding process.

Solar Plant (GS)

- i. Bidders have to provide a Guaranteed Solar Energy Generation of **2,241,135,154** KWh @ Solar CUF(Capacity Utilization Factor) 22% for 10 years.
- ii. This Guaranteed Solar Energy Generation of **2,241,135,154** KWh for 10 years will remain fixed & same shall be considered for the evaluation purpose only.
- iii. Following is the breakup of Guaranteed Solar Energy generation of 10 years on Annual basis.

Year	Guaranteed Solar Energy generation (KWh)
1	231264000
2	229645152
3	228037636
4	226441372
5	224856283
6	223282289
7	221719313
8	220167278
9	218626107
10	217095724
<u>Total Generation for 10 years</u>	<u>2,241,135,154</u>

- iv. The respective penalties on yearly generation shortfall related to the above mentioned Guaranteed Solar Energy generation (KWh) will be calculated accordingly, which is mentioned under the Section VII, Employer's requirement.

Energy Generation (Guaranteed Solar Energy generation in kWh for 10 years + NIWE certified Wind Energy generation in kWh for 10 years) of the Plant Facility for 10 years (GS+GW).

The Energy Annual Energy Generation in kWh for plant facilities for 10 years will be arrived by summing up the NIWE certified Wind Energy generation in kWh for 10 years and Guaranteed Solar Energy generation in kWh for 10 years.

Energy Generation =

GS+GW = NIWE certified Wind Energy generation in kWh for 10 years + **2,241,135,154**

Evaluated Bid Values per kWh (EBVkWh) shall be calculated as per formula below

$$EBVkWh = \frac{EBV}{GS + GW}$$

An illustrative method of evaluation is explained below for reference:

	Bidder 1	Bidder 2
Evaluated Bid Value	EBV1 (INR)	EBV2 (INR)
Energy Generation (Guaranteed Solar Energy generation in kWh for 10 years + NIWE certified Wind Energy generation in kWh for 10 years) of the Plant Facility for 10 years (GS+GW).	G 1	G 2
Evaluated Bid Value per kWh	EBVkWh1 = EBV1 (INR)/G1	EBVkWh2 = EBV2 (INR)/G2

- C. EBVkWh Factor for the mentioned Evaluated Bid Value per kWh will be considered up to 4 decimal places only
- D. If Evaluated Bid Value per kWh for Bidder 1 (EBVkWh1) is less than Evaluated Bid Value per kWh of Bidder 2 (EBVkWh2), then such **Bidder 1** in this case will be selected for the notification of award, subject to the Bidder 1 (EBVkWh1) selection is done
- E. Bidder with lowest EBVkWh shall be L-1, Bidder with Second lowest EBVkWh shall be L-2 & so on, subject to the Bidder selection is done

- F. The Evaluated Bid Value shall be inclusive of GST / Taxation components. The notification of intent to award shall be placed excluding GST / Taxation as against the taxation bifurcation submitted by the successful bidder during the tendering stage.
- G. **Discounting Rate (r) for NPV calculation is considered as 9.08%**
- H. **Bidders are required to go through the attached Price Schedules/SOR 1,2,3,4,5,7 & SOG sheets under Section IV for the submission of Price Bids & Wind Energy generation in kWh for 10 years**
- I. The Evaluated Bid value in this tender is inclusive of GST/Any other applicable taxes & accordingly, the tender evaluation is to be done for the total Project price inclusive of GST/Any other applicable taxes. Hence, the reimbursement of GST/any other applicable tax by the Employer shall only be at the **CEILING of GST/Taxation charges** as mentioned by the Bidder in the Price Schedules/Schedule of Rates at the time of bidding. Bidders are required to quote the applicable GST/Other taxes with due diligence & appropriate Financial prudence, as afterwards bidders will not be able to change or claim the GST charges already quoted in the bidding process.

1.2 Evaluation – Financial Part

The following factors and methods will apply:

(a) Time Schedule: NA

Time to complete the Plant and Installation Services from the effective date specified in Article 3 of the Contract Agreement for determining time for completion of pre-commissioning activities is: _____. No credit will be given for earlier completion.

Or

Time to complete the Plant and Installation Services from the effective date specified in Article 3 of the Contract Agreement for determining time for completion of pre-commissioning activities shall be between _____ minimum and _____ maximum. The adjustment rate in the event of completion beyond the minimum period shall be _____ (%) for each week of delay from that minimum period. No credit will be given for completion earlier than the minimum designated period. Bids offering a completion date beyond the maximum designated period shall be rejected.

(b) Life Cycle Costs:

Since the operating and maintenance costs of the facilities being procured form a major part of the **life cycle cost** of the facilities, these costs will be evaluated according to the

principles given hereafter, including the cost of spare parts for the initial period of operation stated below and based on prices furnished by each Bidder in Price Schedule Nos. 1 and 2, as well as on past experience of the Employer or other employers similarly placed. Such costs shall be added to the Bid price for evaluation.

Option 1:

The operating and maintenance costs factors for calculation of the life cycle cost are:

- (i) number of years for life cycle: 10 [Ten] years
- (ii) operating costs [NA]
- (iii) maintenance costs, including the cost of spare parts for the initial period of operation [As per Price Schedule 5], and
- (iv) Discount rate: 9.08% [Nine point zero eight percent] to be used to discount to present value all annual future costs calculated under (ii) and (iii) above for the period specified in (i).

(c) Functional Guarantees of the Facilities – financial aspects:

The functional Guarantees & their associated penalties for the Non-performance are mentioned under the Section VII, Employer's requirement.

Required Functional Guarantee	Value of Functional Guarantee of the Proposed Plant and Equipment
1. Minimum value of Guaranteed Solar Energy Generation in kWh for 10 years period	<u>2,241,135,154 kWh</u>
2. Independent Energy Yield Assessment Report for Wind Plant prepared by NIWE based on the criteria specified in the Bidding Document under Section VII, Employer's requirement for 10 years period	To be filled by the bidder

(d) Works, services, facilities, etc., to be provided by the employer: NA

(e) Sustainable procurement: NA

(f) Alternative technical solutions for specified parts – financial aspects: NA

(g) Specific additional criteria: NA

1.3 Multiple Contracts (ITB 35.4) : NA

2. Qualification

Factor	1 Eligibility						
Sub-Factor	Criteria						Documentation Required
	Requirement	Bidder					
		Single Entity	Joint Venture (existing or intended)				
			All members combined	Each Member	At least one Member		
1.1 Nationality	Nationality in accordance with ITB 4.4.	Must meet requirement	must meet requirement	Must meet requirement	N / A	Form ELI –1.1 and 1.2, with attachments	
1.2 Conflict of Interest	No- conflicts of interests as described in ITB 4.2	Must meet requirement	must meet requirement	Must meet requirement	N / A	Letter of Bid	
1.3 Bank Ineligibility	Not having been declared ineligible by the Bank as described in 4.5.	Must meet requirement	must meet requirement	Must meet requirement	N / A	Letter of Bid	
1.4 State Owned Enterprise or Institution	Compliance with conditions of ITB 4.6	Must meet requirement	Must meet requirement	Must meet requirement	N / A	Form ELI –1.1 and 1.2, with attachments	
1.5 Ineligibility based on a United Nations resolution or Borrower’s country law	Not having been excluded as a result of the Borrower’s country laws or official regulations, or by an act of compliance with UN Security Council resolution, in accordance with ITB 4.8 and Section V.	Must meet requirement	must meet requirement	Must meet requirement	N / A	Letter of Bid	

Factor	2. Historical Contract Non-Performance					
Sub-Factor	Criteria					Documentation Required
	Requirement	Bidder				
		Single Entity	Joint Venture (existing or intended)			
			All members combined	Each member	At least one member	
2.1 History of non-performing contracts	Non-performance ¹ of a contract did not occur within the last 05 (Five) years prior to the deadline for application submission, based on all information on fully settled disputes or litigation. A fully settled dispute or litigation is one that has been resolved in accordance with the Dispute Resolution Mechanism under the respective contract, and where all appeal instances available to the Bidder have been exhausted.	Must meet requirement by itself or as member to past or existing JV	Must meet requirement	Must meet requirement ²	N / A	Form CON - 2

¹ Nonperformance, as decided by the Employer, shall include all contracts where (a) nonperformance was not challenged by the contractor, including through referral to the dispute resolution mechanism under the respective contract, and (b) contracts that were so challenged but fully settled against the contractor. Nonperformance shall not include contracts where Employers decision was overruled by the dispute resolution mechanism. Nonperformance must be based on all information on fully settled disputes or litigation, i.e. dispute or litigation that has been resolved in accordance with the dispute resolution mechanism under the respective contract and where all appeal instances available to the Bidder have been exhausted.

² This requirement also applies to contracts executed by the Bidder as JV member.

Factor	2. Historical Contract Non-Performance					
Sub-Factor	Criteria					Documentation Required
	Requirement	Bidder				
		Single Entity	Joint Venture (existing or intended)			
			All members combined	Each member	At least one member	
2.2 Suspension	Not under suspension based on execution of a Bid Securing Declaration or Proposal Securing Declaration pursuant to ITB 4.7 and ITB 20.9	Must meet requirement	Must meet requirement	Must meet requirement	N / A	Letter of Bid
2.3 Pending Litigation	Bid’s financial position and prospective long-term profitability still sound according to criteria established in 3.1 below and assuming that all pending litigation will be resolved against the Bidder	Must meet requirement	Must meet requirement	Must meet requirement	N / A	Form CON – 2
2.4 Litigation History	No consistent history of court/arbitral award decisions against the Bidder ³ since <u>1st January 2013</u>	Must meet requirement	Must meet requirement	Must meet requirement	N / A	Form CON – 2

³ The Bidder shall provide accurate information on the related Letter of Bid about any litigation or arbitration resulting from contracts completed or ongoing under its execution over the last five years. A consistent history of awards against the Bidder or any member of a joint venture may result in failure of the Bid.

Factor	3 Financial Situation					
Sub-Factor	Criteria					Documentati on Required
	Requirement	Bidder				
		Single Entity	Joint Venture (existing or intended)			
			All members combined	Each member	At least one member	
3.1 Financial Capabilities	Submission of audited balance sheets or if not required by the law of the Bidder’s Country, other financial statements acceptable to the Employer, for the last <u>03 [Three] Financial years</u> to demonstrate the current soundness of the Bidders financial position and its prospective long-term profitability. The Net Worth” of the Bidder for the last financial year should be positive.	Must meet requirement	N / A	Must meet requirement	N / A	Form FIN – 3.1 with attachments
3.2 Average Annual Turnover	Minimum average annual turnover of INR 987 Crores (Indian Rupees Nine hundred & Eighty-Seven Crores) or USD 145 M (US Dollars One forty-five Million only) , within the last <u>03 (Three) years</u>	Must meet requirement	Must meet requirement	Must meet 20 (Twenty) percent (%) of the requirement	Must meet 50 (Fifty) percent (%) of the requirement (Such Member will be called	Form FIN –3.2

Factor	3 Financial Situation					
Sub-Factor	Criteria					Documentation on Required
	Requirement	Bidder				
		Single Entity	Joint Venture (existing or intended)			
			All members combined	Each member	At least one member	
					as Lead Member/partner)	
3.3 Financial Resources	The Bidder must demonstrate access to, or availability of, financial resources such as liquid assets & lines of credit, other than any contractual advance payments to meet: (i) the following cash-flow requirement: INR 165 Crores (Indian Rupees One hundred & sixty-Five Crores) or USD 25 M (US Dollars Twenty-Five Million only)	Must meet requirement	Must meet requirement	Must meet 20 (Twenty) percent (%) of the requirement	Must meet 50 (Fifty) percent (%) of the requirement (Such Member will be called as Lead Member/partner)	Form FIN –3.3

Factor	4 Experience					
Sub-Factor	Criteria					Documentat ion Require d
	Requirement	Bidder				
		Single Entity	Joint Venture (existing or intended)			
			All members combined	Each member	At least one member	
4.1 General Experience	Experience in Renewable Energy under contracts in the role of <i>contractor</i> , subcontractor, or management contractor for at least the last 03 (Three) years.	Must meet requirement	Must meet requirement	N /A	Must meet requirement	Form EXP-4.1

4.2(a) Specific Experience	For Solar: Participation as contractor, joint venture member, management contractor, or subcontractor: (A) Must have experience in development of Grid connected Ground mounted Solar Projects on Turnkey basis including Design, Engineering, Procurement, Construction, Installation, Testing and Commissioning of Solar PV Power Plant and Solar Systems of cumulative Capacity not less than <u>96 MW (Ninety-Six Mega Watt) (AC)</u> or above in last Five years as on last date of bid submission. However, such Grid connected Ground mounted Solar PV Power Plant and Solar Systems capacity must have been in satisfactory operation for at least <u>12 (Twelve)</u> months from the date of commissioning. Such cumulative capacity of <u>96 MW (Ninety-Six Mega Watt) (AC)</u> as mentioned above should have been achieved with the minimum individual Project capacities of <u>15 MW (Fifteen Mega Watt) (AC)</u> each or above	Must meet requirement	Must meet requirements	N / A	Must meet requirements	Form EXP 4.2(a)

4.2(b) Specific Experience	For Wind: Participation as contractor, joint venture member, management contractor, or subcontractor: (A) Must have experience in development of Grid connected Wind Power Projects on Turnkey basis including Design, Engineering, Procurement, Construction, Installation, Testing and Commissioning of Wind Power Plant of cumulative Capacity not less than <u>128 MW (One hundred & twenty-eight Mega Watt)</u> or above in last Five years as on last date of bid submission. However, such Grid connected Wind Power Projects capacity must have been in satisfactory operation for at least <u>12 (Twelve)</u> months from the date of commissioning. Such cumulative capacity of <u>128 MW (One hundred & twenty-eight Mega Watt)</u> as mentioned above should have been achieved with the minimum individual Project capacity of <u>15 MW (Fifteen Mega Watt)</u> or above	Must meet requirement	Must meet requirements	N / A	Must meet requirements	Form EXP-4.2(b)

4.2(c) Specific Experience	For BESS: Participation as contractor, joint venture member, management contractor, or subcontractor: (A) Must have experience of having successfully completed Design, Engineering, Procurement, Construction, Installation, Testing and Commissioning of Grid Connected Battery Energy Storage System (BESS) of at least 03 (Three) Grid connected BESS Plants of each having an individual capacity of 05 MWh (Five Mega Watt Hour) or above in last Five years as on last date of bid submission. However, such BESS Plant capacity must have been in satisfactory operation for at least 12 (Twelve) months from the date of commissioning	Must meet requirement	Must meet requirement	N /A	Must meet requirement	

Note: (In reference to clause No 4.2 (c) specific experience as mentioned above:

1. If the BESS provider is participating as a subcontractor to the bidder then the Bidder shall submit the list of proposed BESS makes they intend to provide along with the submission of Technical documents, also with the credentials for all those makes and all such mentioned makes shall satisfy the Qualification requirements mentioned in the bidding document. During the execution of the Project, the supplied make of the BESS by the bidder shall have to be mandatorily among the list of makes submitted by the bidder during the Techno commercial stage.

2. The Performance Certificate must be issued minimum 12 (Twelve) months from the date of commissioning. The Performance Certificate/Joint meter reading (JMR) reports shall be issued from any state/ central owned agencies or state power departments or authorized representative of Power off taker (Discom/Private Power purchaser).

3. Except BESS, A job executed by a Bidder for its own plant/ projects cannot be considered as experience for the purpose of meeting the Eligibility Conditions of the Bidding documents. Also, the jobs executed for Subsidiary/ Fellow subsidiary/ Affiliate/ Holding company will not be considered as experience for the purpose of meeting Eligibility Conditions.

4. In case of BESS, this requirement can be met by a specialized subcontractor proposed by the bidder

5. Considered 1 USD = INR 68

2.5 Personnel: NA

The Bidder must demonstrate that it will have the personnel for the key positions that meet the following requirements:

The Bidder shall provide details of the proposed personnel and their experience records in the relevant Forms included in Section IV, Bidding Forms.

2.6 Equipment: NA

The Bidder must demonstrate that it will have access to the key Contractor's equipment listed hereafter:

The Bidder shall provide further details of proposed items of equipment using the relevant Form in Section IV.

2.7 Subcontractors:

If the BESS supplier is not participating as a JV Partner, then the qualifying requirements of the BESS subcontractor is specified in Technical specifications in Section VII, Employer's requirement

Failure to comply with this requirement will result in rejection of the subcontractor. The bidder will replace the subcontractor with a subcontractor meeting the above qualifying requirements.

In the case of a Bidder who offers to supply and install major items of supply under the contract that the Bidder did not manufacture or otherwise produce, the Bidder shall provide the manufacturer's authorization, using the form provided in Section IV, showing that the Bidder has been duly authorized by the manufacturer or producer of the related plant and equipment or component to supply and install that item in the Employer's Country. The Bidder is responsible for ensuring that the manufacturer or producer complies with the requirements of ITB 4 and 5 and meets the minimum criteria listed above for that item.

Section IV - Bidding Forms

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Letter of Bid – Technical Part

INSTRUCTIONS TO BIDDERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE DOCUMENT

The Bidder must prepare this Letter of Bid – Technical Part on stationery with its letterhead clearly showing the Bidder's complete name and business address.

Note: All italicized text is to help Bidders in preparing this form.

Date of this Bid submission: *[insert date (as day, month and year) of Bid submission]*

RFB No.: *[insert number of RFB process]*

Alternative No⁴: NA

To: *[insert complete name of Employer]*

We, the undersigned, hereby submit our Bid, in two parts, namely:

- (a) the Technical Part, and
- (b) the Financial Part

In submitting our Bid, we make the following declarations:

- (a) **No reservations:** We have examined and have no reservations to the bidding document, including Addenda issued in accordance with ITB 8;
- (b) **Eligibility:** We meet the eligibility requirements and have no conflict of interest in accordance with ITB 4;
- (c) **Bid-Securing Declaration:** We have not been suspended nor declared ineligible by the Employer based on execution of a Bid Securing Declaration or Proposal-Securing Declaration in the Employer's Country in accordance with ITB 4.7;
- (d) **Conformity:** We offer to provide design, supply and installation services in conformity with the bidding document of the following: [Design, Engineering, Supply, Construction, Erection, Testing & Commissioning of 160 MW Solar-Wind Hybrid Power Plant with BESS including 10 Years Plant O&M under International competitive bidding];
- (e) **Bid Validity Period:** Our Bid shall be valid for the period specified in BDS 19.1 (as amended if applicable) from the date fixed for the Bid submission deadline specified in BDS 23.1 (as amended if applicable), and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

⁴ Delete if not applicable

-
- (f) **Performance Security:** If our Bid is accepted, we commit to obtain a Performance Security in accordance with the bidding document;
- (g) **One Bid Per Bidder:** We are not submitting any other Bid(s) as an individual Bidder, and we are not participating in any other Bid(s) as a Joint Venture member, and meet the requirements of ITB 4.3, other than alternative Bids submitted in accordance with ITB 13;
- (h) **Suspension and Debarment:** We, along with any of our subcontractors, suppliers, consultants, manufacturers, or service providers for any part of the contract, are not subject to, and not controlled by any entity or individual that is subject to, a temporary suspension or a debarment imposed by the World Bank Group or a debarment imposed by the World Bank Group in accordance with the Agreement for Mutual Enforcement of Debarment Decisions between the World Bank and other development banks. Further, we are not ineligible under the Employer's Country laws or official regulations or pursuant to a decision of the United Nations Security Council;
- (i) **State-owned enterprise or institution:** *[select the appropriate option and delete the other] [We are not a state-owned enterprise or institution] / [We are a state-owned enterprise or institution but meet the requirements of ITB 4.6]⁵;*
- (j) **Binding Contract:** We understand that this Bid, together with your written acceptance thereof included in your Letter of Acceptance, shall constitute a binding contract between us, until a formal contract is prepared and executed;
- (k) **Not Bound to Accept:** We understand that you are not bound to accept the lowest evaluated cost Bid, the Most Advantageous Bid or any other Bid that you may receive; and
- (l) **Fraud and Corruption:** We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf engages in any type of Fraud and Corruption.

Name of the Bidder: **[insert complete name of person signing the Bid]*

Name of the person duly authorized to sign the Bid on behalf of the Bidder: ***[insert complete name of person duly authorized to sign the Bid]*

Title of the person signing the Bid: *[insert complete title of the person signing the Bid]*

Signature of the person named above: *[insert signature of person whose name and capacity are shown above]*

Date signed *[insert date of signing]* **day of** *[insert month], [insert year]*

⁵ Use one of the two options as appropriate

FORM

POWER OF ATTORNEY FOR BIDDING COMPANY

(To be stamped in accordance with Stamp Act, the Non-Judicial Stamp Paper of Appropriate Value should be in the name of the Bidder or equivalent to the rules applicable to international bidders as per their country)

Know all men by these presents, We (name and address of the registered office of the Bidding Company as applicable) do hereby constitute, appoint and authorize Mr./Ms. (name & residential address) who is presently employed with us and holding the position of as our true and lawful attorney, to do in our name and on our behalf, all such acts, deeds and things necessary in connection with or incidental to submission of our Bid for (insert details of Tender) in response to the Tender No dated issued by Solar Energy Corporation of India Limited (SECI), New Delhi including signing and submission of the Bid and all other documents related to the Bid, including but not limited to undertakings, letters, certificates, acceptances, clarifications, guarantees or any other document which the SECI may require us to submit. The aforesaid Attorney is further authorized for making representations to the Solar Energy Corporation of India Limited, New Delhi and providing information/ responses to SECI, New Delhi representing us in all matters before SECI, New Delhi and generally dealing with SECI, New Delhi in all matters in connection with Bid till the completion of the bidding process as per the terms of the above mentioned Tender.

We hereby agree to ratify all acts, deeds and things done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall be binding on us and shall always be deemed to have been done by us.

All the terms used herein but not defined shall have the meaning ascribed to such terms under the Tender.

Signed by the within named

..... **(Insert the name of the executant company)**

through the hand of

Mr.

duly authorized by the Board to issue such Power of Attorney

Dated this **day of**

Accepted

.....
Signature of Attorney
(Name, designation and address of the Attorney)

Attested

.....

(Signature of the executant)

(Name, designation and address of the executant)

.....

Signature and stamp of Notary of the place of execution

**Common seal of has been affixed in my/ our presence pursuant to
Board of Director's Resolution dated.....**

WITNESS

1.

(Signature)

Name.....

Designation

2.

(Signature)

Name.....

Designation

Technical Proposal

- Site Organization
- Method Statement
- Mobilization Schedule
- Construction Schedule
- Plant
- Contractor's Equipment
- Personnel
- Proposed Subcontractors for Major Items of Plant and Installation Services
- Others

Appendix to Technical Part

Site Organization

Appendix to Technical Part

Method Statement

Appendix to Technical Part

Mobilization Schedule

Appendix to Technical Part

Construction Schedule

Appendix to Technical Part

Plant

Appendix to Technical Part:
Not Applicable
Contractor's Equipment
 Form EQU

The Bidder shall provide adequate information to demonstrate clearly that it has the capability to meet the requirements for the key Contractor's equipment listed in Section III, Evaluation and Qualification Criteria. A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Bidder.

Item of equipment		
Equipment information	Name of manufacturer	Model and power rating
	Capacity	Year of manufacture
Current status	Current location	
	Details of current commitments	
Source	Indicate source of the equipment ☐ Owned ☐ Rented ☐ Leased ☐ Specially manufactured	

Omit the following information for equipment owned by the Bidder.

Owner	Name of owner	
	Address of owner	
	Telephone	Contact name and title
	Fax	Telex
Agreements	Details of rental / lease / manufacture agreements specific to the project	

Appendix to Technical Part

Functional Guarantees

Form FUNC

The Bidder shall copy in the left column of the table below, the identification of each functional guarantee required in the Specification and stated by the Employer in para. 1.3 of Section III, Evaluation and Qualification Criteria, and in the right column, provide the corresponding value for each functional guarantee of the proposed plant and equipment:-

The Required functional Guarantees related to each Plant (Solar, Wind & BESS) are mentioned under the Section VII, Employer's requirement. Bidders are required to fill in those Functional Guarantee here & provide their acceptance accordingly for all such functional Guarantees.

Required Functional Guarantee	Value of Functional Guarantee of the Proposed Plant and Equipment
1. Minimum value of Guaranteed Solar Energy Generation in kWh for 10 years period	<u>2,241,135,154 KWh</u>
2.Independent Energy Yield Assessment Report for Wind Plant prepared by NIWE based on the criteria specified in the Bidding Document under Section VII, Employer's requirement for 10 years period	To be filled by the bidder

Appendix to Technical Part :

Not Applicable

Personnel

Form PER -1

Proposed Personnel

Bidders should provide the names of suitably qualified personnel to meet the specified requirements stated in Section III. The data on their experience should be supplied using the Form below for each candidate.

1.	Title of position*
	Name
2.	Title of position*
	Name
3.	Title of position*
	Name
4.	Title of position*
	Name

*As listed in Section III.

Appendix to Technical Part

Not Applicable

Form PER-2

Resume of Proposed Personnel

Name of Bidder

Position		
Personnel information	Name	Date of birth
	Professional qualifications	
Present employment	Name of employer	
	Address of employer	
	Telephone	Contact (manager / personnel officer)
	Fax	E-mail
	Job title	Years with present employer

Summarize professional experience over the last 20 years, in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

From	To	Company / Project / Position / Relevant technical and management experience

Appendix to Technical Part

Proposed Subcontractors for Major Items of Plant and Installation Services

A list of major items of Plant and Installation Services is provided below.

The following Subcontractors and/or manufacturers are proposed for carrying out the item of the facilities indicated. **Bidders are free to propose more than one for each item**

Major Items of Plant and Installation Services	Proposed Subcontractors/Manufacturers	Nationality
1. BESS	1. 2. 3. 4. 6. 7. 8. 9. 10.	

Refer the TS for the qualifying requirements for such BESS subcontractors

Appendix to Technical Part

Others - Time Schedule

(to be used by Bidder when alternative Time for **Completion is invited in ITB 13.2)**

Not Applicable

Appendix to Technical Part

Bidders Qualification

To establish its qualifications to perform the contract in accordance with Section III, Evaluation and Qualification Criteria the Bidder shall provide the information requested in the corresponding Information Sheets included hereunder.

Appendix to Technical Part**Form ELI 1.1****Bidder Information Sheet**

Date: _____

RFB No.: _____

Page _____ of _____ pages

1. Bidder's Legal Name
2. In case of JV, legal name of each party:
3. Bidder's actual or intended Country of Registration:
4. Bidder's Year of Registration:
5. Permanent Account Number (PAN) of the Bidder (Only for bidders of Employer's country)
6. GST No (Only for bidders of Employer's country)
7. Bidder's Legal Address in Country of Registration: (Address of Lead Partner/member in case of JV)
8. Bidder's Authorized Representative Information Name: Address: Telephone/Fax numbers: Email Address:

9. Attached are copies of original documents of

- ☐ Certificate of Incorporation & Article of Association & Memorandum of Association (or equivalent documents of constitution or association), and/or documents of registration of the legal entity named above, in accordance with ITB 4.4
- ☐ In case of JV, letter of intent to form JV or JV agreement, in accordance with ITB 4.1
- ☐ In case of state-owned enterprise or institution, in accordance with ITB 4.6, documents establishing:
 - Legal and financial autonomy
 - Operation under commercial law
 - Establishing that the Bidder is not under the supervision of the Employer

10. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership. *[If required under BDS ITB 49.1, the successful Bidder shall provide additional information on beneficial ownership, using the Beneficial Ownership Disclosure Form.]*

Appendix to Technical Part

Form ELI 1.2

Party to JV Information Sheet

Date: _____

RFB No.: _____

Page _____ of _____ pages

1. Bidder's Legal Name:
2. JV's Party legal name:
3. JV's Party Country of Registration:
4. JV's Party Year of Registration:
5. Permanent Account Number (PAN) of the Bidder (Only for bidders of Employer's country)
6 GST No (Only for bidders of Employer's country)
7. JV's Party Legal Address in Country of Registration: (For all JV members/Partners)
8. JV's Party Authorized Representative Information Name: Address: Telephone/Fax numbers: Email Address:
9. Attached are copies of original documents of ☐ Certificate of Incorporation & Article of Association & Memorandum of Association (or equivalent documents of constitution or association), and/or registration documents of the legal entity named above, in accordance with ITB 4.4. ☐ In case of a state-owned enterprise or institution, documents establishing legal and financial autonomy, operation in accordance with commercial law, and that they are not under the supervision of the Employer, in accordance with ITB 4.6.
10. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership. <i>[If required under BDS ITB 49.1, the successful Bidder shall provide additional information on beneficial ownership for each JV member using the Beneficial Ownership Disclosure Form.]</i>

FORM 1**FORM OF POWER OF ATTORNEY FOR JOINT VENTURE**

(On Non-judicial Stamp Paper of Appropriate value, if required as per laws of the country of the bidder, to be Purchased in the Name of Joint Venture or equivalent to rules applicable to international bidders as per their country)

KNOW ALL MEN BY THESE PRESENTS THAT WE , the Partners whose details are given hereunder have formed a Joint Venture under the laws of(*)/intend to form a Joint Venture(*) [(*) delete whichever is not applicable] and having our Registered Office(s)/Head Office(s) at (hereinafter called the 'Joint Venture' which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators and assigns) acting through M/s being the Partner in-charge do hereby constitute, nominate and appoint M/s..... a Company incorporated under the laws of and having its Registered/Head Office at as our duly constituted lawful Attorney (hereinafter called "Attorney" or "Authorised Representative" or "Partner In-charge") to exercise all or any of the powers for and on behalf of the Joint Venture in regard to Specification No..... Package the bids for which have been invited by Solar Energy Corporation of India (SECI) Limited., having its Registered Office at D - 3, 1st Floor, Wing - A, Prius Platinum Building, District Centre, Saket, New Delhi - 110017, India (hereinafter called the '**Employer**') to undertake the following acts :

- i) To sign and submit proposal and participate in the aforesaid Bid Specification of the Employer on behalf of the "Joint Venture".
- ii) To negotiate with the Employer the terms and conditions for award of the Contract pursuant to the aforesaid Bid and to sign the Contract with the Employer for and on behalf of the "Joint Venture".
- iii) To do any other act or submit any document related to the above.
- iv) To receive, accept and execute the Contract for and on behalf of the "Joint Venture".

For the above purpose, the person(s) authorized by the Partner In-charge shall be the person(s) authorized to act on behalf of the "Joint Venture" as per the Power of Attorney given to him/her/them by the Partner In-Charge,

It is clearly understood that all the partners of the joint venture shall be liable jointly and severally for the execution of the Contract in accordance with the Contract terms and the Partner In-charge (Lead Partner) shall ensure performance of the Contract(s) and if one or

more Partner fail to perform their respective portions of the Contract(s), the same shall be deemed to be a default by all the Partners.

It is expressly understood that this Power of Attorney shall remain valid binding and irrevocable till completion of the Defect Liability Period in terms of the Contract.

The Joint Venture hereby agrees and undertakes to ratify and confirm all the whatsoever the said Attorney/Authorised Representatives/Partner in-charge quotes in the bid, negotiates and signs the Contract with the Employer and/or proposes to act on behalf of the Joint Venture by virtue of this Power of Attorney and the same shall bind the Joint Venture as if done by itself.

IN WITNESS THEREOF the Partners Constituting the Joint Venture as aforesaid have executed these presents on this day of under the Common Seal(s) of their Companies.

for and on behalf of the
Partners of Joint Venture

.....

.....

The Common Seal of the above Partners of the Joint Venture :

The Common Seal has been affixed there unto in the presence of :

WITNESS

1. Signature.....

Name

Designation

Occupation

2. Signature.....

Name

Designation

Occupation

FORM 2a**FORM OF UNDERTAKING BY THE JOINT VENTURE PARTNERS**

(On Non-Judicial Stamp Paper of Appropriate Value, if required as per laws of the country of the bidder, to be Purchased in the Name of Joint Venture or equivalent to rules applicable to international bidders as per their country) THIS JOINT DEED OF UNDERTAKING executed on this..... day of..... Two Thousand and

.....by..... a company incorporated under the laws of and having its Registered Office at(hereinafter called the "Party No.1" which expression shall include its successors, executors and permitted assigns) and M/s.....a company incorporated under the laws of..... and

having its Registered Office at..... (hereinafter called the "Party No.2" which expression shall include its successors, executors and permitted assigns) and M/s.. . . .

..... a Company incorporated under the laws of..... and having its Registered Office at..... (hereinafter called the "Party

No.3" which expression shall include its successors, executors and permitted assigns) for the purpose of making a bid and entering into a contract [hereinafter called the "Contract"_{in case of award)] against the Specification No.....for _____ (Package) _____ associated with _____ of Solar Energy Corporation of India (SECI) Limited., having its Registered Office at D - 3, 1st Floor, Wing - A, Prius Platinum Building, District Centre, Saket, New Delhi - 110017, India (hereinafter called the 'Employer').

WHEREAS the Party No.1, Party No.2 and Party No.3 have entered into an Agreement dated

AND WHEREAS the Employer invited bids as per the above mentioned Specification for the design, manufacture, Supply of Equipment Materials stipulated in the bidding documents under _____ (Package) _____ associated with _____.

AND WHEREAS 'Qualification Requirement of the Bidder', Section on Evaluation and Qualification Criteria forming part of the bidding documents, inter-alia, stipulates that an Undertaking of two or more qualified partners, meeting the requirements of 'Qualification Requirement of the Bidder', Section on Evaluation and Qualification Criteria, as applicable may bid, provided, the Joint Venture fulfills all other requirements under Qualification Requirement of the Bidder', Section on Evaluation and Qualification Criteria and in such a case, the Letter of Bid (Bid Form) shall be signed by the Partner –In Charge so as to legally bind all the Partners of the Joint Venture, who will be jointly and severally liable to perform the Contract and all obligations hereunder.

The above clause further states that this Undertaking shall be attached to the bid and the Contract performance guarantee will be as per the format enclosed with the bidding document without any restrictions or liability for either party.

AND WHEREAS the bid is being submitted to the Employer vide proposal No.....dated..... by Party No.1 based on this Undertaking between all the parties; under these presents and the bid in accordance with the requirements of 'Qualification Requirement of the Bidder', Section on Evaluation and Qualification Criteria, has been signed by all the parties.

NOW THIS UNDERTAKING WITNESSETH AS UNDER:

In consideration of the above premises and agreements all the parties of this Deed of Undertaking do hereby declare and undertake:

1. In requirement of the award of the Contract by the Employer to the Joint Venture Partners, we, the Parties do hereby undertake that M/s..... the Party No.1, shall act as Lead Partner and further declare and confirm that we the parties to the Joint Venture shall jointly and severally be bound unto the Employer for the successful performance of the Contract and shall be fully responsible for the design, manufacture, Supply, and successful performance of the equipment in accordance with the Contract:
2. In case of any breach or default of the said Contract by any of the parties to the Joint Venture, the party(s) do hereby undertake to be fully responsible for the successful performance of the Contract and to carry out all the obligations and responsibilities under the Contract in accordance with the requirements of the Contract.
3. Further, if the Employer suffers any loss or damage on account of any breach in the Contract or any shortfall in the performance of the equipment in meeting the performances guaranteed as per the specification in terms of the Contract, the Party(s) of these presents undertake to promptly make good such loss or damages caused to the Employer, on its demand without any demur. It shall not be necessary or obligatory for the Employer to proceed against Lead Partner to these presents before proceeding against or dealing with the other Party(s), the Employer can proceed against any of the parties who shall be jointly and severally liable for the performance and all other liabilities/obligations under the Contract to the Employer.
4. The financial liability of the Parties of this Deed of Undertaking to the Employer, with respect to any of the claims rising out of the performance or non-performance of the obligations set forth in this Deed of Undertaking, read in conjunction with the relevant conditions of the Contract shall, however not be limited in any way so as to restrict or limit the liabilities or obligations of any of the Parties of this Deed of Undertaking.
5. It is expressly understood and agreed between the Parties to this Undertaking that the responsibilities and obligations of each of the Parties shall be suitably appended by the Parties alongwith undertaking in its bid. It is further undertaken by the parties that the above sharing of responsibilities and obligations shall not in any way be a limitation of joint and several responsibilities of the Parties under the Contract.
6. It is also understood that this Undertaking is provided for the purposes of undertaking joint and several liabilities of the partners to the Joint Venture for submission of the bid and performance of the Contract if awarded and that this Undertaking shall not be deemed to give rise to any additional liabilities or obligations, in any manner or any

law, on any of the Parties to this Undertaking or on the Joint Venture, other than the express provisions of the Contract.

7. ***This Undertaking shall be construed and interpreted in accordance with the provisions of the Contract.***
8. ***In case of an award of a Contract, we the parties to this Deed of Undertaking do hereby agree that we shall be jointly and severally responsible for furnishing a Contract performance security from a bank in favour of the Employer in the currency/currencies of the Contract.***
9. It is further agreed that this Deed of Undertaking shall be irrevocable and shall form an integral part of the bid and shall continue to be enforceable till the Employer discharges the same or upon the completion of the Contract in accordance with its provisions, whichever is earlier. It shall be effective from the date first mentioned above for all purposes and intents.

IN WITNESS WHEREOF, the Parties to this Deed of Undertaking have through their authorised representatives executed these presents and affixed Common Seals of their companies, on the day, month and year first mentioned above.

Common Seal of
has been affixed in my/ our
presence pursuant to Board of
Director's Resolution dated

For Lead Partner (Party No.-1)
For and on behalf of M/s
.....

Name

Designation

Signature

(Signature of the authorized
representative)

WITNESS :

I.

II.

Common Seal of
has been affixed in my/ our
presence pursuant to Board of
Director's Resolution dated

For Party No.-2
For and on behalf of M/s.....

Name

(Signature of the authorized
representative)

Designation

Signature

WITNESS :

I.

II.

Common Seal of
has been affixed in my/ our
presence pursuant to Board of
Director's Resolution dated

For Party No.-3
For and on behalf of M/s.
.....

Name

Designation

Signature

(Signature of the authorized
representative)

WITNESS :

I.

II.

FORM 2b**FORM OF LETTER OF INTENT BY JV PARTNERS TO ENTER INTO JV AGREEMENT**

THIS LETTER OF INTENT signed on this..... day of..... Two Thousand and by..... a company incorporated under the laws of and having its Registered Office at(hereinafter called the "Party No.1" which expression shall include its successors, executors and permitted assigns) and M/s.....a company incorporated under the laws of..... and having its Registered Office at..... (hereinafter called the "Party No.-2" which expression shall include its successors, executors and permitted assigns) and M/s.. a Company incorporated under the laws of..... and having its Registered Office at..... (hereinafter called the "Party No.3" which expression shall include its successors, executors and permitted assigns) for the purpose of making a bid and entering into a contract [hereinafter called the "Contract" {in case of award)] against the Specification No.....for (Package) associated with of Solar Energy Corporation of India (SECI) Limited., having its Registered Office at D - 3, 1st Floor, Wing - A, Prius Platinum Building, District Centre, Saket, New Delhi - 110017, India (hereinafter called the '**Employer**')

WHEREAS the Party No.1, Party No.2 and Party No.3 intend to enter into a Joint Venture Agreement

AND WHEREAS the Employer invited bids as per the above mentioned Specification for the design, manufacture, Supply of Equipment Materials stipulated in the bidding documents under (Package) associated with

AND WHEREAS 'Qualification Requirement of the Bidder', Section on Evaluation and Qualification Criteria forming part of the bidding documents, inter-alia, stipulates that two or more qualified partners, meeting the requirements of 'Qualification Requirement of the Bidder', Section-Evaluation and Qualification Criteria, as applicable may bid, provided, they submit a Letter of Intent to enter into Joint Venture Agreement and the Joint Venture Partners fulfill all other requirements under 'Qualification Requirement of the Bidder', Section on Evaluation and Qualification Criteria and in such a case, the Letter of Bid (Bid Form) shall be signed by all the proposed partners so as to legally bind all the Partners of the Joint Venture, who will be jointly and severally liable to perform the Contract by entering into Joint Venture Agreement as per proforma specified in this Section . Bidding Forms of the Bidding Documents which will be legally binding on all partners and all obligations hereunder.

The above clause further states that this Letter of Intent shall be attached to the bid and the Contract performance guarantee will be as per the format enclosed with the bidding document without any restrictions or liability for either party.

AND WHEREAS the bid is being submitted to the Employer vide proposal No.....dated..... by Party No.1 based on this Letter of Intent between all the parties; under these presents and the bid in accordance with the requirements of 'Qualification Requirement of the Bidder', Section on Evaluation and Qualification Criteria, has been signed by all the parties.

NOW THIS UNDERTAKING WITNESSETH AS UNDER:

In consideration of the above premises and agreements all the parties of this Letter of Intent do hereby declare and undertake:

1. In requirement of the award of the Contract by the Employer to the Joint Venture Partners, we, the Parties do hereby undertake that M/s..... the Party No.1, shall act as Lead Partner and further declare and confirm that we the parties to the Joint Venture shall jointly and severally be bound unto the Employer for the successful performance of the Contract and shall be fully responsible for the design, manufacture, Supply, and successful performance of the equipment in accordance with the Contract for which we shall enter into Joint Venture Agreement as per proforma specified in this Section IV. Bidding Forms of the Bidding Documents which will be legally binding on all partners:
2. If the Contract is awarded to Joint Venture then in case of any breach or default of the said Contract by any of the parties to the Joint Venture, the party(s) will be fully responsible for the successful performance of the Contract and to carry out all the obligations and responsibilities under the Contract in accordance with the requirements of the Contract.
3. Further, if the Employer suffers any loss or damage on account of any breach in the Contract or any shortfall in the performance of the equipment in meeting the performances guaranteed as per the specification in terms of the Contract, the Party(s) of these presents will promptly make good such loss or damages caused to the Employer, on its demand without any demur. It shall not be necessary or obligatory for the Employer to proceed against Lead Partner to these presents before proceeding against or dealing with the other Party(s), the Employer can proceed against any of the parties who shall be jointly and severally liable for the performance and all other liabilities/obligations under the Contract to the Employer.
4. The financial liability of the Parties of the Deed of Undertaking to the Employer in the event of award of Contract on the Joint Venture, with respect to any of the claims rising out of the performance or non-performance of the obligations set forth in the Deed of Undertaking, read in conjunction with the relevant conditions of the Contract shall, however not be limited in any way so as to restrict or limit the liabilities or obligations of any of the Parties of the Deed of Undertaking.

5. It is expressly understood and agreed between the Parties to this Letter of Intent that the responsibilities and obligations of each of the Parties shall be suitably appended by the Parties along with Letter of Intent in its bid). It is further undertaken by the parties that the above sharing of responsibilities and obligations shall not in any way be a limitation of joint and several responsibilities of the Parties under the Contract in the event of award on Joint Venture.
6. It is also understood that this Letter of Intent is provided for the purposes of undertaking joint and several liabilities of the partners to the Joint Venture for submission of the bid and performance of the Contract if awarded and that this Letter of Intent shall not be deemed to give rise to any additional liabilities or obligations, in any manner or any law, on any of the Parties to this Letter of Intent or on the Joint Venture, other than the express provisions of the Contract.
7. ***This Letter of Intent shall be construed and interpreted in accordance with the provisions of the Contract.***
8. ***In case of an award of a Contract, we the parties to this Letter of Intent do hereby agree that we shall enter into Joint Venture Agreement as per proforma specified in this Section IV. Bidding Forms of the Bidding Documents which will be legally binding on all partners and we shall be jointly and severally responsible for furnishing a Contract performance security from a bank in favour of the Employer in the currency/currencies of the Contract.***
9. It is further agreed that this Letter of Intent shall be irrevocable and shall form an integral part of the bid. It shall be effective from the date first mentioned above for all purposes and intents.

IN WITNESS WHEREOF, the Parties to this Letter of Intent have through their authorised representatives executed these presents and affixed Common Seals of their companies, on the day, month and year first mentioned above.

Common Seal of
has been affixed in my/ our
presence pursuant to Board of
Director's Resolution dated

For Lead Partner (Party No.-1)

For and on behalf of M/s

.....

Name

Designation

Signature

(Signature of the authorized
representative)

WITNESS :

I.

II.

Common Seal of
has been affixed in my/ our
presence pursuant to Board of
Director's Resolution dated

For Party No.-2
For and on behalf of M/s.....

Name

(Signature of the authorized
representative)

Designation

Signature

WITNESS :

I.

II.

Common Seal of
has been affixed in my/ our
presence pursuant to Board of
Director's Resolution dated

For Party No.-3
For and on behalf of M/s.
.....

Name

Designation

(Signature of the authorized
representative)

Signature

WITNESS :

I.

II.

Appendix to Technical Part

Details of Participation in the

Joint Venture (if applicable)

PARTICIPATION DETAILS	FIRM 'A' (Lead Member)	FIRM 'B'	FIRM 'C'
Financial	MAAT: LIQUIDITY: NET WORTH:	MAAT: LIQUIDITY: NET WORTH:	MAAT: LIQUIDITY: NET WORTH:
Detailed Role of each Partner/member in the JV			
Planning			
Construction Equipment			
Key Personnel			
Execution of Work (Give details on contribution of each e.g. Plant, Installation Services etc.)			

MAAT: Minimum average annual turnover

The Joint Venture should indicate the details of participation as above.

Appendix to Technical Part

Form CON – 2

Historical Contract Non-Performance

Bidder's Legal Name: _____

Date: _____

JV Member Legal Name: _____

RFB No.: _____

Page _____ of _____ pages

Non-Performed Contracts in accordance with Section III, Evaluation and Qualification Criteria

- ☐ Contract non-performance did not occur since 1st January *[insert year]* specified in Section III, Evaluation and Qualification Criteria, Sub-Factor 2.1.
- ☐ Contract(s) not performed since 1st January *[insert year]* specified in Section III, Evaluation and Qualification Criteria, requirement 2.1

Year	Non-performed portion of contract	Contract Identification	Total Contract Amount (current value, currency, exchange rate and US\$ equivalent)
<i>[insert year]</i>	<i>[insert amount and percentage]</i>	Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Reason(s) for nonperformance: <i>[indicate main reason(s)]</i>	<i>[insert amount]</i>

Pending Litigation, in accordance with Section III, Evaluation and Qualification Criteria

- ☐ No pending litigation in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.3.
- ☐ Pending litigation in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.3 as indicated below.

Year of dispute	Amount in dispute (currency)	Contract Identification	Total Contract Amount (currency), USD Equivalent (exchange rate)
		Contract Identification: _____ Name of Employer: _____ Address of Employer: _____ Matter in dispute: _____ Party who initiated the dispute: _____ Status of dispute: _____	
		Contract Identification: Name of Employer: Address of Employer: Matter in dispute: Party who initiated the dispute: Status of dispute:	
Litigation History in accordance with Section III, Evaluation and Qualification Criteria			
☐ No Litigation History in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.4. ☐ Litigation History in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.4 as indicated below.			
Year of award	Outcome as percentage of Net Worth	Contract Identification	Total Contract Amount (currency), USD Equivalent (exchange rate)

<i>[insert year]</i>	<i>[insert percentage]</i>	Contract Identification: [indicate complete contract name, number, and any other identification] Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Matter in dispute: <i>[indicate main issues in dispute]</i> Party who initiated the dispute: <i>[indicate “Employer” or “Contractor”]</i> Reason(s) for Litigation and award decision <i>[indicate main reason(s)]</i>	<i>[insert amount]</i>

Appendix to Technical Part

Form CCC

Current Contract Commitments / Works in Progress

Bidders and each member to a JV should provide information on their current commitments on all contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued.

Name of contract	Employer, contact address/tel/fax	Value of outstanding work (INR/USD Equivalent)	Estimated completion date	Average monthly invoicing over last six months (INR/USD Equivalent)
1.				
2.				
3.				
4.				
5.				
etc.				

Appendix to Technical Part

Form FIN – 3.1

Financial Situation

Historical Financial Performance

Bidder's Legal Name: _____ Date: _____

JV Member Legal Name: _____ RFB No.: _____

Page _____ of _____ pages

To be completed by the Bidder and, if JV, by each member

Financial information <i>(INR/RESPECTIVE CURRENCY OF THE BIDDER'S BALANCE SHEET))</i>	Historic information for previous 03 (Three) years <i>(INR/RESPECTIVE CURRENCY OF THE BIDDER'S BALANCE SHEET)</i>				
	Year 1 (FY 2017-18)	Year 2 (FY 2016-17)	Year 3 (FY 2015-16)	Avg.	
Information from Balance Sheet					
Total Assets (TA)					
Total Liabilities (TL)					
Net Worth (NW)					
Current Assets (CA)					
Current Liabilities (CL)					
Information from Income Statement					
Revenue from Operations (R)					
Profits Before Taxes (PBT)					

Attached are copies of financial statements (balance sheets, including all related notes, and income statements) for the years required above complying with the following conditions:

- (a) **Must reflect the financial situation of the Bidder or member to a JV, and not sister or parent companies**
- (b) **Historic financial statements must be audited by a certified public accountant/Chartered accountant**
- (c) **Historic financial statements must be complete, including all notes to the financial statements**

-
- (d) **Historic financial statements must correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted)**
 - (e) **Bidders may produce the Financial statements based on the Calendar Year in place of Financial Year, if applicable**

Appendix to Technical Part

Form FIN – 3.2

Minimum Average Annual Turnover

Bidder's Legal Name: _____ Date: _____

JV Member Legal Name: _____ RFB No.: _____

Page _____ of _____ pages

Minimum Average Annual turnover** (MAAT)		
Year	(RESPECTIVE CURRENCY OF THE BIDDER'S BALANCE SHEET)	INR /USD equivalent
(FY 2017-18)	_____	_____
(FY 2016-17)	_____	_____
(FY 2015-16)	_____	_____
*Minimum Average Annual Turnover	_____	_____

* **Minimum Average Annual Turnover (MAAT)** shall mean Revenue from Operations as incorporated in the profit & loss account excluding other income, e.g. sale of fixed assets. This must be the individual Company's turnover and not that of any group of Companies. A summarized sheet of average turnover certified by a practicing CA/Statutory Auditor should be compulsorily enclosed along with corresponding annual accounts.

** Bidders may produce the Financial statements based on the Calendar Year in place of Financial Year, if applicable

Appendix to Technical Part

Form FIN3.3

Financial Resources

Specify proposed sources of financing, such as liquid assets, unencumbered real assets, lines of credit, and other financial means, net of current commitments, available to meet the total cash flow demands of the subject contract or contracts as indicated in Section III, Evaluation and Qualification Criteria

Source of financing	Amount (INR/USD equivalent)
1.	
2.	
3.	
4.	

Appendix to Technical Part

Form EXP 4.1

Experience

General Experience

Bidder's Legal Name: _____

Date: _____

JV Member Legal Name: _____

RFB No.: _____

Page _____ of _____ pages

Starting Month / Year	Ending Month / Year	Years *	Contract Identification	Role of Bidder
_____	_____		Contract name: Brief Description of the Works performed by the Bidder: Amount of contract: _____ Actual Completion Value: _____ Name of Employer: Address:	_____
_____	_____		Contract name: Brief Description of the Works performed by the Bidder: Amount of contract: _____ Actual Completion Value: _____ Name of Employer: Address:	_____

Starting Month / Year	Ending Month / Year	Years *	Contract Identification	Role of Bidder
_____	_____		Contract name: Brief Description of the Works performed by the Bidder: Name of Employer: Address:	_____
_____	_____		Contract name: Brief Description of the Works performed by the Bidder: Name of Employer: Address:	_____
_____	_____		Contract name: Brief Description of the Works performed by the Bidder: Name of Employer: Address:	_____
_____	_____		Contract name: Brief Description of the Works performed by the Bidder: Name of Employer: Address:	_____

*List calendar year for years with contracts with at least nine (9) months activity per year starting with the earliest year

Appendix to Technical Part

Form EXP –4.2(a)

Specific Experience

Bidder's Legal Name: _____ Date: _____

JV Member Legal Name: _____ RFB No.: _____

Page _____ of _____ pages

Similar Contract Number: ____ of ____ required.	Information		
Contract Identification	_____		
Award date	_____		
Completion date	_____		
Role in Contract	☐ Contractor	☐ Management Contractor	☐ Subcontract or
Total contract amount	_____ _____		INR Equivalent _____ _____
If member in a JV or subcontractor, specify participation of total contract amount	_____%	_____	INR Equivalent _____ _____
Employer's Name:	_____		
Address:	_____ _____ _____		
Telephone/fax number:	_____		
E-mail:	_____		

Appendix to Technical Part

Form EXP –4.2(a) (cont.)

Specific Experience (cont.)

Bidder's Legal Name: _____ Page _____ of _____ pages

JV Member Legal Name: _____

Similar Contract No. __[insert specific number] of [total number of contracts] __ required	Information
Description of the similarity in accordance with Sub-Factor 4.2a) of Section III:	
Amount	_____
Physical size	_____
Complexity	_____
Methods/Technology	_____
Physical Production Rate	_____

Appendix to Technical Part

Form EXP –4.2(b)

Specific Experience in Key Activities

Bidder's Legal Name: _____ Date: _____

JV Member Legal Name: _____ RFB No.: _____

Subcontractor's Legal Name: _____ Page _____ of _____ pages

	Information		
Contract Identification			
Award date			
Completion date			
Role in Contract	☐ Contractor	☐ Management Contractor	☐ Subcontractor
Total contract amount			INR Equivalent____ _____
If member in a JV or subcontractor, specify participation of total contract amount	_____%		INR Equivalent____ _____
Employer's Name:			
Address:			
Telephone/fax number:			
E-mail:			

Appendix to Technical Part

Form EXP –4.2 (b)(cont.)

Specific Experience in Key Activities (cont.)

Bidder's Legal Name: _____ Page _____ of _____ pages

JV Member Legal Name: _____

Subcontractor's Legal Name: _____

	Information
Description of the key activities in accordance with Sub-Factor 4.2b) of Section III:	

Appendix to Technical Part

Form of Bid Security

Form of Bid Security – Bank Guarantee **Beneficiary:** *[Employer to insert its name and address]*

RFB No.: *[Employer to insert reference number for the Request for Bids]*

Alternative No.: *[Insert identification No if this is a Bid for an alternative]*

Date: *[Insert date of issue]*

BID GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that _____ *[insert name of the Bidder, which in the case of a joint venture shall be the name of the joint venture (whether legally constituted or prospective) or the names of all members thereof]* (hereinafter called "the Applicant") has submitted or will submit to the Beneficiary its Bid (hereinafter called "the Bid") for the execution of _____ under RFB No. _____

Furthermore, we understand that, according to the Beneficiary's conditions, Bids must be supported by a Bid guarantee.

At the request of the Applicant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of _____ (_____) upon receipt by us of the Beneficiary's complying demand, supported by the Beneficiary's statement, whether in the demand itself or a separate signed document accompanying or identifying the demand, stating that either the Bidder:

- (a) has withdrawn its Bid during the period of Bid validity set forth in the Bidder's Letter(s) of Bid ("the Bid Validity Period"), or any extension thereto provided by the Bidder; or
- (b) having been notified of the acceptance of its Bid by the Beneficiary during the Bid Validity Period or any extension thereto provided by the Applicant, (i) has failed to execute the Contract Agreement, or (ii) has failed to furnish the Performance Security, in accordance with the Instructions to Bidders ("ITB") of the Beneficiary's bidding document.

This guarantee will expire: (a) if the Applicant is the successful Bidder, upon our receipt of copies of the contract agreement signed by the Applicant and the Performance Security issued to the Beneficiary in relation to such contract agreement; or (b) if the Applicant is not the successful Bidder, upon the earlier of (i) our receipt of a copy of the Beneficiary's notification

to the Applicant of the results of the Bidding process; or (ii) twenty-eight days after the end of the Bid Validity Period.

Consequently, any demand for payment under this guarantee must be received by us at the office indicated above on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758.

[Signature(s)]

Note: All italicized text is for use in preparing this form and shall be deleted from the final product.

Appendix to Technical Part
Manufacturer's Authorization
(For Solar Modules & WTG)

Date: _____

RFB No.: _____

To: _____

WHEREAS

We _____, who are official manufacturers of _____, having factories at _____, do hereby authorize _____ to submit a Bid the purpose of which is to provide the following goods, manufactured by us _____, and to subsequently negotiate and sign the Contract.

We hereby extend our full guarantee and warranty in accordance with Clause 27 of the General Conditions, with respect to the goods offered by the above firm.

Signed: _____

Name: _____

Title: _____

Duly authorized to sign this Authorization on behalf of:

Dated on _____ day of _____, _____

Appendix to Technical Part
Manufacturer's Authorization
(For BESS)

Date: _____

RFB No.: _____

To: _____

WHEREAS

We _____, who are official manufacturers of _____, having factories at _____, do hereby authorize _____ to submit a Bid the purpose of which is to provide the following goods, manufactured by us _____, and to subsequently negotiate and sign the Contract.

We hereby extend our full guarantee and warranty in accordance with Clause 27 of the General Conditions, with respect to the goods offered by the above firm.

Signed: _____

Name: _____

Title: _____

Duly authorized to sign this Authorization on behalf of:

Dated on _____ day of _____, _____

Appendix to Technical Part

(Name of the Project)

(Declaration regarding tax/ duty exemption for plant/equipment/construction equipment bought for the work)⁶

(Bidder's Name and Address)

To:

(Name of the Employer & address)

Dear Sir:

Re: [Name of Work].....

RFB NO.....

Certificate for Import/Procurement of Plant and Equipment/Construction Equipment

1. We confirm that we are solely responsible for obtaining tax/ duty waivers which we have considered in our bid and in case of failure to receive such waivers for reasons whatsoever, the employer will not compensate us.
2. We are furnishing below the information required by the Employer for issue of the necessary certificates in terms of the Government of India's relevant Notifications.
3. The goods/construction equipment for which certificates are required are as under:

Items (modify the list suitably for each specific work)*	Make/ Brand Name	Capacity [where applicable]	Quantity	Value	State whether it will be procured locally or imported [if so from which country]	Remarks regarding justification for the quantity and their usage in works.
Plant and Equipment						
[a] _____						
[b] _____						
[c] _____						

⁶ This declaration refers to ITB 17.12 and shall be retained only if ITB 17.12 is retained. The format may be modified as per the latest instructions of Government of India.

Construction Equipment						

4. We agree that no modification to the above list is permitted after bids are opened.
5. We agree that the certificate will be issued only to the extent considered reasonable by the Employer for the work, based on the Employer's Requirements and the construction program and methodology as furnished by us along with the bid.
6. We confirm that the above plant, equipment and construction equipment will be exclusively used for the construction of the above work and the construction equipment will not be sold or otherwise disposed of in any manner for a period of five years from the date of acquisition.

Date: _____

(Signature) _____

Place: _____

(Printed Name)

(Designation) _____

(Common Seal) _____

[This certificate will be issued within 60 days of signing of contract and no subsequent changes will be permitted.]

*** Modify the above to suit the requirements given in Government of India's Notifications as current of date of bidding.**

Letter of Bid – Financial Part

INSTRUCTIONS TO BIDDERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE DOCUMENT

The Bidder must prepare this Letter of Bid – Financial Part on stationery with its letterhead clearly showing the Bidder's complete name and business address.

Note: All italicized text is to help Bidders in preparing this form.

Date of this Bid submission: *[insert date (as day, month and year) of Bid submission]*

RFB No.: *[insert number of RFB process]*

Alternative No.⁷: NA

To: *[insert complete name of Employer]*

We, the undersigned, hereby submit the second part of our Bid, the Bid Price and Price Schedules. This accompanies the Letter of Bid - Technical Part.

In submitting our Bid, we make the following additional declarations:

- (a) **No reservations:** We have examined and have no reservations to the bidding document, including Addenda issued in accordance with ITB 8;
- (b) **Eligibility:** We meet the eligibility requirements and have no conflict of interest in accordance with ITB 4;
- (c) **Bid-Securing Declaration:** We have not been suspended nor declared ineligible by the Employer based on execution of a Bid Securing Declaration or Proposal-Securing Declaration in the Employer's Country in accordance with ITB 4.7;
- (d) **Conformity:** We offer to provide design, supply and installation services in conformity with the bidding document of the following: [Design, Engineering, Supply, Construction, Erection, Testing & Commissioning of 160 MW Solar-Wind Hybrid Power Plant with BESS including 10 Years Plant O&M under International competitive bidding];
- (e) **Performance Security:** If our Bid is accepted, we commit to obtain a Performance Security in accordance with the bidding document;

⁷ Delete if not applicable

- (f) **One Bid Per Bidder:** We are not submitting any other Bid(s) as an individual Bidder, and we are not participating in any other Bid(s) as a Joint Venture member, and meet the requirements of ITB 4.3, other than alternative Bids submitted in accordance with ITB 13;
- (g) **Suspension and Debarment:** We, along with any of our subcontractors, suppliers, consultants, manufacturers, or service providers for any part of the contract, are not subject to, and not controlled by any entity or individual that is subject to, a temporary suspension or a debarment imposed by the World Bank Group or a debarment imposed by the World Bank Group in accordance with the Agreement for Mutual Enforcement of Debarment Decisions between the World Bank and other development banks. Further, we are not ineligible under the Employer's Country laws or official regulations or pursuant to a decision of the United Nations Security Council;
- (h) **State-owned enterprise or institution:** *[select the appropriate option and delete the other] [We are not a state-owned enterprise or institution] / [We are a state-owned enterprise or institution but meet the requirements of ITB 4.6]⁸;*
- (i) **Binding Contract:** We understand that this Bid, together with your written acceptance thereof included in your Letter of Acceptance, shall constitute a binding contract between us, until a formal contract is prepared and executed;
- (j) **Not Bound to Accept:** We understand that you are not bound to accept the lowest evaluated cost Bid, the Most Advantageous Bid or any other Bid that you may receive; and
- (k) **Fraud and Corruption:** We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf engages in any type of Fraud and Corruption.
- (l) **Bid Validity Period:** Our Bid shall be valid for the period specified in BDS 19.1 (as amended if applicable) from the date fixed for the Bid submission deadline specified in BDS 23.1 (as amended if applicable), and it shall remain binding upon us and may be accepted at any time before the expiration of that period; (m) **Bid Price:** The total price of our Bid, excluding any discounts offered in item (n) below is: []
- (n) **Discounts:** The discounts offered and the methodology for their application are:
- (i) The discounts offered are: *[Specify in detail each discount offered.]*
- (ii) The exact method of calculations to determine the net price after application of discounts is shown below: *[Specify in detail the method that shall be used to apply the discounts];*

⁸ Use one of the two options as appropriate

(o) Commissions, gratuities and fees: We have paid, or will pay the following commissions, gratuities, or fees with respect to the Bidding process or execution of the Contract: *[insert complete name of each Recipient, its full address, the reason for which each commission or gratuity was paid and the amount of each such commission or gratuity]*

Name of Recipient	Address	Reason	Amount

(If none has been paid or is to be paid, indicate "none.")

Name of the Bidder: *[insert complete name of person signing the Bid]*

Name of the person duly authorized to sign the Bid on behalf of the Bidder: *[insert complete name of person duly authorized to sign the Bid]*

Title of the person signing the Bid: *[insert complete title of the person signing the Bid]*

Signature of the person named above: *[insert signature of person whose name and capacity are shown above]*

Date signed *[insert date of signing]* **day of** *[insert month]*, *[insert year]*

**Appendix to Financial Part
Schedule of Rates,**

Schedule No 1/Schedule of Rates (SOR) 1

Schedule No 2/Schedule of Rates (SOR) 2

Schedule No 3/Schedule of Rates (SOR) 3

Schedule No 4/Schedule of Rates (SOR) 4

Schedule No 5/Schedule of Rates (SOR) 5

Schedule No 6/Schedule of Generation (SOG)

Schedule No 7/Grand Total Summary

Are attached as a “Main Bid” as .xlsx Sheets to the bidding document.

Appendix to Financial Part
Country of Origin Declaration Form

Item	Description	Code	Country

****The bidders are required to mention country of origin of the supply of items mentioned under SOR -1, wherever applicable.**

Appendix to Financial Part

Price Adjustment

Not Applicable

Section V - Eligible Countries

Eligibility for the Provision of Goods, Works and Non Consulting Services in Bank-Financed Procurement

In reference to ITB 4.8 and 5.1, for the information of the Bidders, at the present time firms, goods and services from the following countries are excluded from this Bidding process:

Under ITB 4.8 (a) and 5.1: *“none”*

Under ITB 4.8 (b) and 5.1: *“none”*

Section VI - Fraud and Corruption

1. Purpose

1.1 The Bank's Anti-Corruption Guidelines and this annex apply with respect to procurement under Bank Investment Project Financing operations.

2. Requirements

2.1 The Bank requires that Borrowers (including beneficiaries of Bank financing); bidders (applicants/proposers), consultants, contractors and suppliers; any sub-contractors, sub-consultants, service providers or suppliers; any agents (whether declared or not); and any of their personnel, observe the highest standard of ethics during the procurement process, selection and contract execution of Bank-financed contracts, and refrain from Fraud and Corruption.

2.2 To this end, the Bank:

- a. Defines, for the purposes of this provision, the terms set forth below as follows:
 - i. "corrupt practice" is the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;
 - ii. "fraudulent practice" is any act or omission, including misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain financial or other benefit or to avoid an obligation;
 - iii. "collusive practice" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;
 - iv. "coercive practice" is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;
 - v. "obstructive practice" is:
 - (a) deliberately destroying, falsifying, altering, or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a Bank investigation into allegations of a corrupt, fraudulent, coercive, or collusive practice; and/or threatening, harassing, or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or
 - (b) acts intended to materially impede the exercise of the Bank's inspection and audit rights provided for under paragraph 2.2 e. below.
- b. Rejects a proposal for award if the Bank determines that the firm or individual recommended for award, any of its personnel, or its agents, or its sub-consultants, sub-

contractors, service providers, suppliers and/ or their employees, has, directly or indirectly, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for the contract in question;

- c. In addition to the legal remedies set out in the relevant Legal Agreement, may take other appropriate actions, including declaring misprocurement, if the Bank determines at any time that representatives of the Borrower or of a recipient of any part of the proceeds of the loan engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices during the procurement process, selection and/or execution of the contract in question, without the Borrower having taken timely and appropriate action satisfactory to the Bank to address such practices when they occur, including by failing to inform the Bank in a timely manner at the time they knew of the practices;
- d. Pursuant to the Bank's Anti- Corruption Guidelines and in accordance with the Bank's prevailing sanctions policies and procedures, may sanction a firm or individual, either indefinitely or for a stated period of time, including by publicly declaring such firm or individual ineligible (i) to be awarded or otherwise benefit from a Bank-financed contract, financially or in any other manner;¹ (ii) to be a nominated² sub-contractor, consultant, manufacturer or supplier, or service provider of an otherwise eligible firm being awarded a Bank-financed contract; and (iii) to receive the proceeds of any loan made by the Bank or otherwise to participate further in the preparation or implementation of any Bank-financed project;
- e. Requires that a clause be included in bidding/request for proposals documents and in contracts financed by a Bank loan, requiring (i) bidders (applicants/proposers), consultants, contractors, and suppliers, and their sub-contractors, sub-consultants, service providers, suppliers, agents personnel, permit the Bank to inspect³ all accounts, records and other documents relating to the procurement process, selection and/or contract execution, and to have them audited by auditors appointed by the Bank.

¹ For the avoidance of doubt, a sanctioned party's ineligibility to be awarded a contract shall include, without limitation, (i) applying for pre-qualification, expressing interest in a consultancy, and bidding, either directly or as a nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider, in respect of such contract, and (ii) entering into an addendum or amendment introducing a material modification to any existing contract.

² A nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider (different names are used depending on the particular bidding document) is one which has been: (i) included by the bidder in its pre-qualification application or bid because it brings specific and critical experience and know-how that allow the bidder to meet the qualification requirements for the particular bid; or (ii) appointed by the Borrower.

³ Inspections in this context usually are investigative (i.e., forensic) in nature. They involve fact-finding activities undertaken by the Bank or persons appointed by the Bank to address specific matters related to investigations/audits, such as evaluating the veracity of an allegation of possible Fraud and Corruption, through the appropriate mechanisms. Such activity includes but is not limited to: accessing and examining a firm's or individual's financial records and information, and making copies thereof as relevant; accessing and examining any other documents, data and information (whether in hard copy or electronic format) deemed relevant for the investigation/audit, and making copies thereof as relevant; interviewing staff and other relevant individuals; performing physical inspections and site visits; and obtaining third party verification of information.

PART 2 - Employer’s Requirements

Section VII - Employer’s Requirements

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Scope of Supply of Plant and Installation Services by the Contractor

Specification

Employer’s requirement or Technical specifications is attached as “Annexure A” to the Bidding Documents

Forms and Procedures

Form of Completion Certificate

Date: _____

Loan/Credit N°: _____

RFB N°: _____

_____ *[Name of Contract]*To: _____ *[Name and address of Contractor]*

Dear Ladies and/or Gentlemen,

Pursuant to GCC Clause 24 (Completion of the Facilities) of the General Conditions of the Contract entered into between yourselves and the Employer dated _____, relating to the _____ *[brief description of the Facilities]*, we hereby notify you that the following part(s) of the Facilities was (were) complete on the date specified below, and that, in accordance with the terms of the Contract, the Employer hereby takes over the said part(s) of the Facilities, together with the responsibility for care and custody and the risk of loss thereof on the date mentioned below.

1. Description of the Facilities or part thereof: _____
2. Date of Completion: _____

However, you are required to complete the outstanding items listed in the attachment hereto as soon as practicable.

This letter does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defect Liability Period.

Very truly yours,

Title
(Project Manager)

Form of Operational Acceptance Certificate

Date: _____

Loan/Credit N°: _____

RFB N°: _____

[Name of Contract]

To: _____ [Name and address of Contractor]

Dear Ladies and/or Gentlemen,

Pursuant to GCC Sub-Clause 25.3 (Operational Acceptance) of the General Conditions of the Contract entered into between yourselves and the Employer dated _____, relating to the _____ [brief description of the Facilities], we hereby notify you that the Functional Guarantees of the following part(s) of the Facilities were satisfactorily attained on the date specified below.

1. Description of the Facilities or part thereof: _____
2. Date of Operational Acceptance: _____

This letter does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defect Liability Period.

Very truly yours,

Title

(Project Manager)

Change Order Procedure and Forms

Date: _____

Loan/Credit N°: _____

RFB N°: _____

CONTENTS

1. General
2. Change Order Log
3. References for Changes

ANNEXES

- Annex 1 Request for Change Proposal
- Annex 2 Estimate for Change Proposal
- Annex 3 Acceptance of Estimate
- Annex 4 Change Proposal
- Annex 5 Change Order
- Annex 6 Pending Agreement Change Order
- Annex 7 Application for Change Proposal

Change Order Procedure

1. General

This section provides samples of procedures and forms for implementing changes in the Facilities during the performance of the Contract in accordance with GCC Clause 39 (Change in the Facilities) of the General Conditions of Contract.

2. Change Order Log

The Contractor shall keep an up-to-date Change Order Log to show the current status of Requests for Change and Changes authorized or pending, as Annex 8. Entries of the Changes in the Change Order Log shall be made to ensure that the log is up-to-date. The Contractor shall attach a copy of the current Change Order Log in the monthly progress report to be submitted to the Employer.

3. References for Changes

- (1) Request for Change as referred to in GCC Clause 39 shall be serially numbered CR-X-nnn.
- (2) Estimate for Change Proposal as referred to in GCC Clause 39 shall be serially numbered CN-X-nnn.
- (3) Acceptance of Estimate as referred to in GCC Clause 39 shall be serially numbered CA-X-nnn.
- (4) Change Proposal as referred to in GCC Clause 39 shall be serially numbered CP-X-nnn.
- (5) Change Order as referred to in GCC Clause 39 shall be serially numbered CO-X-nnn.

Note: (a) Requests for Change issued from the Employer’s Home Office and the Site representatives of the Employer shall have the following respective references:

Home Office	CR-H-nnn
Site	CR-S-nnn

- (b) The above number “nnn” is the same for Request for Change, Estimate for Change Proposal, Acceptance of Estimate, Change Proposal and Change Order.

Annex 1. Request for Change Proposal

(Employer's Letterhead)

To: _____

Date: _____

Attention: _____

Contract Name: _____

Contract Number: _____

Dear Ladies and/or Gentlemen:

With reference to the captioned Contract, you are requested to prepare and submit a Change Proposal for the Change noted below in accordance with the following instructions within _____ days of the date of this letter_____.

1. Title of Change: _____
2. Change Request No. _____
3. Originator of Change: Employer: _____
Contractor (by Application for Change Proposal No.) _____:
4. Brief Description of Change: _____
5. Facilities and/or Item No. of equipment related to the requested Change: _____
6. Reference drawings and/or technical documents for the request of Change:

<u>Drawing No./Document No.</u>	<u>Description</u>
7. Detailed conditions or special requirements on the requested Change: _____
8. General Terms and Conditions:
 - (a) Please submit your estimate to us showing what effect the requested Change will have on the Contract Price.
 - (b) Your estimate shall include your claim for the additional time, if any, for completion of the requested Change.
 - (c) If you have any opinion negative to the adoption of the requested Change in connection with the conformability to the other provisions of the Contract or the

safety of the Plant or Facilities, please inform us of your opinion in your proposal of revised provisions.

- (d) Any increase or decrease in the work of the Contractor relating to the services of its personnel shall be calculated.
- (e) You shall not proceed with the execution of the work for the requested Change until we have accepted and confirmed the amount and nature in writing.

(Employer’s Name)

(Signature)

(Name of signatory)

(Title of signatory)

Annex 2. Estimate for Change Proposal

(Contractor's Letterhead)

To: _____

Date: _____

Attention: _____

Contract Name: _____

Contract Number: _____

Dear Ladies and/or Gentlemen:

With reference to your Request for Change Proposal, we are pleased to notify you of the approximate cost of preparing the below-referenced Change Proposal in accordance with GCC Sub-Clause 39.2.1 of the General Conditions. We acknowledge that your agreement to the cost of preparing the Change Proposal, in accordance with GCC Sub-Clause 39.2.2, is required before estimating the cost for change work.

1. Title of Change: _____
2. Change Request No./Rev.: _____
3. Brief Description of Change: _____
4. Scheduled Impact of Change: _____
5. Cost for Preparation of Change Proposal: _____¹²

(a) Engineering	(Amount)

(i) Engineer	_____ hrs	x	_____ rate/hr	=	_____

(ii) Draftsperson	_____ hrs	x	_____ rate/hr	=	_____

Sub-total	_____ hrs				_____

Total Engineering Cost	_____

(b) Other Cost	_____

Total Cost (a) + (b)	_____

¹² Costs shall be in the currencies of the Contract.

(Contractor’s Name)

(Signature)

(Name of signatory)

(Title of signatory)

Annex 3. Acceptance of Estimate

(Employer's Letterhead)

To: _____

Date: _____

Attention: _____

Contract Name: _____

Contract Number: _____

Dear Ladies and/or Gentlemen:

We hereby accept your Estimate for Change Proposal and agree that you should proceed with the preparation of the Change Proposal.

1. Title of Change: _____

2. Change Request No./Rev.: _____

3. Estimate for Change Proposal No./Rev.: _____

4. Acceptance of Estimate No./Rev.: _____

5. Brief Description of Change: _____

6. Other Terms and Conditions: In the event that we decide not to order the Change accepted, you shall be entitled to compensation for the cost of preparation of Change Proposal described in your Estimate for Change Proposal mentioned in para. 3 above in accordance with GCC Clause 39 of the General Conditions of Contract.

(Employer’s Name)

(Signature)

(Name and Title of signatory)

Annex 4. Change Proposal

(Contractor's Letterhead)

To: _____

Date: _____

Attention: _____

Contract Name: _____

Contract Number: _____

Dear Ladies and/or Gentlemen:

In response to your Request for Change Proposal No. _____, we hereby submit our proposal as follows:

1. Title of Change: _____
2. Change Proposal No./Rev.: _____
3. Originator of Change: Employer: [_____]
Contractor: _____
4. Brief Description of Change: _____
5. Reasons for Change: _____
6. Facilities and/or Item No. of Equipment related to the requested Change: _____
7. Reference drawings and/or technical documents for the requested Change:

<u>Drawing/Document No.</u>	<u>Description</u>
8. Estimate of increase/decrease to the Contract Price resulting from Change Proposal:¹³

(Amount)

¹³ Costs shall be in the currencies of the Contract.

- (a) Direct material _____
- (b) Major construction equipment _____
- (c) Direct field labor (Total ____ hrs) _____
- (d) Subcontracts _____
- (e) Indirect material and labor _____
- (f) Site supervision _____
- (g) Head office technical staff salaries

Process engineer	_____ hrs @ _____ rate/hr	_____
Project engineer	_____ hrs @ _____ rate/hr	_____
Equipment engineer	_____ hrs @ _____ rate/hr	_____
Procurement	_____ hrs @ _____ rate/hr	_____
Draftsperson	_____ hrs @ _____ rate/hr	_____
Total	_____ hrs	_____

- (h) Extraordinary costs (computer, travel, etc.) _____
- (i) Fee for general administration, _____ % of Items _____
- (j) Taxes and customs duties _____

Total lump sum cost of Change Proposal _____

(Sum of items (a) to (j))

Cost to prepare Estimate for Change Proposal _____

(Amount payable if Change is not accepted)

9. Additional time for Completion required due to Change Proposal
10. Effect on the Functional Guarantees
11. Effect on the other terms and conditions of the Contract
12. Validity of this Proposal: within [Number] days after receipt of this Proposal by the Employer
13. Other terms and conditions of this Change Proposal:

- (a) You are requested to notify us of your acceptance, comments or rejection of this detailed Change Proposal within _____ days from your receipt of this Proposal.
- (b) The amount of any increase and/or decrease shall be taken into account in the adjustment of the Contract Price.
- (c) Contractor's cost for preparation of this Change Proposal:²

(Contractor's Name)

(Signature)

(Name of signatory)

(Title of signatory)

² Specify where necessary.

Annex 5. Change Order

(Employer’s Letterhead)

To: _____

Date: _____

Attention: _____

Contract Name: _____

Contract Number: _____

Dear Ladies and/or Gentlemen:

We approve the Change Order for the work specified in the Change Proposal (No. _____), and agree to adjust the Contract Price, Time for Completion and/or other conditions of the Contract in accordance with GCC Clause 39 of the General Conditions of Contract.

1. Title of Change: _____
2. Change Request No./Rev.: _____
3. Change Order No./Rev.: _____
4. Originator of Change: Employer: _____
Contractor: _____
5. Authorized Price:
Ref. No.: _____ Date: _____
Foreign currency portion _____ plus Local currency portion _____
6. Adjustment of Time for Completion
None Increase _____ days Decrease _____ days
7. Other effects, if any

Authorized by: _____
(Employer)

Date: _____

Accepted by: _____

Date: _____

(Contractor)

Annex 6. Pending Agreement Change Order

(Employer's Letterhead)

To: _____

Date: _____

Attention: _____

Contract Name: _____

Contract Number: [_____

Dear Ladies and/or Gentlemen:

We instruct you to carry out the work in the Change Order detailed below in accordance with GCC Clause 39 of the General Conditions of Contract.

1. Title of Change: _____
2. Employer's Request for Change Proposal No./Rev.:
_____ dated: _____
3. Contractor's Change Proposal No./Rev.: _____ dated:

4. Brief Description of Change: _____
5. Facilities and/or Item No. of equipment related to the requested Change:

6. Reference Drawings and/or technical documents for the requested Change:

<u>Drawing/Document No.</u>	<u>Description</u>
7. Adjustment of Time for Completion:
8. Other change in the Contract terms:
9. Other terms and conditions:

(Employer's Name)

(Signature)

(Name of signatory)

(Title of signatory)

Annex 7. Application for Change Proposal

(Contractor's Letterhead)

To: _____

Date: _____

Attention: _____

Contract Name: _____

Contract Number: _____

Dear Ladies and/or Gentlemen:

We hereby propose that the below-mentioned work be treated as a Change in the Facilities.

1. Title of Change: _____
 2. Application for Change Proposal No./Rev.: _____ dated:

 3. Brief Description of Change: _____
 4. Reasons for Change:
 5. Order of Magnitude Estimation (in the currencies of the Contract):
 6. Scheduled Impact of Change:
 7. Effect on Functional Guarantees, if any:
 8. Appendix:
-

(Contractor’s Name)

(Signature)

(Name of signatory)

(Title of signatory)

Drawings

Supplementary Information

PART 3 – Conditions of Contract and Contract Forms

Section VIII - General Conditions of Contract

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General Conditions of Contract

A. Contract and Interpretation

1. Definitions

1.1 The following words and expressions shall have the meanings hereby assigned to them:

“Contract” means the Contract Agreement entered into between the Employer and the Contractor, together with the Contract Documents referred to therein; they shall constitute the Contract, and the term “the Contract” shall in all such documents be construed accordingly.

“Contract Documents” means the documents listed in Article 1.1 (Contract Documents) of the Contract Agreement (including any amendments thereto).

“GCC” means the General Conditions of Contract hereof.

“PCC” means the Particular Conditions of Contract.

“day” means calendar day.

“year” means 365 days.

“month” means calendar month.

“Party” means the Employer or the Contractor, as the context requires, and “Parties” means both of them.

“Employer” means the person **named as such in the PCC** and includes the legal successors or permitted assigns of the Employer.

“Project Manager” means the person appointed by the Employer in the manner provided in GCC Sub-Clause 17.1 (Project Manager) hereof and **named as such in the PCC** to perform the duties delegated by the Employer.

“Contractor” means the person(s) whose Bid to perform the Contract has been accepted by the Employer and is named as Contractor in the Contract Agreement, and includes the legal successors or permitted assigns of the Contractor.

“Contractor’s Representative” means any person nominated by the Contractor and approved by the Employer in the manner provided in GCC Sub-Clause 17.2 (Contractor’s Representative and Construction Manager) hereof to perform the duties delegated by the Contractor.

“Construction Manager” means the person appointed by the Contractor’s Representative in the manner provided in GCC Sub-Clause 17.2.4.

“Subcontractor,” including manufacturers, means any person to whom execution of any part of the Facilities, including preparation of any design or supply of any Plant, is sub-contracted directly or indirectly by the Contractor, and includes its legal successors or permitted assigns.

“Dispute Board” (DB) means the person or persons named as such in the PCC appointed by agreement between the Employer and the Contractor to make a decision with respect to any dispute or difference between the Employer and the Contractor referred to him or her by the Parties pursuant to GCC Sub-Clause 46.1 (Dispute Board) hereof.

“The Bank” means the financing institution **named in the PCC**.

“Contract Price” means the sum specified in Article 2.1 (Contract Price) of the Contract Agreement, subject to such additions and adjustments thereto or deductions therefrom, as may be made pursuant to the Contract.

“Facilities” means the Plant to be supplied and installed, as well as all the Installation Services to be carried out by the Contractor under the Contract.

“Plant” means permanent plant, equipment, machinery, apparatus, materials, articles and things of all kinds to be provided and incorporated in the Facilities by the Contractor under the Contract (including the spare parts to be supplied by the Contractor under GCC Sub-Clause 7.3 hereof), but does not include Contractor’s Equipment.

“Installation Services” means all those services ancillary to the supply of the Plant for the Facilities, to be provided by the Contractor under the Contract, such as transportation and provision of marine or other similar insurance, inspection, expediting, site preparation works (including the provision and use of Contractor’s Equipment and the supply of all construction materials required), installation, testing, precommissioning, commissioning, operations, maintenance, the provision of operations and maintenance manuals, training, etc... as the case may require.

“Contractor’s Equipment” means all 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, or other things intended to form or forming part of the Facilities.

“Country of Origin” means the countries and territories eligible under the rules of the Bank as further **elaborated in the PCC**.

“Site” means the land and other places upon which the Facilities are to be installed, and such other land or places as may be specified in the Contract as forming part of the Site.

“Effective Date” means the date of fulfillment of all conditions stated in Article 3 (Effective Date) of the Contract Agreement, from which the Time for Completion shall be counted.

“Time for Completion” means the time within which Completion of the Facilities as a whole (or of a part of the Facilities where a separate Time for Completion of such part has been prescribed) is to be attained, as referred to in GCC Clause 8 and in accordance with the relevant provisions of the Contract.

“Completion” means that the Facilities (or a specific part thereof where specific parts are specified in the Contract) have been completed operationally and structurally and put in a tight and clean condition, that all work in respect of Precommissioning of the Facilities or such specific part thereof has been completed, and that the Facilities or specific part thereof are ready for Commissioning as provided in GCC Clause 24 (Completion) hereof.

“Precommissioning” means the testing, checking and other requirements specified in the Employer’s Requirements that are to be carried out by the Contractor in preparation for Commissioning as provided in GCC Clause 24 (Completion) hereof.

“Commissioning” means operation of the Facilities or any part thereof by the Contractor following Completion, which operation is to be carried out by the Contractor as provided in GCC Sub-Clause 25.1 (Commissioning) hereof, for the purpose of carrying out Guarantee Test(s).

“Guarantee Test(s)” means the test(s) specified in the Employer’s Requirements to be carried out to ascertain whether the Facilities or a specified part thereof is able to attain the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees, in accordance with the provisions of GCC Sub-Clause 25.2 (Guarantee Test) hereof.

“Operational Acceptance” means the acceptance by the Employer of the Facilities (or any part of the Facilities where the Contract provides for acceptance of the Facilities in parts), which certifies the Contractor’s fulfillment of the Contract in respect of Functional Guarantees of the Facilities (or the relevant part thereof) in accordance with the provisions

of GCC Clause 28 (Functional Guarantees) hereof and shall include deemed acceptance in accordance with GCC Clause 25 (Commissioning and Operational Acceptance) hereof.

“Defect Liability Period” means the period of validity of the warranties given by the Contractor commencing at Completion of the Facilities or a part thereof, during which the Contractor is responsible for defects with respect to the Facilities (or the relevant part thereof) as provided in GCC Clause 27 (Defect Liability) hereof.

2. Contract Documents

2.1 Subject to Article 1.2 (Order of Precedence) of the Contract Agreement, all documents forming part of the Contract (and all parts thereof) are intended to be correlative, complementary and mutually explanatory. The Contract shall be read as a whole.

3. Interpretation

3.1 In the Contract, except where the context requires otherwise:

- (a) words indicating one gender include all genders;
- (b) words indicating the singular also include the plural and words indicating the plural also include the singular;
- (c) provisions including the word “agree,” “agreed,” or “agreement” require the agreement to be recorded in writing;
- (d) the word “tender” is synonymous with “Bid,” “tenderer,” with “Bidder,” and “tender documents” with “Bidding Document,” and
- (e) “written” or “in writing” means hand-written, type-written, printed or electronically made, and resulting in a permanent record.

The marginal words and other headings shall not be taken into consideration in the interpretation of these Conditions.

3.2 Incoterms

Unless inconsistent with any provision of the Contract, the meaning of any trade term and the rights and obligations of Parties thereunder shall be as prescribed by *Incoterms*.

Incoterms means international rules for interpreting trade terms published by the International Chamber of Commerce (latest edition), 38 Cours Albert 1^{er}, 75008 Paris, France.

3.3 Entire Agreement

Subject to GCC Sub-Clause 16.4 hereof, the Contract constitutes the entire agreement between the Employer and Contractor with respect to the subject matter of Contract and supersedes all communications, negotiations and agreements (whether written or oral) of Parties with respect thereto made prior to the date of Contract.

3.4 Amendment

No amendment or other variation of the Contract shall be effective unless it is in writing, is dated, expressly refers to the Contract, and is signed by a duly authorized representative of each Party hereto.

3.5 Independent Contractor

The Contractor shall be an independent contractor performing the Contract. The Contract does not create any agency, partnership, joint venture or other joint relationship between the Parties hereto. Subject to the provisions of the Contract, the Contractor shall be solely responsible for the manner in which the Contract is performed. All employees, representatives or Subcontractors engaged by the Contractor in connection with the performance of the Contract shall be under the complete control of the Contractor and shall not be deemed to be employees of the Employer, and nothing contained in the Contract or in any subcontract awarded by the Contractor shall be construed to create any contractual relationship between any such employees, representatives or Subcontractors and the Employer.

3.6 Non-Waiver

3.6.1 Subject to GCC Sub-Clause 3.6.2 below, no relaxation, forbearance, delay or indulgence by either Party in enforcing any of the terms and conditions of the Contract or the granting of time by either Party to the other shall prejudice, affect or restrict the rights of that Party under the Contract, nor shall any waiver by either Party of any breach of Contract operate as waiver of any subsequent or continuing breach of Contract.

3.6.2 Any waiver of a Party's rights, powers or remedies under the Contract must be in writing, must be dated and signed by an authorized representative of the Party granting such waiver, and must specify the right and the extent to which it is being waived.

3.7 Severability

If any provision or condition of the Contract is prohibited or rendered invalid or unenforceable, such prohibition, invalidity or

unenforceability shall not affect the validity or enforceability of any other provisions and conditions of the Contract.

3.8 Country of Origin

“Origin” means the place where the plant and component parts thereof are mined, grown, produced or manufactured, and from which the services are provided. Plant components are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that is substantially in its basic characteristics or in purpose or utility from its components.

4. **Communications**

4.1 Wherever these Conditions provide for the giving or issuing of approvals, certificates, consents, determinations, notices, requests and discharges, these communications shall be:

- (a) in writing and delivered against receipt; and
- (b) delivered, sent or transmitted to the address for the recipient’s communications as stated in the Contract Agreement.

When a certificate is issued to a Party, the certifier shall send a copy to the other Party. When a notice is issued to a Party, by the other Party or the Project Manager, a copy shall be sent to the Project Manager or the other Party, as the case may be.

5. **Law and Language**

5.1 The Contract shall be governed by and interpreted in accordance with laws of the country **specified in the PCC**.

5.2 The ruling language of the Contract shall be that **stated in the PCC**.

5.3 The language for communications shall be the ruling language unless otherwise **stated in the PCC**.

6. **Fraud and Corruption**

6.1 The Bank requires compliance with the Bank’s Anti-Corruption Guidelines and its prevailing sanctions policies and procedures as set forth in the WBG’s Sanctions Framework, as set forth in Appendix B to the GCC.

6.2 The Employer requires the Contractor to disclose any commissions or fees that may have been paid or are to be paid to agents or any other party with respect to the Bidding process or execution of the Contract. The information disclosed must include at least the name and address

of the agent or other party, the amount and currency, and the purpose of the commission, gratuity or fee.

B. Subject Matter of Contract

7. Scope of Facilities

- 7.1 Unless otherwise expressly limited in the Employer's Requirements, the Contractor's obligations cover the provision of all Plant and the performance of all Installation Services required for the design, and the manufacture (including procurement, quality assurance, construction, installation, associated civil works, Precommissioning and delivery) of the Plant, and the installation, completion and commissioning of the Facilities in accordance with the plans, procedures, specifications, drawings, codes and any other documents as specified in the Section, Employer's Requirements. Such specifications include, but are not limited to, the provision of supervision and engineering services; the supply of labor, materials, equipment, spare parts (as specified in GCC Sub-Clause 7.3 below) and accessories; Contractor's Equipment; construction utilities and supplies; temporary materials, structures and facilities; transportation (including, without limitation, unloading and hauling to, from and at the Site); and storage, except for those supplies, works and services that will be provided or performed by the Employer, as set forth in the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer.
- 7.2 The Contractor shall, unless specifically excluded in the Contract, perform all such work and/or supply all such items and materials not specifically mentioned in the Contract but that can be reasonably inferred from the Contract as being required for attaining Completion of the Facilities as if such work and/or items and materials were expressly mentioned in the Contract.
- 7.3 In addition to the supply of Mandatory Spare Parts included in the Contract, the Contractor agrees to supply spare parts required for the operation and maintenance of the Facilities for the period **specified in the PCC** and the provisions, if any, **specified in the PCC**. However, the identity, specifications and quantities of such spare parts and the terms and conditions relating to the supply thereof are to be agreed between the Employer and the Contractor, and the price of such spare parts shall be that given in Price Schedule No. 6, which shall be added to the Contract Price. The price of such spare parts shall include the purchase price therefor and other costs and expenses (including the Contractor's fees) relating to the supply of spare parts.

8. Time for Commencement and Completion

- 8.1 The Contractor shall commence work on the Facilities within the period **specified in the PCC** and without prejudice to GCC Sub-Clause 26.2 hereof, the Contractor shall thereafter proceed with the Facilities in accordance with the time schedule specified in the Appendix to the Contract Agreement titled Time Schedule.
- 8.2 The Contractor shall attain Completion of the Facilities or of a part where a separate time for Completion of such part is specified in the Contract, within the time **stated in the PCC** or within such extended time to which the Contractor shall be entitled under GCC Clause 40 hereof.

9. Contractor's Responsibilities

- 9.1 The Contractor shall design, manufacture including associated purchases and/or subcontracting, install and complete the Facilities in accordance with the Contract. When completed, the Facilities should be fit for the purposes for which they are intended as defined in the Contract.
- 9.2 The Contractor confirms that it has entered into this Contract on the basis of a proper examination of the data relating to the Facilities including any data as to boring tests provided by the Employer, and on the basis of information that the Contractor could have obtained from a visual inspection of the Site if access thereto was available and of other data readily available to it relating to the Facilities as of the date twenty-eight (28) days prior to Bid submission. The Contractor acknowledges that any failure to acquaint itself with all such data and information shall not relieve its responsibility for properly estimating the difficulty or cost of successfully performing the Facilities.
- 9.3 The Contractor shall acquire and pay for all permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings in the country where the Site is located which such authorities or undertakings require the Contractor to obtain in its name and which are necessary for the performance of the Contract, including, without limitation, visas for the Contractor's and Subcontractor's personnel and entry permits for all imported Contractor's Equipment. The Contractor shall acquire all other permits, approvals and/or licenses that are not the responsibility of the Employer under GCC Sub-Clause 10.3 hereof and that are necessary for the performance of the Contract.
- 9.4 The Contractor shall comply with all laws in force in the country where the Facilities are to be implemented. The laws will include all local, state, national or other laws that affect the performance of the

Contract and bind upon the Contractor. The Contractor shall indemnify and hold harmless the Employer from and against any and all liabilities, damages, claims, fines, penalties and expenses of whatever nature arising or resulting from the violation of such laws by the Contractor or its personnel, including the Subcontractors and their personnel, but without prejudice to GCC Sub-Clause 10.1 hereof.

- 9.5 Any Plant and Installation Services that will be incorporated in or be required for the Facilities and other supplies shall have their origin as specified under GCC Clause 1 (Country of Origin). Any subcontractors retained by the Contractor shall be from a country as specified in GCC Clause 1 (Country of Origin).
- 9.6 If the Contractor is a joint venture, or association (JV) of two or more persons, all such persons shall be jointly and severally bound to the Employer for the fulfillment of the provisions of the Contract, and shall designate one of such persons to act as a leader with authority to bind the JV. The composition or the constitution of the JV shall not be altered without the prior consent of the Employer.
- 9.7 Pursuant to paragraph 2.2 e. of Appendix B to the General Conditions the Contractor shall permit and shall cause its subcontractors and subconsultants to permit, the Bank and/or persons appointed by the Bank to inspect the Site and/or the accounts and records relating to the procurement process, selection and/or contract execution, and to have such accounts and records audited by auditors appointed by the Bank if requested by the Bank. The Contractor's and its Subcontractors' and subconsultants' attention is drawn to Sub-Clause 6.1 which provides, inter alia, that acts intended to materially impede the exercise of the Bank's inspection and audit rights constitute a prohibited practice subject to contract termination (as well as to a determination of ineligibility pursuant to the Bank's prevailing sanctions procedures).
- 9.8 The Contractor shall conform to the sustainable procurement contractual provisions, if and as specified **in the PCC**.

10. Employer's Responsibilities

- 10.1 All information and/or data to be supplied by the Employer as described in the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer, shall be deemed to be accurate, except when the Employer expressly states otherwise.
- 10.2 The Employer shall be responsible for acquiring and providing legal and physical possession of the Site and access thereto, and for providing possession of and access to all other areas reasonably required for the proper execution of the Contract, including all

requisite rights of way, as specified in the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer. The Employer shall give full possession of and accord all rights of access thereto on or before the date(s) specified in that Appendix.

- 10.3 The Employer shall acquire and pay for all permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings in the country where the Site is located which (a) such authorities or undertakings require the Employer to obtain in the Employer's name, (b) are necessary for the execution of the Contract, including those required for the performance by both the Contractor and the Employer of their respective obligations under the Contract, and (c) are specified in the Appendix (Scope of Works and Supply by the Employer).
- 10.4 If requested by the Contractor, the Employer shall use its best endeavors to assist the Contractor in obtaining in a timely and expeditious manner all permits, approvals and/or licenses necessary for the execution of the Contract from all local, state or national government authorities or public service undertakings that such authorities or undertakings require the Contractor or Subcontractors or the personnel of the Contractor or Subcontractors, as the case may be, to obtain.
- 10.5 Unless otherwise specified in the Contract or agreed upon by the Employer and the Contractor, the Employer shall provide sufficient, properly qualified operating and maintenance personnel; shall supply and make available all raw materials, utilities, lubricants, chemicals, catalysts, other materials and facilities; and shall perform all work and services of whatsoever nature, including those required by the Contractor to properly carry out Precommissioning, Commissioning and Guarantee Tests, all in accordance with the provisions of the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer, at or before the time specified in the program furnished by the Contractor under GCC Sub-Clause 18.2 hereof and in the manner thereupon specified or as otherwise agreed upon by the Employer and the Contractor.
- 10.6 The Employer shall be responsible for the continued operation of the Facilities after Completion, in accordance with GCC Sub-Clause 24.8, and shall be responsible for facilitating the Guarantee Test(s) for the Facilities, in accordance with GCC Sub-Clause 25.2.
- 10.7 All costs and expenses involved in the performance of the obligations under this GCC Clause 10 shall be the responsibility of the Employer, save those to be incurred by the Contractor with respect to the

performance of Guarantee Tests, in accordance with GCC Sub-Clause 25.2.

- 10.8 In the event that the Employer shall be in breach of any of his obligations under this Clause, the additional cost incurred by the Contractor in consequence thereof shall be determined by the Project Manager and added to the Contract Price.

C. Payment

11. Contract Price

- 11.1 The Contract Price shall be as specified in Article 2 (Contract Price and Terms of Payment) of the Contract Agreement.
- 11.2 Unless an adjustment clause is **provided for in the PCC**, the Contract Price shall be a firm lump sum not subject to any alteration, except in the event of a Change in the Facilities or as otherwise provided in the Contract.
- 11.3 Subject to GCC Sub-Clauses 9.2, 10.1 and 35 hereof, the Contractor shall be deemed to have satisfied itself as to the correctness and sufficiency of the Contract Price, which shall, except as otherwise provided for in the Contract, cover all its obligations under the Contract.

12. Terms of Payment

- 12.1 The Contract Price shall be paid as specified in Article 2 (Contract Price and Terms of Payment) of the Contract Agreement and in the Appendix to the Contract Agreement titled Terms and Procedures of Payment, which also outlines the procedures to be followed in making application for and processing payments.
- 12.2 No payment made by the Employer herein shall be deemed to constitute acceptance by the Employer of the Facilities or any part(s) thereof.
- 12.3 In the event that the Employer fails to make any payment by its respective due date or within the period set forth in the Contract, the Employer shall pay to the Contractor interest on the amount of such delayed payment at the rate(s) shown in the Appendix to the Contract Agreement titled Terms and Procedures of Payment, for the period of delay until payment has been made in full, whether before or after judgment or arbitration award.
- 12.4 The currency or currencies in which payments are made to the Contractor under this Contract shall be specified in the Appendix to the Contract Agreement titled Terms and Procedures of Payment,

subject to the general principle that payments will be made in the currency or currencies in which the Contract Price has been stated in the Contractor's Bid.

13. Securities

13.1 Issuance of Securities

The Contractor shall provide the securities specified below in favor of the Employer at the times, and in the amount, manner and form specified below.

13.2 Advance Payment Security

13.2.1 The Contractor shall, within twenty-eight (28) days of the notification of contract award, provide a security in an amount equal to the advance payment calculated in accordance with the Appendix to the Contract Agreement titled Terms and Procedures of Payment, and in the same currency or currencies.

13.2.2 The security shall be in the form provided in the Bidding documents or in another form acceptable to the Employer. The amount of the security shall be reduced in proportion to the value of the Facilities executed by and paid to the Contractor from time to time, and shall automatically become null and void when the full amount of the advance payment has been recovered by the Employer. The security shall be returned to the Contractor immediately after its expiration.

13.3 Performance Security

13.3.1 The Contractor shall, within twenty-eight (28) days of the notification of contract award, provide a security for the due performance of the Contract in the amount **specified in the PCC**.

13.3.2 The Performance Security shall be denominated in the currency or currencies of the Contract, or in a freely convertible currency acceptable to the Employer, and shall be in the form provided in Section X, Contract Forms, corresponding to the type of bank guarantee stipulated by the Employer **in the PCC**, or in another form acceptable to the Employer.

13.3.3 Unless otherwise specified **in the PCC**, the security shall be reduced by half on the date of the Operational Acceptance. The Security shall become null and void, or shall be reduced pro rata to the Contract Price of a part of the Facilities for which a separate Time for Completion is provided, five hundred and forty (540) days after Completion of the Facilities or three

hundred and sixty five (365) days after Operational Acceptance of the Facilities, whichever occurs first; provided, however, that if the Defects Liability Period has been extended on any part of the Facilities pursuant to GCC Sub-Clause 27.8 hereof, the Contractor shall issue an additional security in an amount proportionate to the Contract Price of that part. The security shall be returned to the Contractor immediately after its expiration, provided, however, that if the Contractor, pursuant to GCC Sub-Clause 27.10, is liable for an extended defect liability obligation, the Performance Security shall be extended for the period specified **in the PCC** pursuant to GCC Sub-Clause 27.10 and up to the amount specified **in the PCC**.

13.3.4 The Employer shall not make a claim under the Performance Security, except for amounts to which the Employer is entitled under the Contract. The Employer shall indemnify and hold the Contractor harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from a claim under the Performance Security to the extent to which the Employer was not entitled to make the claim.

14. Taxes and Duties

14.1 Except as otherwise specifically provided in the Contract, the Contractor shall bear and pay all taxes, duties, levies and charges assessed on the Contractor, its Subcontractors or their employees by all municipal, state or national government authorities in connection with the Facilities in and outside of the country where the Site is located.

14.2 Notwithstanding GCC Sub-Clause 14.1 above, the Employer shall bear and promptly pay

- (a) all customs and import duties for the Plant specified in Price Schedule No. 1; and
- (b) other domestic taxes such as, sales tax and value added tax (VAT) on the Plant specified in Price Schedules No. 1 and No. 2 and that is to be incorporated into the Facilities, and on the finished goods, imposed by the law of the country where the Site is located.

14.3 If any tax exemptions, reductions, allowances or privileges may be available to the Contractor in the country where the Site is located, the Employer shall use its best endeavors to enable the Contractor to benefit from any such tax savings to the maximum allowable extent.

- 14.4 For the purpose of the Contract, it is agreed that the Contract Price specified in Article 2 (Contract Price and Terms of Payment) of the Contract Agreement is based on the taxes, duties, levies and charges prevailing at the date twenty-eight (28) days prior to the date of Bid submission in the country where the Site is located (hereinafter called “Tax” in this GCC Sub-Clause 14.4). If any rates of Tax are increased or decreased, a new Tax is introduced, an existing Tax is abolished, or any change in interpretation or application of any Tax occurs in the course of the performance of Contract, which was or will be assessed on the Contractor, Subcontractors or their employees in connection with performance of the Contract, an equitable adjustment of the Contract Price shall be made to fully take into account any such change by addition to the Contract Price or deduction therefrom, as the case may be, in accordance with GCC Clause 36 hereof.

D. Intellectual Property

15. License/Use of Technical Information

- 15.1 For the operation and maintenance of the Plant, the Contractor hereby grants a non-exclusive and non-transferable license (without the right to sub-license) to the Employer under the patents, utility models or other industrial property rights owned by the Contractor or by a third Party from whom the Contractor has received the right to grant licenses thereunder, and shall also grant to the Employer a non-exclusive and non-transferable right (without the right to sub-license) to use the know-how and other technical information disclosed to the Employer under the Contract. Nothing contained herein shall be construed as transferring ownership of any patent, utility model, trademark, design, copyright, know-how or other intellectual property right from the Contractor or any third Party to the Employer.
- 15.2 The copyright in all drawings, documents and other materials containing data and information furnished to the Employer by the Contractor herein shall remain vested in the Contractor or, if they are furnished to the Employer directly or through the Contractor by any third Party, including suppliers of materials, the copyright in such materials shall remain vested in such third Party.

16. Confidential Information

- 16.1 The Employer and the Contractor shall keep confidential and shall not, without the written consent of the other Party hereto, divulge to any third Party any documents, data or other information furnished directly or indirectly by the other Party hereto in connection with the Contract, whether such information has been furnished prior to,

during or following termination of the Contract. Notwithstanding the above, the Contractor may furnish to its Subcontractor(s) such documents, data and other information it receives from the Employer to the extent required for the Subcontractor(s) to perform its work under the Contract, in which event the Contractor shall obtain from such Subcontractor(s) an undertaking of confidentiality similar to that imposed on the Contractor under this GCC Clause 16.

16.2 The Employer shall not use such documents, data and other information received from the Contractor for any purpose other than the operation and maintenance of the Facilities. Similarly, the Contractor shall not use such documents, data and other information received from the Employer for any purpose other than the design, procurement of Plant, construction or such other work and services as are required for the performance of the Contract.

16.3 The obligation of a Party under GCC Sub-Clauses 16.1 and 16.2 above, however, shall not apply to that information which

- (a) now or hereafter enters the public domain through no fault of that Party
- (b) can be proven to have been possessed by that Party at the time of disclosure and which was not previously obtained, directly or indirectly, from the other Party hereto
- (c) otherwise lawfully becomes available to that Party from a third Party that has no obligation of confidentiality.

16.4 The above provisions of this GCC Clause 16 shall not in any way modify any undertaking of confidentiality given by either of the Parties hereto prior to the date of the Contract in respect of the Facilities or any part thereof.

16.5 The provisions of this GCC Clause 16 shall survive termination, for whatever reason, of the Contract.

E. Execution of the Facilities

17. Representatives 17.1 Project Manager

If the Project Manager is not named in the Contract, then within fourteen (14) days of the Effective Date, the Employer shall appoint and notify the Contractor in writing of the name of the Project Manager. The Employer may from time to time appoint some other person as the Project Manager in place of the person

previously so appointed, and shall give a notice of the name of such other person to the Contractor without delay. No such appointment shall be made at such a time or in such a manner as to impede the progress of work on the Facilities. Such appointment shall only take effect upon receipt of such notice by the Contractor. The Project Manager shall represent and act for the Employer at all times during the performance of the Contract. All notices, instructions, orders, certificates, approvals and all other communications under the Contract shall be given by the Project Manager, except as herein otherwise provided.

All notices, instructions, information and other communications given by the Contractor to the Employer under the Contract shall be given to the Project Manager, except as herein otherwise provided.

17.2 Contractor's Representative & Construction Manager

17.2.1 If the Contractor's Representative is not named in the Contract, then within fourteen (14) days of the Effective Date, the Contractor shall appoint the Contractor's Representative and shall request the Employer in writing to approve the person so appointed. If the Employer makes no objection to the appointment within fourteen (14) days, the Contractor's Representative shall be deemed to have been approved. If the Employer objects to the appointment within fourteen (14) days giving the reason therefor, then the Contractor shall appoint a replacement within fourteen (14) days of such objection, and the foregoing provisions of this GCC Sub-Clause 17.2.1 shall apply thereto.

17.2.2 The Contractor's Representative shall represent and act for the Contractor at all times during the performance of the Contract and shall give to the Project Manager all the Contractor's notices, instructions, information and all other communications under the Contract.

All notices, instructions, information and all other communications given by the Employer or the Project Manager to the Contractor under the Contract shall be given to the Contractor's Representative or, in its absence, its deputy, except as herein otherwise provided.

The Contractor shall not revoke the appointment of the Contractor's Representative without the Employer's prior

written consent, which shall not be unreasonably withheld. If the Employer consents thereto, the Contractor shall appoint some other person as the Contractor's Representative, pursuant to the procedure set out in GCC Sub-Clause 17.2.1.

- 17.2.3 The Contractor's Representative may, subject to the approval of the Employer which shall not be unreasonably withheld, at any time delegate to any person any of the powers, functions and authorities vested in him or her. Any such delegation may be revoked at any time. Any such delegation or revocation shall be subject to a prior notice signed by the Contractor's Representative, and shall specify the powers, functions and authorities thereby delegated or revoked. No such delegation or revocation shall take effect unless and until a copy thereof has been delivered to the Employer and the Project Manager.

Any act or exercise by any person of powers, functions and authorities so delegated to him or her in accordance with this GCC Sub-Clause 17.2.3 shall be deemed to be an act or exercise by the Contractor's Representative.

- 17.2.4 From the commencement of installation of the Facilities at the Site until Completion, the Contractor's Representative shall appoint a suitable person as the Construction Manager. The Construction Manager shall supervise all work done at the Site by the Contractor and shall be present at the Site throughout normal working hours except when on leave, sick or absent for reasons connected with the proper performance of the Contract. Whenever the Construction Manager is absent from the Site, a suitable person shall be appointed to act as the Construction Manager's deputy.

- 17.2.5 The Employer may by notice to the Contractor object to any representative or person employed by the Contractor in the execution of the Contract who, in the reasonable opinion of the Employer, may behave inappropriately, may be incompetent or negligent, or may commit a serious breach of the Site regulations provided under GCC Sub-Clause 22.4. The Employer shall provide evidence of the same, whereupon the Contractor shall remove such person from the Facilities.

- 17.2.6 If any representative or person employed by the Contractor is removed in accordance with GCC Sub-Clause 17.2.5, the Contractor shall, where required, promptly appoint a replacement.

18. Work Program 18.1 Contractor's Organization

The Contractor shall supply to the Employer and the Project Manager a chart showing the proposed organization to be established by the Contractor for carrying out work on the Facilities within twenty-one (21) days of the Effective Date. The chart shall include the identities of the key personnel and the curricula vitae of such key personnel to be employed shall be supplied together with the chart. The Contractor shall promptly inform the Employer and the Project Manager in writing of any revision or alteration of such an organization chart.

18.2 Program of Performance

Within twenty-eight (28) days after the Effective Date, the Contractor shall submit to the Project Manager a detailed program of performance of the Contract, made in a form acceptable to the Project Manager and showing the sequence in which it proposes to design, manufacture, transport, assemble, install and precommission the Facilities, as well as the date by which the Contractor reasonably requires that the Employer shall have fulfilled its obligations under the Contract so as to enable the Contractor to execute the Contract in accordance with the program and to achieve Completion, Commissioning and Acceptance of the Facilities in accordance with the Contract. The program so submitted by the Contractor shall accord with the Time Schedule included in the Appendix to the Contract Agreement titled Time Schedule, and any other dates and periods specified in the Contract. The Contractor shall update and revise the program as and when appropriate or when required by the Project Manager, but without modification in the Times for Completion specified in the PCC pursuant to Sub-Clause 8.2 and any extension granted in accordance with GCC Clause 40, and shall submit all such revisions to the Project Manager.

18.3 Progress Report

The Contractor shall monitor progress of all the activities specified in the program referred to in GCC Sub-Clause 18.2 above, and supply a progress report to the Project Manager every month.

The progress report shall be in a form acceptable to the Project Manager and shall indicate: (a) percentage completion

achieved compared with the planned percentage completion for each activity; and (b) where any activity is behind the program, giving comments and likely consequences and stating the corrective action being taken.

18.4 Progress of Performance

If at any time the Contractor's actual progress falls behind the program referred to in GCC Sub-Clause 18.2, or it becomes apparent that it will so fall behind, the Contractor shall, at the request of the Employer or the Project Manager, prepare and submit to the Project Manager a revised program, taking into account the prevailing circumstances, and shall notify the Project Manager of the steps being taken to expedite progress so as to attain Completion of the Facilities within the Time for Completion under GCC Sub-Clause 8.2, any extension thereof entitled under GCC Sub-Clause 40.1, or any extended period as may otherwise be agreed upon between the Employer and the Contractor.

18.5 Procedures

The Contract shall be executed in accordance with the Contract Documents including the procedures given in the Forms and Procedures of the Employer's Requirements.

The Contractor may execute the Contract in accordance with its own standard project execution plans and procedures to the extent that they do not conflict with the provisions contained in the Contract.

19. Subcontracting

19.1 The Appendix to the Contract Agreement titled List of Major Items of Plant and Installation Services and List of Approved Subcontractors, specifies major items of supply or services and a list of approved Subcontractors against each item, including manufacturers. Insofar as no Subcontractors are listed against any such item, the Contractor shall prepare a list of Subcontractors for such item for inclusion in such list. The Contractor may from time to time propose any addition to or deletion from any such list. The Contractor shall submit any such list or any modification thereto to the Employer for its approval in sufficient time so as not to impede the progress of work on the Facilities. Such approval by the Employer for any of the Subcontractors shall not relieve the Contractor from any of its obligations, duties or responsibilities under the Contract.

- 19.2 The Contractor shall select and employ its Subcontractors for such major items from those listed in the lists referred to in GCC Sub-Clause 19.1.
- 19.3 For items or parts of the Facilities not specified in the Appendix to the Contract Agreement titled List of Major Items of Plant and Installation Services and List of Approved Subcontractors, the Contractor may employ such Subcontractors as it may select, at its discretion.
- 19.4 Each sub-contract shall include provisions which would entitle the Employer to require the sub-contract to be assigned to the Employer under GCC 19.5 (if and when applicable), or in event of termination by the Employer under GCC 42.2.
- 19.5 If a subcontractor's obligations extend beyond the expiry date of the relevant Defects Liability Period and the Project Manager, prior to that date, instructs the Contractor to assign the benefits of such obligations to the Employer, then the Contractor shall do so.

20. Design and Engineering

20.1 Specifications and Drawings

- 20.1.1 The Contractor shall execute the basic and detailed design and the engineering work in compliance with the provisions of the Contract, or where not so specified, in accordance with good engineering practice.

The Contractor shall be responsible for any discrepancies, errors or omissions in the specifications, drawings and other technical documents that it has prepared, whether such specifications, drawings and other documents have been approved by the Project Manager or not, provided that such discrepancies, errors or omissions are not because of inaccurate information furnished in writing to the Contractor by or on behalf of the Employer.

- 20.1.2 The Contractor shall be entitled to disclaim responsibility for any design, data, drawing, specification or other document, or any modification thereof provided or designated by or on behalf of the Employer, by giving a notice of such disclaimer to the Project Manager.

20.2 Codes and Standards

Wherever references are made in the Contract to codes and standards in accordance with which the Contract shall be

executed, the edition or the revised version of such codes and standards current at the date twenty-eight (28) days prior to date of Bid submission shall apply unless otherwise specified. During Contract execution, any changes in such codes and standards shall be applied subject to approval by the Employer and shall be treated in accordance with GCC Clause 39.

20.3 Approval/Review of Technical Documents by Project Manager

20.3.1 The Contractor shall prepare or cause its Subcontractors to prepare, and furnish to the Project Manager the documents listed in the Appendix to the Contract Agreement titled List of Documents for Approval or Review, for its approval or review as specified and in accordance with the requirements of GCC Sub-Clause 18.2 (Program of Performance).

Any part of the Facilities covered by or related to the documents to be approved by the Project Manager shall be executed only after the Project Manager's approval thereof.

GCC Sub-Clauses 20.3.2 through 20.3.7 shall apply to those documents requiring the Project Manager's approval, but not to those furnished to the Project Manager for its review only.

20.3.2 Within fourteen (14) days after receipt by the Project Manager of any document requiring the Project Manager's approval in accordance with GCC Sub-Clause 20.3.1, the Project Manager shall either return one copy thereof to the Contractor with its approval endorsed thereon or shall notify the Contractor in writing of its disapproval thereof and the reasons therefor and the modifications that the Project Manager proposes.

If the Project Manager fails to take such action within the said fourteen (14) days, then the said document shall be deemed to have been approved by the Project Manager.

20.3.3 The Project Manager shall not disapprove any document, except on the grounds that the document does not comply with the Contract or that it is contrary to good engineering practice.

- 20.3.4 If the Project Manager disapproves the document, the Contractor shall modify the document and resubmit it for the Project Manager's approval in accordance with GCC Sub-Clause 20.3.2. If the Project Manager approves the document subject to modification(s), the Contractor shall make the required modification(s), whereupon the document shall be deemed to have been approved.
- 20.3.5 If any dispute or difference occurs between the Employer and the Contractor in connection with or arising out of the disapproval by the Project Manager of any document and/or any modification(s) thereto that cannot be settled between the Parties within a reasonable period, then such dispute or difference may be referred to a Dispute Board for determination in accordance with GCC Sub-Clause 46.1 hereof. If such dispute or difference is referred to a Dispute Board, the Project Manager shall give instructions as to whether and if so, how, performance of the Contract is to proceed. The Contractor shall proceed with the Contract in accordance with the Project Manager's instructions, provided that if the Dispute Board upholds the Contractor's view on the dispute and if the Employer has not given notice under GCC Sub-Clause 46.3 hereof, then the Contractor shall be reimbursed by the Employer for any additional costs incurred by reason of such instructions and shall be relieved of such responsibility or liability in connection with the dispute and the execution of the instructions as the Dispute Board shall decide, and the Time for Completion shall be extended accordingly.
- 20.3.6 The Project Manager's approval, with or without modification of the document furnished by the Contractor, shall not relieve the Contractor of any responsibility or liability imposed upon it by any provisions of the Contract except to the extent that any subsequent failure results from modifications required by the Project Manager.
- 20.3.7 The Contractor shall not depart from any approved document unless the Contractor has first submitted to the Project Manager an amended document and obtained the Project Manager's approval thereof, pursuant to the provisions of this GCC Sub-Clause 20.3.

If the Project Manager requests any change in any already approved document and/or in any document based thereon, the provisions of GCC Clause 39 shall apply to such request.

21. Procurement

21.1 Plant

Subject to GCC Sub-Clause 14.2, the Contractor shall procure and transport all Plant in an expeditious and orderly manner to the Site.

21.2 Employer-Supplied Plant

If the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer, provides that the Employer shall furnish any specific items to the Contractor, the following provisions shall apply:

21.2.1 The Employer shall, at its own risk and expense, transport each item to the place on or near the Site as agreed upon by the Parties and make such item available to the Contractor at the time specified in the program furnished by the Contractor, pursuant to GCC Sub-Clause 18.2, unless otherwise mutually agreed.

21.2.2 Upon receipt of such item, the Contractor shall inspect the same visually and notify the Project Manager of any detected shortage, defect or default. The Employer shall immediately remedy any shortage, defect or default, or the Contractor shall, if practicable and possible, at the request of the Employer, remedy such shortage, defect or default at the Employer's cost and expense. After inspection, such item shall fall under the care, custody and control of the Contractor. The provision of this GCC Sub-Clause 21.2.2 shall apply to any item supplied to remedy any such shortage or default or to substitute for any defective item, or shall apply to defective items that have been repaired.

21.2.3 The foregoing responsibilities of the Contractor and its obligations of care, custody and control shall not relieve the Employer of liability for any undetected shortage, defect or default, nor place the Contractor under any liability for any such shortage, defect or default whether under GCC Clause 27 or under any other provision of Contract.

21.3 Transportation

21.3.1 The Contractor shall at its own risk and expense transport all the materials and the Contractor's Equipment to the Site by the mode of transport that the Contractor judges most suitable under all the circumstances.

21.3.2 Unless otherwise provided in the Contract, the Contractor shall be entitled to select any safe mode of transport operated by any person to carry the materials and the Contractor's Equipment.

21.3.3 Upon dispatch of each shipment of materials and the Contractor's Equipment, the Contractor shall notify the Employer by telex, cable, facsimile or electronic means, of the description of the materials and of the Contractor's Equipment, the point and means of dispatch, and the estimated time and point of arrival in the country where the Site is located, if applicable, and at the Site. The Contractor shall furnish the Employer with relevant shipping documents to be agreed upon between the Parties.

21.3.4 The Contractor shall be responsible for obtaining, if necessary, approvals from the authorities for transportation of the materials and the Contractor's Equipment to the Site. The Employer shall use its best endeavors in a timely and expeditious manner to assist the Contractor in obtaining such approvals, if requested by the Contractor. The Contractor shall indemnify and hold harmless the Employer from and against any claim for damage to roads, bridges or any other traffic facilities that may be caused by the transport of the materials and the Contractor's Equipment to the Site.

21.4 Customs Clearance

The Contractor shall, at its own expense, handle all imported materials and Contractor's Equipment at the point(s) of import and shall handle any formalities for customs clearance, subject to the Employer's obligations under GCC Sub-Clause 14.2, provided that if applicable laws or regulations require any application or act to be made by or in the name of the Employer, the Employer shall take all necessary steps to comply with such laws or regulations. In the event of delays in customs clearance that are not the fault of the Contractor, the Contractor shall be

entitled to an extension in the Time for Completion, pursuant to GCC Clause 40.

22. Installation

22.1 Setting Out/Supervision

22.1.1 Bench Mark: The Contractor shall be responsible for the true and proper setting-out of the Facilities in relation to bench marks, reference marks and lines provided to it in writing by or on behalf of the Employer.

If, at any time during the progress of installation of the Facilities, any error shall appear in the position, level or alignment of the Facilities, the Contractor shall forthwith notify the Project Manager of such error and, at its own expense, immediately rectify such error to the reasonable satisfaction of the Project Manager. If such error is based on incorrect data provided in writing by or on behalf of the Employer, the expense of rectifying the same shall be borne by the Employer.

22.1.2 Contractor's Supervision: The Contractor shall give or provide all necessary superintendence during the installation of the Facilities, and the Construction Manager or its deputy shall be constantly on the Site to provide full-time superintendence of the installation. The Contractor shall provide and employ only technical personnel who are skilled and experienced in their respective callings and supervisory staff who are competent to adequately supervise the work at hand.

22.2 Labor:

22.2.1 Engagement of Staff and Labor

Except as otherwise stated in the Specification, the Contractor shall make arrangements for the engagement of all staff and labor, local or otherwise, and for their payment, housing, feeding and transport.

The Contractor shall provide and employ on the Site in the installation of the Facilities such skilled, semi-skilled and unskilled labor as is necessary for the proper and timely execution of the Contract. The Contractor is encouraged to use local labor that has the necessary skills.

The Contractor shall be responsible for obtaining all necessary permit(s) and/or visa(s) from the appropriate authorities for the entry of all labor and personnel to be employed on the Site into the country where the Site is located. The Employer will, if requested by the Contractor, use his best endeavors in a timely and expeditious manner to assist the Contractor in obtaining any local, state, national or government permission required for bringing in the Contractor's personnel.

The Contractor shall at its own expense provide the means of repatriation to all of its and its Subcontractor's personnel employed on the Contract at the Site to the place where they were recruited or to their domicile. It shall also provide suitable temporary maintenance of all such persons from the cessation of their employment on the Contract to the date programmed for their departure. In the event that the Contractor defaults in providing such means of transportation and temporary maintenance, the Employer may provide the same to such personnel and recover the cost of doing so from the Contractor.

22.2.2 Persons in the Service of Employer

The Contractor shall not recruit, or attempt to recruit, staff and labor from amongst the Employer's Personnel.

22.2.3 Labor Laws

The Contractor shall comply with all the relevant labor Laws applicable to the Contractor's Personnel, including Laws relating to their employment, health, safety, welfare, immigration and emigration, and shall allow them all their legal rights.

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 labor of its Subcontractors.

The Contractor shall, in all dealings with its labor and the labor 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.

22.2.4 Rates of Wages and Conditions of Labor

The Contractor shall pay rates of wages, and observe conditions of labor, which are not lower than those established for the trade or industry where the work is carried out. If no established rates or conditions are applicable, the Contractor shall pay rates of wages and observe conditions which are not lower than the general level of wages and conditions observed locally by employers whose trade or industry is similar to that of the Contractor.

The Contractor shall inform the Contractor's Personnel about their liability to pay personal income taxes in the Country in respect of such of their salaries, wages and allowances as are chargeable under the Laws for the time being in force, and the Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such Laws.

22.2.5 Working Hours

No work shall be carried out on the Site on locally recognized days of rest, or outside the normal working hours **stated in the PCC**, unless:

- (a) otherwise stated in the Contract,
- (b) the Project Manager gives consent, or
- (c) the work is unavoidable, or necessary for the protection of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Project Manager.

If and when the Contractor considers it necessary to carry out work at night or on public holidays so as to meet the Time for Completion and requests the Project Manager's consent thereto, the Project Manager shall not unreasonably withhold such consent.

This Sub-Clause shall not apply to any work which is customarily carried out by rotary or double-shifts.

22.2.6 Facilities for Staff and Labor

Except as otherwise stated in the Specification, the Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor's Personnel. The Contractor shall also provide facilities for the Employer's Personnel as stated in the Specification.

The Contractor shall not permit any of the Contractor's Personnel to maintain any temporary or permanent living quarters within the structures forming part of the Permanent Works.

22.2.7 Health and Safety

The Contractor shall at all times take all reasonable precautions to maintain the health and safety of the Contractor's Personnel. In collaboration with local health authorities, the Contractor shall ensure that medical staff, first aid facilities, sick bay and ambulance service are available at all times at the Site and at any accommodation for Contractor's and Employer's Personnel, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics.

The Contractor shall appoint an accident prevention officer at the Site, responsible for maintaining safety and protection against accidents. This person shall be qualified for this responsibility, and shall have the authority to issue instructions and take protective measures to prevent accidents. Throughout the performance of the Contract, the Contractor shall provide whatever is required by this person to exercise this responsibility and authority.

The Contractor shall send to the Project Manager, details of any accident as soon as practicable after its occurrence. The Contractor shall maintain records and make reports concerning health, safety and welfare of persons, and damage to property, as the Project Manager may reasonably require.

The Contractor shall throughout the contract (including the Defects Notification Period): (i) conduct Information, Education and Consultation Communication (IEC)

campaigns, at least every other month, addressed to all the Site staff and labor (including all the Contractor's employees, all Subcontractors and Employer's and Project Manager's' employees, and all truck drivers and crew making deliveries to Site for construction activities) and to the immediate local communities, concerning the risks, dangers and impact, and appropriate avoidance behavior with respect to of Sexually Transmitted Diseases (STD)—or Sexually Transmitted Infections (STI) in general and HIV/AIDS in particular; (ii) provide male or female condoms for all Site staff and labor as appropriate; and (iii) provide for STI and HIV/AIDS screening, diagnosis, counseling and referral to a dedicated national STI and HIV/AIDS program, (unless otherwise agreed) of all Site staff and labor.

The Contractor shall include in the program to be submitted for the execution of the Facilities under Sub-Clause 18.2 an alleviation program for Site staff and labor and their families in respect of Sexually Transmitted Infections (STI) and Sexually Transmitted Diseases (STD) including HIV/AIDS. The STI, STD and HIV/AIDS alleviation program shall indicate when, how and at what cost the Contractor plans to satisfy the requirements of this Sub-Clause and the related specification. For each component, the program shall detail the resources to be provided or utilized and any related sub-contracting proposed. The program shall also include provision of a detailed cost estimate with supporting documentation. Payment to the Contractor for preparation and implementation this program shall not exceed the Provisional Sum dedicated for this purpose.

22.2.8 Funeral Arrangements

In the event of the death of any of the Contractor's personnel or accompanying members of their families, the Contractor shall be responsible for making the appropriate arrangements for their return or burial, unless otherwise **specified in the PCC**.

22.2.9 Records of Contractor's Personnel

The Contractor shall keep accurate records of the Contractor's personnel, including the number of each class of Contractor's Personnel on the Site and the names, ages, genders, hours worked and wages paid to

all workers. These records shall be summarized on a monthly basis in a form approved by the Project Manager and shall be available for inspection by the Project Manager until the Contractor has completed all work.

22.2.10 Supply of Foodstuffs

The Contractor shall arrange for the provision of a sufficient supply of suitable food as may be stated in the Specification at reasonable prices for the Contractor's Personnel for the purposes of or in connection with the Contract.

22.2.11 Supply of Water

The Contractor shall, having regard to local conditions, provide on the Site an adequate supply of drinking and other water for the use of the Contractor's Personnel.

22.2.12 Measures against Insect and Pest Nuisance

The Contractor shall at all times take the necessary precautions to protect the Contractor's Personnel employed on the Site from insect and pest nuisance, and to reduce their danger to health. The Contractor shall comply with all the regulations of the local health authorities, including use of appropriate insecticide.

22.2.13 Alcoholic Liquor or Drugs

The Contractor shall not, otherwise than in accordance with the Laws of the Country, import, sell, give barter or otherwise dispose of any alcoholic liquor or drugs, or permit or allow importation, sale, gift barter or disposal by Contractor's Personnel.

22.2.14 Arms and Ammunition

The Contractor shall not give, barter, or otherwise dispose of, to any person, any arms or ammunition of any kind, or allow Contractor's Personnel to do so.

22.2.15 Prohibition of All Forms of Forced or Compulsory Labor

The contractor shall not employ "forced or compulsory labor" in any form. "Forced or compulsory labor"

consists of all work or service, not voluntarily performed, that is extracted from an individual under threat of force or penalty.

22.2.16 Prohibition of Harmful Child Labor

The Contractor shall not employ any child to perform any work that is economically exploitative, or is likely to be hazardous to, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development.

22.3 Contractor's Equipment

22.3.1 All Contractor's Equipment brought by the Contractor onto the Site shall be deemed to be intended to be used exclusively for the execution of the Contract. The Contractor shall not remove the same from the Site without the Project Manager's consent that such Contractor's Equipment is no longer required for the execution of the Contract.

22.3.2 Unless otherwise specified in the Contract, upon completion of the Facilities, the Contractor shall remove from the Site all Equipment brought by the Contractor onto the Site and any surplus materials remaining thereon.

22.3.3 The Employer will, if requested, use its best endeavors to assist the Contractor in obtaining any local, state or national government permission required by the Contractor for the export of the Contractor's Equipment imported by the Contractor for use in the execution of the Contract that is no longer required for the execution of the Contract.

22.4 Site Regulations and Safety

The Employer and the Contractor shall establish Site regulations setting out the rules to be observed in the execution of the Contract at the Site and shall comply therewith. The Contractor shall prepare and submit to the Employer, with a copy to the Project Manager, proposed Site regulations for the Employer's approval, which approval shall not be unreasonably withheld.

Such Site regulations shall include, but shall not be limited to, rules in respect of security, safety of the Facilities, gate control, sanitation, medical care, and fire prevention.

22.5 Opportunities for Other Contractors

22.5.1 The Contractor shall, upon written request from the Employer or the Project Manager, give all reasonable opportunities for carrying out the work to any other contractors employed by the Employer on or near the Site.

22.5.2 If the Contractor, upon written request from the Employer or the Project Manager, makes available to other contractors any roads or ways the maintenance for which the Contractor is responsible, permits the use by such other contractors of the Contractor's Equipment, or provides any other service of whatsoever nature for such other contractors, the Employer shall fully compensate the Contractor for any loss or damage caused or occasioned by such other contractors in respect of any such use or service, and shall pay to the Contractor reasonable remuneration for the use of such equipment or the provision of such services.

22.5.3 The Contractor shall also so arrange to perform its work as to minimize, to the extent possible, interference with the work of other contractors. The Project Manager shall determine the resolution of any difference or conflict that may arise between the Contractor and other contractors and the workers of the Employer in regard to their work.

22.5.4 The Contractor shall notify the Project Manager promptly of any defects in the other contractors' work that come to its notice, and that could affect the Contractor's work. The Project Manager shall determine the corrective measures, if any, required to rectify the situation after inspection of the Facilities. Decisions made by the Project Manager shall be binding on the Contractor.

22.6 Emergency Work

If, by reason of an emergency arising in connection with and during the execution of the Contract, any protective or remedial work is necessary as a matter of urgency to prevent damage to

the Facilities, the Contractor shall immediately carry out such work.

If the Contractor is unable or unwilling to do such work immediately, the Employer may do or cause such work to be done as the Employer may determine is necessary in order to prevent damage to the Facilities. In such event the Employer shall, as soon as practicable after the occurrence of any such emergency, notify the Contractor in writing of such emergency, the work done and the reasons therefor. If the work done or caused to be done by the Employer is work that the Contractor was liable to do at its own expense under the Contract, the reasonable costs incurred by the Employer in connection therewith shall be paid by the Contractor to the Employer. Otherwise, the cost of such remedial work shall be borne by the Employer.

22.7 Site Clearance

22.7.1 Site Clearance in Course of Performance: In the course of carrying out the Contract, the Contractor shall keep the Site reasonably free from all unnecessary obstruction, store or remove any surplus materials, clear away any wreckage, rubbish or temporary works from the Site, and remove any Contractor's Equipment no longer required for execution of the Contract.

22.7.2 Clearance of Site after Completion: After Completion of all parts of the Facilities, the Contractor shall clear away and remove all wreckage, rubbish and debris of any kind from the Site, and shall leave the Site and Facilities in a clean and safe condition.

22.8 Watching and Lighting

The Contractor shall provide and maintain at its own expense all lighting, fencing, and watching when and where necessary for the proper execution and the protection of the Facilities, or for the safety of the owners and occupiers of adjacent property and for the safety of the public.

23. Test and Inspection

23.1 The Contractor shall at its own expense carry out at the place of manufacture and/or on the Site all such tests and/or inspections of the Plant and any part of the Facilities as are specified in the Contract.

- 23.2 The Employer and the Project Manager or their designated representatives shall be entitled to attend the aforesaid test and/or inspection, provided that the Employer shall bear all costs and expenses incurred in connection with such attendance including, but not limited to, all traveling and board and lodging expenses.
- 23.3 Whenever the Contractor is ready to carry out any such test and/or inspection, the Contractor shall give a reasonable advance notice of such test and/or inspection and of the place and time thereof to the Project Manager. The Contractor shall obtain from any relevant third Party or manufacturer any necessary permission or consent to enable the Employer and the Project Manager or their designated representatives to attend the test and/or inspection.
- 23.4 The Contractor shall provide the Project Manager with a certified report of the results of any such test and/or inspection.
- If the Employer or Project Manager or their designated representatives fails to attend the test and/or inspection, or if it is agreed between the Parties that such persons shall not do so, then the Contractor may proceed with the test and/or inspection in the absence of such persons, and may provide the Project Manager with a certified report of the results thereof.
- 23.5 The Project Manager may require the Contractor to carry out any test and/or inspection not required by the Contract, provided that the Contractor's reasonable costs and expenses incurred in the carrying out of such test and/or inspection shall be added to the Contract Price. Further, if such test and/or inspection impede the progress of work on the Facilities and/or the Contractor's performance of its other obligations under the Contract, due allowance will be made in respect of the Time for Completion and the other obligations so affected.
- 23.6 If any Plant or any part of the Facilities fails to pass any test and/or inspection, the Contractor shall either rectify or replace such Plant or part of the Facilities and shall repeat the test and/or inspection upon giving a notice under GCC Sub-Clause 23.3.
- 23.7 If any dispute or difference of opinion shall arise between the Parties in connection with or arising out of the test and/or inspection of the Plant or part of the Facilities that cannot be settled between the Parties within a reasonable period of time,

it may be referred to an Dispute Board for determination in accordance with GCC Sub-Clause 46.3.

23.8 The Contractor shall afford the Employer and the Project Manager, at the Employer's expense, access at any reasonable time to any place where the Plant are being manufactured or the Facilities are being installed, in order to inspect the progress and the manner of manufacture or installation, provided that the Project Manager shall give the Contractor a reasonable prior notice.

23.9 The Contractor agrees that neither the execution of a test and/or inspection of Plant or any part of the Facilities, nor the attendance by the Employer or the Project Manager, nor the issue of any test certificate pursuant to GCC Sub-Clause 23.4, shall release the Contractor from any other responsibilities under the Contract.

23.10 No part of the Facilities or foundations shall be covered up on the Site without the Contractor carrying out any test and/or inspection required under the Contract. The Contractor shall give a reasonable notice to the Project Manager whenever any such parts of the Facilities or foundations are ready or about to be ready for test and/or inspection; such test and/or inspection and notice thereof shall be subject to the requirements of the Contract.

23.11 The Contractor shall uncover any part of the Facilities or foundations, or shall make openings in or through the same as the Project Manager may from time to time require at the Site, and shall reinstate and make good such part or parts.

If any parts of the Facilities or foundations have been covered up at the Site after compliance with the requirement of GCC Sub-Clause 23.10 and are found to be executed in accordance with the Contract, the expenses of uncovering, making openings in or through, reinstating, and making good the same shall be borne by the Employer, and the Time for Completion shall be reasonably adjusted to the extent that the Contractor has thereby been delayed or impeded in the performance of any of its obligations under the Contract.

24. Completion of the Facilities

24.1 As soon as the Facilities or any part thereof has, in the opinion of the Contractor, been completed operationally and structurally and put in a tight and clean condition as specified in the Employer's Requirements, excluding minor items not

materially affecting the operation or safety of the Facilities, the Contractor shall so notify the Employer in writing.

- 24.2 Within seven (7) days after receipt of the notice from the Contractor under GCC Sub-Clause 24.1, the Employer shall supply the operating and maintenance personnel specified in the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer for Precommissioning of the Facilities or any part thereof.

Pursuant to the Appendix to the Contract Agreement titled Scope of Works and Supply by the Employer, the Employer shall also provide, within the said seven (7) day period, the raw materials, utilities, lubricants, chemicals, catalysts, facilities, services and other matters required for Precommissioning of the Facilities or any part thereof.

- 24.3 As soon as reasonably practicable after the operating and maintenance personnel have been supplied by the Employer and the raw materials, utilities, lubricants, chemicals, catalysts, facilities, services and other matters have been provided by the Employer in accordance with GCC Sub-Clause 24.2, the Contractor shall commence Precommissioning of the Facilities or the relevant part thereof in preparation for Commissioning, subject to GCC Sub-Clause 25.5.

- 24.4 As soon as all works in respect of Precommissioning are completed and, in the opinion of the Contractor, the Facilities or any part thereof is ready for Commissioning, the Contractor shall so notify the Project Manager in writing.

- 24.5 The Project Manager shall, within fourteen (14) days after receipt of the Contractor's notice under GCC Sub-Clause 24.4, either issue a Completion Certificate in the form specified in the Employer's Requirements (Forms and Procedures), stating that the Facilities or that part thereof have reached Completion as of the date of the Contractor's notice under GCC Sub-Clause 24.4, or notify the Contractor in writing of any defects and/or deficiencies.

If the Project Manager notifies the Contractor of any defects and/or deficiencies, the Contractor shall then correct such defects and/or deficiencies, and shall repeat the procedure described in GCC Sub-Clause 24.4.

If the Project Manager is satisfied that the Facilities or that part thereof have reached Completion, the Project Manager shall,

within seven (7) days after receipt of the Contractor's repeated notice, issue a Completion Certificate stating that the Facilities or that part thereof have reached Completion as of the date of the Contractor's repeated notice.

If the Project Manager is not so satisfied, then it shall notify the Contractor in writing of any defects and/or deficiencies within seven (7) days after receipt of the Contractor's repeated notice, and the above procedure shall be repeated.

- 24.6 If the Project Manager fails to issue the Completion Certificate and fails to inform the Contractor of any defects and/or deficiencies within fourteen (14) days after receipt of the Contractor's notice under GCC Sub-Clause 24.4 or within seven (7) days after receipt of the Contractor's repeated notice under GCC Sub-Clause 24.5, or if the Employer makes use of the Facilities or part thereof, then the Facilities or that part thereof shall be deemed to have reached Completion as of the date of the Contractor's notice or repeated notice, or as of the Employer's use of the Facilities, as the case may be.
- 24.7 As soon as possible after Completion, the Contractor shall complete all outstanding minor items so that the Facilities are fully in accordance with the requirements of the Contract, failing which the Employer will undertake such completion and deduct the costs thereof from any monies owing to the Contractor.
- 24.8 Upon Completion, the Employer shall be responsible for the care and custody of the Facilities or the relevant part thereof, together with the risk of loss or damage thereto, and shall thereafter take over the Facilities or the relevant part thereof.

25. Commissioning and Operational Acceptance

25.1 Commissioning

25.1.1 Commissioning of the Facilities or any part thereof shall be commenced by the Contractor immediately after issue of the Completion Certificate by the Project Manager, pursuant to GCC Sub-Clause 24.5, or immediately after the date of the deemed Completion, under GCC Sub-Clause 24.6.

25.1.2 The Employer shall supply the operating and maintenance personnel and all raw materials, utilities, lubricants, chemicals, catalysts, facilities, services and other matters required for Commissioning.

25.1.3 In accordance with the requirements of the Contract, the Contractor's and Project Manager's advisory personnel shall attend the Commissioning, including the Guarantee Test, and shall advise and assist the Employer.

25.2 Guarantee Test

25.2.1 Subject to GCC Sub-Clause 25.5, the Guarantee Test and repeats thereof shall be conducted by the Contractor during Commissioning of the Facilities or the relevant part thereof to ascertain whether the Facilities or the relevant part can attain the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees. The Employer shall promptly provide the Contractor with such information as the Contractor may reasonably require in relation to the conduct and results of the Guarantee Test and any repeats thereof.

25.2.2 If for reasons not attributable to the Contractor, the Guarantee Test of the Facilities or the relevant part thereof cannot be successfully completed within the period from the date of Completion **specified in the PCC** or any other period agreed upon by the Employer and the Contractor, the Contractor shall be deemed to have fulfilled its obligations with respect to the Functional Guarantees, and GCC Sub-Clauses 28.2 and 28.3 shall not apply.

25.3 Operational Acceptance

25.3.1 Subject to GCC Sub-Clause 25.4 below, Operational Acceptance shall occur in respect of the Facilities or any part thereof when

- (a) the Guarantee Test has been successfully completed and the Functional Guarantees are met; or
- (b) the Guarantee Test has not been successfully completed or has not been carried out for reasons not attributable to the Contractor within the period from the date of Completion specified in the PCC pursuant to GCC Sub-Clause 25.2.2 above or any other period agreed upon by the Employer and the Contractor; or

- (c) the Contractor has paid the liquidated damages specified in GCC Sub-Clause 28.3 hereof; and
- (d) any minor items mentioned in GCC Sub-Clause 24.7 hereof relevant to the Facilities or that part thereof have been completed.

25.3.2 At any time after any of the events set out in GCC Sub-Clause 25.3.1 have occurred, the Contractor may give a notice to the Project Manager requesting the issue of an Operational Acceptance Certificate in the form provided in the Employer's Requirements (Forms and Procedures) in respect of the Facilities or the part thereof specified in such notice as of the date of such notice.

25.3.3 The Project Manager shall, after consultation with the Employer, and within seven (7) days after receipt of the Contractor's notice, issue an Operational Acceptance Certificate.

25.3.4 If within seven (7) days after receipt of the Contractor's notice, the Project Manager fails to issue the Operational Acceptance Certificate or fails to inform the Contractor in writing of the justifiable reasons why the Project Manager has not issued the Operational Acceptance Certificate, the Facilities or the relevant part thereof shall be deemed to have been accepted as of the date of the Contractor's said notice.

25.4 Partial Acceptance

25.4.1 If the Contract specifies that Completion and Commissioning shall be carried out in respect of parts of the Facilities, the provisions relating to Completion and Commissioning including the Guarantee Test shall apply to each such part of the Facilities individually, and the Operational Acceptance Certificate shall be issued accordingly for each such part of the Facilities.

25.4.2 If a part of the Facilities comprises facilities such as buildings, for which no Commissioning or Guarantee Test is required, then the Project Manager shall issue the Operational Acceptance Certificate for such facility when it attains Completion, provided that the Contractor shall thereafter complete any outstanding minor items that are listed in the Operational Acceptance Certificate.

25.5 Delayed Precommissioning and/or Guarantee Test

25.5.1 In the event that the Contractor is unable to proceed with the Precommissioning of the Facilities pursuant to Sub-Clause 24.3, or with the Guarantee Test pursuant to Sub-Clause 25.2, for reasons attributable to the Employer either on account of non availability of other facilities under the responsibilities of other contractor(s), or for reasons beyond the Contractor's control, the provisions leading to "deemed" completion of activities such as Completion, pursuant to GCC Sub-Clause 24.6, and Operational Acceptance, pursuant to GCC Sub-Clause 25.3.4, and Contractor's obligations regarding Defect Liability Period, pursuant to GCC Sub-Clause 27.2, Functional Guarantee, pursuant to GCC Clause 28, and Care of Facilities, pursuant to GCC Clause 32, and GCC Clause 41.1, Suspension, shall not apply. In this case, the following provisions shall apply.

25.5.2 When the Contractor is notified by the Project Manager that he will be unable to proceed with the activities and obligations pursuant to above Sub-Clause 25.5.1, the Contractor shall be entitled to the following:

- (a) the Time of Completion shall be extended for the period of suspension without imposition of liquidated damages pursuant to GCC Sub-Clause 26.2;
- (b) payments due to the Contractor in accordance with the provision specified in the Appendix to the Contract Agreement titled Terms and Procedures of Payment, which would not have been payable in normal circumstances due to non-completion of the subject activities, shall be released to the Contractor against submission of a security in the form of a bank guarantee of equivalent amount acceptable to the Employer, and which shall become null and void when the Contractor will have complied with its obligations regarding those payments, subject to the provision of Sub-Clause 25.5.3 below;
- (c) the expenses towards the above security and extension of other securities under the contract, of

which validity needs to be extended, shall be reimbursed to the Contractor by the Employer;

- (d) the additional charges towards the care of the Facilities pursuant to GCC Sub-Clause 32.1 shall be reimbursed to the Contractor by the Employer for the period between the notification mentioned above and the notification mentioned in Sub-Clause 25.5.4 below. The provision of GCC Sub-Clause 33.2 shall apply to the Facilities during the same period.

25.5.3 In the event that the period of suspension under above Sub-Clause 25.5.1 actually exceeds one hundred eighty (180) days, the Employer and Contractor shall mutually agree to any additional compensation payable to the Contractor.

25.5.4 When the Contractor is notified by the Project Manager that the plant is ready for Precommissioning, the Contractor shall proceed without delay in performing Precommissioning in accordance with Clause 24.

F. Guarantees and Liabilities

26. Completion Time Guarantee

26.1 The Contractor guarantees that it shall attain Completion of the Facilities (or a part for which a separate time for completion is specified) within the Time for Completion specified in the PCC pursuant to GCC Sub-Clause 8.2, or within such extended time to which the Contractor shall be entitled under GCC Clause 40 hereof.

26.2 If the Contractor fails to attain Completion of the Facilities or any part thereof within the Time for Completion or any extension thereof under GCC Clause 40, the Contractor shall pay to the Employer liquidated damages in the amount **specified in the PCC** as a percentage rate of the Contract Price or the relevant part thereof. The aggregate amount of such liquidated damages shall in no event exceed the amount **specified as “Maximum” in the PCC** as a percentage rate of the Contract Price. Once the “Maximum” is reached, the Employer may consider termination of the Contract, pursuant to GCC Sub-Clause 42.2.2.

Such payment shall completely satisfy the Contractor’s obligation to attain Completion of the Facilities or the relevant part thereof

within the Time for Completion or any extension thereof under GCC Clause 40. The Contractor shall have no further liability whatsoever to the Employer in respect thereof.

However, the payment of liquidated damages shall not in any way relieve the Contractor from any of its obligations to complete the Facilities or from any other obligations and liabilities of the Contractor under the Contract.

Save for liquidated damages payable under this GCC Sub-Clause 26.2, the failure by the Contractor to attain any milestone or other act, matter or thing by any date specified in the Appendix to the Contract Agreement titled Time Schedule, and/or other program of work prepared pursuant to GCC Sub-Clause 18.2 shall not render the Contractor liable for any loss or damage thereby suffered by the Employer.

- 26.3 If the Contractor attains Completion of the Facilities or any part thereof before the Time for Completion or any extension thereof under GCC Clause 40, the Employer shall pay to the Contractor a bonus in the amount **specified in the PCC**. The aggregate amount of such bonus shall in no event exceed the amount **specified as “Maximum” in the PCC**.

27. Defect Liability

- 27.1 The Contractor warrants that the Facilities or any part thereof shall be free from defects in the design, engineering, materials and workmanship of the Plant supplied and of the work executed.
- 27.2 The Defect Liability Period shall be five hundred and forty (540) days from the date of Completion of the Facilities (or any part thereof) or one year from the date of Operational Acceptance of the Facilities (or any part thereof), whichever first occurs, unless specified otherwise in the PCC pursuant to GCC Sub-Clause 27.10.

If during the Defect Liability Period any defect should be found in the design, engineering, materials and workmanship of the Plant supplied or of the work executed by the Contractor, the Contractor shall promptly, in consultation and agreement with the Employer regarding appropriate remedying of the defects, and at its cost, repair, replace or otherwise make good as the Contractor shall determine at its discretion, such defect as well as any damage to the Facilities caused by such defect. The Contractor shall not be responsible for the repair, replacement or making good of any defect or of any damage to the Facilities arising out of or resulting from any of the following causes:

- (a) improper operation or maintenance of the Facilities by the Employer;
- (b) operation of the Facilities outside specifications provided in the Contract; or
- (c) normal wear and tear.

27.3 The Contractor's obligations under this GCC Clause 27 shall not apply to:

- (a) any materials that are supplied by the Employer under GCC Sub-Clause 21.2, are normally consumed in operation, or have a normal life shorter than the Defect Liability Period stated herein;
- (b) any designs, specifications or other data designed, supplied or specified by or on behalf of the Employer or any matters for which the Contractor has disclaimed responsibility herein; or
- (c) any other materials supplied or any other work executed by or on behalf of the Employer, except for the work executed by the Employer under GCC Sub-Clause 27.7.

27.4 The Employer shall give the Contractor a notice stating the nature of any such defect together with all available evidence thereof, promptly following the discovery thereof. The Employer shall afford all reasonable opportunity for the Contractor to inspect any such defect.

27.5 The Employer shall afford the Contractor all necessary access to the Facilities and the Site to enable the Contractor to perform its obligations under this GCC Clause 27.

The Contractor may, with the consent of the Employer, remove from the Site any Plant or any part of the Facilities that are defective if the nature of the defect, and/or any damage to the Facilities caused by the defect, is such that repairs cannot be expeditiously carried out at the Site.

27.6 If the repair, replacement or making good is of such a character that it may affect the efficiency of the Facilities or any part thereof, the Employer may give to the Contractor a notice requiring that tests of the defective part of the Facilities shall be made by the Contractor immediately upon completion of such

remedial work, whereupon the Contractor shall carry out such tests.

If such part fails the tests, the Contractor shall carry out further repair, replacement or making good, as the case may be, until that part of the Facilities passes such tests. The tests shall be agreed upon by the Employer and the Contractor.

27.7 If the Contractor fails to commence the work necessary to remedy such defect or any damage to the Facilities caused by such defect within a reasonable time (which shall in no event be considered to be less than fifteen (15) days), the Employer may, following notice to the Contractor, proceed to do such work, and the reasonable costs incurred by the Employer in connection therewith shall be paid to the Employer by the Contractor or may be deducted by the Employer from any monies due the Contractor or claimed under the Performance Security.

27.8 If the Facilities or any part thereof cannot be used by reason of such defect and/or making good of such defect, the Defect Liability Period of the Facilities or such part, as the case may be, shall be extended by a period equal to the period during which the Facilities or such part cannot be used by the Employer because of any of the aforesaid reasons.

27.9 Except as provided in GCC Clauses 27 and 33, the Contractor shall be under no liability whatsoever and howsoever arising, and whether under the Contract or at law, in respect of defects in the Facilities or any part thereof, the Plant, design or engineering or work executed that appear after Completion of the Facilities or any part thereof, except where such defects are the result of the gross negligence, fraud, or criminal or willful action of the Contractor.

27.10 In addition, any such component of the Facilities, and during the period of time as may be **specified in the PCC**, shall be subject to an extended defect liability period. Such obligation of the Contractor shall be in addition to the defect liability period specified under GCC Sub-Clause 27.2.

28. Functional Guarantees

28.1 The Contractor guarantees that during the Guarantee Test, the Facilities and all parts thereof shall attain the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees, subject to and upon the conditions therein specified.

- 28.2 If, for reasons attributable to the Contractor, the minimum level of the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees, are not met either in whole or in part, the Contractor shall at its cost and expense make such changes, modifications and/or additions to the Plant or any part thereof as may be necessary to meet at least the minimum level of such Guarantees. The Contractor shall notify the Employer upon completion of the necessary changes, modifications and/or additions, and shall request the Employer to repeat the Guarantee Test until the minimum level of the Guarantees has been met. If the Contractor eventually fails to meet the minimum level of Functional Guarantees, the Employer may consider termination of the Contract, pursuant to GCC Sub-Clause 42.2.2.
- 28.3 If, for reasons attributable to the Contractor, the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees, are not attained either in whole or in part, but the minimum level of the Functional Guarantees specified in the said Appendix to the Contract Agreement is met, the Contractor shall, at the Contractor's option, either
- (a) make such changes, modifications and/or additions to the Facilities or any part thereof that are necessary to attain the Functional Guarantees at its cost and expense, and shall request the Employer to repeat the Guarantee Test or
 - (b) pay liquidated damages to the Employer in respect of the failure to meet the Functional Guarantees in accordance with the provisions in the Appendix to the Contract Agreement titled Functional Guarantees.
- 28.4 The payment of liquidated damages under GCC Sub-Clause 28.3, up to the limitation of liability specified in the Appendix to the Contract Agreement titled Functional Guarantees, shall completely satisfy the Contractor's guarantees under GCC Sub-Clause 28.3, and the Contractor shall have no further liability whatsoever to the Employer in respect thereof. Upon the payment of such liquidated damages by the Contractor, the Project Manager shall issue the Operational Acceptance Certificate for the Facilities or any part thereof in respect of which the liquidated damages have been so paid.

29. Patent Indemnity

- 29.1 The Contractor shall, subject to the Employer's compliance with GCC Sub-Clause 29.2, indemnify and hold harmless the Employer and its employees and officers from and against any

and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, which the Employer may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Contract by reason of: (a) the installation of the Facilities by the Contractor or the use of the Facilities in the country where the Site is located; and (b) the sale of the products produced by the Facilities in any country.

Such indemnity shall not cover any use of the Facilities or any part thereof other than for the purpose indicated by or to be reasonably inferred from the Contract, any infringement resulting from the use of the Facilities or any part thereof, or any products produced thereby in association or combination with any other equipment, plant or materials not supplied by the Contractor, pursuant to the Contract Agreement.

- 29.2 If any proceedings are brought or any claim is made against the Employer arising out of the matters referred to in GCC Sub-Clause 29.1, the Employer shall promptly give the Contractor a notice thereof, and the Contractor may at its own expense and in the Employer's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim.

If the Contractor fails to notify the Employer within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Employer shall be free to conduct the same on its own behalf. Unless the Contractor has so failed to notify the Employer within the twenty-eight (28) day period, the Employer shall make no admission that may be prejudicial to the defense of any such proceedings or claim.

The Employer shall, at the Contractor's request, afford all available assistance to the Contractor in conducting such proceedings or claim, and shall be reimbursed by the Contractor for all reasonable expenses incurred in so doing.

- 29.3 The Employer shall indemnify and hold harmless the Contractor and its employees, officers and Subcontractors from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, which the Contractor may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered

or otherwise existing at the date of the Contract arising out of or in connection with any design, data, drawing, specification, or other documents or materials provided or designed by or on behalf of the Employer.

30. Limitation of Liability

30.1 Except in cases of criminal negligence or willful misconduct,

- (a) neither Party shall be liable to the other Party, 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, which may be suffered by the other Party in connection with the Contract, other than specifically provided as any obligation of the Party in the Contract, and
- (b) the aggregate liability of the Contractor to the Employer, whether under the Contract, in tort or otherwise, shall not exceed the amount resulting from the application of the multiplier specified **in the PCC**, to the Contract Price or, if a multiplier is not so specified, the total Contract Price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment, or to any obligation of the Contractor to indemnify the Employer with respect to patent infringement.

G. Risk Distribution

31. Transfer of Ownership

31.1 Ownership of the Plant (including spare parts) to be imported into the country where the Site is located shall be transferred to the Employer upon loading on to the mode of transport to be used to convey the Plant from the country of origin to that country.

31.2 Ownership of the Plant (including spare parts) procured in the country where the Site is located shall be transferred to the Employer when the Plant are brought on to the Site.

31.3 Ownership of the Contractor's Equipment used by the Contractor and its Subcontractors in connection with the Contract shall remain with the Contractor or its Subcontractors.

31.4 Ownership of any Plant in excess of the requirements for the Facilities shall revert to the Contractor upon Completion of the Facilities or at such earlier time when the Employer and the

Contractor agree that the Plant in question are no longer required for the Facilities.

- 31.5 Notwithstanding the transfer of ownership of the Plant, the responsibility for care and custody thereof together with the risk of loss or damage thereto shall remain with the Contractor pursuant to GCC Clause 32 (Care of Facilities) hereof until Completion of the Facilities or the part thereof in which such Plant are incorporated.

32. Care of Facilities

- 32.1 The Contractor shall be responsible for the care and custody of the Facilities or any part thereof until the date of Completion of the Facilities pursuant to GCC Clause 24 or, where the Contract provides for Completion of the Facilities in parts, until the date of Completion of the relevant part, and shall make good at its own cost any loss or damage that may occur to the Facilities or the relevant part thereof from any cause whatsoever during such period. The Contractor shall also be responsible for any loss or damage to the Facilities caused by the Contractor or its Subcontractors in the course of any work carried out, pursuant to GCC Clause 27. Notwithstanding the foregoing, the Contractor shall not be liable for any loss or damage to the Facilities or that part thereof caused by reason of any of the matters specified or referred to in paragraphs (a), (b) and (c) of GCC Sub-Clauses 32.2 and 38.1.

- 32.2 If any loss or damage occurs to the Facilities or any part thereof or to the Contractor's temporary facilities by reason of

- (a) insofar as they relate to the country where the Site is located, nuclear reaction, nuclear radiation, radioactive contamination, pressure wave caused by aircraft or other aerial objects, or any other occurrences that an experienced contractor could not reasonably foresee, or if reasonably foreseeable could not reasonably make provision for or insure against, insofar as such risks are not normally insurable on the insurance market and are mentioned in the general exclusions of the policy of insurance, including War Risks and Political Risks, taken out under GCC Clause 34 hereof; or
- (b) any use or occupation by the Employer or any third Party other than a Subcontractor, authorized by the Employer of any part of the Facilities; or
- (c) any use of or reliance upon any design, data or specification provided or designated by or on behalf of the Employer, or

any such matter for which the Contractor has disclaimed responsibility herein,

the Employer shall pay to the Contractor all sums payable in respect of the Facilities executed, notwithstanding that the same be lost, destroyed or damaged, and will pay to the Contractor the replacement value of all temporary facilities and all parts thereof lost, destroyed or damaged. If the Employer requests the Contractor in writing to make good any loss or damage to the Facilities thereby occasioned, the Contractor shall make good the same at the cost of the Employer in accordance with GCC Clause 39. If the Employer does not request the Contractor in writing to make good any loss or damage to the Facilities thereby occasioned, the Employer shall either request a change in accordance with GCC Clause 39, excluding the performance of that part of the Facilities thereby lost, destroyed or damaged, or, where the loss or damage affects a substantial part of the Facilities, the Employer shall terminate the Contract pursuant to GCC Sub-Clause 42.1 hereof.

32.3 The Contractor shall be liable for any loss of or damage to any Contractor's Equipment, or any other property of the Contractor used or intended to be used for purposes of the Facilities, except (i) as mentioned in GCC Sub-Clause 32.2 with respect to the Contractor's temporary facilities, and (ii) where such loss or damage arises by reason of any of the matters specified in GCC Sub-Clauses 32.2 (b) and (c) and 38.1.

32.4 With respect to any loss or damage caused to the Facilities or any part thereof or to the Contractor's Equipment by reason of any of the matters specified in GCC Sub-Clause 38.1, the provisions of GCC Sub-Clause 38.3 shall apply.

**33. Loss of or
Damage to
Property;
Accident or
Injury to
Workers;
Indemnifica-
tion**

33.1 Subject to GCC Sub-Clause 33.3, the Contractor shall indemnify and hold harmless the Employer and its employees and officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, in respect of the death or injury of any person or loss of or damage to any property other than the Facilities whether accepted or not, arising in connection with the supply and installation of the Facilities and by reason of the negligence of the Contractor or its Subcontractors, or their employees, officers or agents, except any injury, death or property damage caused by the

negligence of the Employer, its contractors, employees, officers or agents.

- 33.2 If any proceedings are brought or any claim is made against the Employer that might subject the Contractor to liability under GCC Sub-Clause 33.1, the Employer shall promptly give the Contractor a notice thereof and the Contractor may at its own expense and in the Employer's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim.

If the Contractor fails to notify the Employer within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Employer shall be free to conduct the same on its own behalf. Unless the Contractor has so failed to notify the Employer within the twenty-eight (28) day period, the Employer shall make no admission that may be prejudicial to the defense of any such proceedings or claim.

The Employer shall, at the Contractor's request, afford all available assistance to the Contractor in conducting such proceedings or claim, and shall be reimbursed by the Contractor for all reasonable expenses incurred in so doing.

- 33.3 The Employer shall indemnify and hold harmless the Contractor and its employees, officers and Subcontractors from any liability for loss of or damage to property of the Employer, other than the Facilities not yet taken over, that is caused by fire, explosion or any other perils, in excess of the amount recoverable from insurances procured under GCC Clause 34, provided that such fire, explosion or other perils were not caused by any act or failure of the Contractor.
- 33.4 The Party entitled to the benefit of an indemnity under this GCC Clause 33 shall take all reasonable measures to mitigate any loss or damage which has occurred. If the Party fails to take such measures, the other Party's liabilities shall be correspondingly reduced.

34. Insurance

- 34.1 To the extent specified in the Appendix to the Contract Agreement titled Insurance Requirements, the Contractor shall at its expense take out and maintain in effect, or cause to be taken out and maintained in effect, during the performance of the Contract, the insurances set forth below in the sums and with the deductibles and other conditions specified in the said Appendix. The identity of the insurers and the form of the policies shall be subject to the

approval of the Employer, who should not unreasonably withhold such approval.

(a) Cargo Insurance During Transport

Covering loss or damage occurring while in transit from the Contractor's or Subcontractor's works or stores until arrival at the Site, to the Plant (including spare parts therefor) and to the Contractor's Equipment.

(b) Installation All Risks Insurance

Covering physical loss or damage to the Facilities at the Site, occurring prior to Completion of the Facilities, with an extended maintenance coverage for the Contractor's liability in respect of any loss or damage occurring during the Defect Liability Period while the Contractor is on the Site for the purpose of performing its obligations during the Defect Liability Period.

(c) Third Party Liability Insurance

Covering bodily injury or death suffered by third Parties including the Employer's personnel, and loss of or damage to property occurring in connection with the supply and installation of the Facilities.

(d) Automobile Liability Insurance

Covering use of all vehicles used by the Contractor or its Subcontractors, whether or not owned by them, in connection with the execution of the Contract.

(e) Workers' Compensation

In accordance with the statutory requirements applicable in any country where the Contract or any part thereof is executed.

(f) Employer's Liability

In accordance with the statutory requirements applicable in any country where the Contract or any part thereof is executed.

(g) Other Insurances

Such other insurances as may be specifically agreed upon by the Parties hereto as listed in the Appendix to the Contract Agreement titled Insurance Requirements.

- 34.2 The Employer shall be named as co-insured under all insurance policies taken out by the Contractor pursuant to GCC Sub-Clause 34.1, except for the Third Party Liability, Workers' Compensation and Employer's Liability Insurances, and the Contractor's Subcontractors shall be named as co-insureds under all insurance policies taken out by the Contractor pursuant to GCC Sub-Clause 34.1 except for the Cargo Insurance During Transport, Workers' Compensation and Employer's Liability Insurances. All insurer's rights of subrogation against such co-insureds for losses or claims arising out of the performance of the Contract shall be waived under such policies.
- 34.3 The Contractor shall, in accordance with the provisions of the Appendix to the Contract Agreement titled Insurance Requirements, deliver to the Employer certificates of insurance or copies of the insurance policies as evidence that the required policies are in full force and effect. The certificates shall provide that no less than twenty-one (21) days' notice shall be given to the Employer by insurers prior to cancellation or material modification of a policy.
- 34.4 The Contractor shall ensure that, where applicable, its Subcontractor(s) shall take out and maintain in effect adequate insurance policies for their personnel and vehicles and for work executed by them under the Contract, unless such Subcontractors are covered by the policies taken out by the Contractor.
- 34.5 The Employer shall at its expense take out and maintain in effect during the performance of the Contract those insurances specified in the Appendix to the Contract Agreement titled Insurance Requirements, in the sums and with the deductibles and other conditions specified in the said Appendix. The Contractor and the Contractor's Subcontractors shall be named as co-insureds under all such policies. All insurers' rights of subrogation against such co-insureds for losses or claims arising out of the performance of the Contract shall be waived under such policies. The Employer shall deliver to the Contractor satisfactory evidence that the required insurances are in full force and effect. The policies shall provide that not less than twenty-one (21) days' notice shall be given to the Contractor by all insurers prior to any cancellation or material modification of the policies. If so requested by the

Contractor, the Employer shall provide copies of the policies taken out by the Employer under this GCC Sub-Clause 34.5.

- 34.6 If the Contractor fails to take out and/or maintain in effect the insurances referred to in GCC Sub-Clause 34.1, the Employer may take out and maintain in effect any such insurances and may from time to time deduct from any amount due the Contractor under the Contract any premium that the Employer shall have paid to the insurer, or may otherwise recover such amount as a debt due from the Contractor. If the Employer fails to take out and/or maintain in effect the insurances referred to in GCC 34.5, the Contractor may take out and maintain in effect any such insurances and may from time to time deduct from any amount due the Employer under the Contract any premium that the Contractor shall have paid to the insurer, or may otherwise recover such amount as a debt due from the Employer. If the Contractor fails to or is unable to take out and maintain in effect any such insurances, the Contractor shall nevertheless have no liability or responsibility towards the Employer, and the Contractor shall have full recourse against the Employer for any and all liabilities of the Employer herein.
- 34.7 Unless otherwise provided in the Contract, the Contractor shall prepare and conduct all and any claims made under the policies effected by it pursuant to this GCC Clause 34, and all monies payable by any insurers shall be paid to the Contractor. The Employer shall give to the Contractor all such reasonable assistance as may be required by the Contractor. With respect to insurance claims in which the Employer's interest is involved, the Contractor shall not give any release or make any compromise with the insurer without the prior written consent of the Employer. With respect to insurance claims in which the Contractor's interest is involved, the Employer shall not give any release or make any compromise with the insurer without the prior written consent of the Contractor.

35. Unforeseen Conditions

- 35.1 If, during the execution of the Contract, the Contractor shall encounter on the Site any physical conditions other than climatic conditions, or artificial obstructions that could not have been reasonably foreseen prior to the date of the Contract Agreement by an experienced contractor on the basis of reasonable examination of the data relating to the Facilities including any data as to boring tests, provided by the Employer, and on the basis of information that it could have obtained from a visual inspection of the Site if access thereto was available, or other data readily available to it relating to the Facilities, and if the Contractor

determines that it will in consequence of such conditions or obstructions incur additional cost and expense or require additional time to perform its obligations under the Contract that would not have been required if such physical conditions or artificial obstructions had not been encountered, the Contractor shall promptly, and before performing additional work or using additional Plant or Contractor's Equipment, notify the Project Manager in writing of

- (a) the physical conditions or artificial obstructions on the Site that could not have been reasonably foreseen;
- (b) the additional work and/or Plant and/or Contractor's Equipment required, including the steps which the Contractor will or proposes to take to overcome such conditions or obstructions;
- (c) the extent of the anticipated delay; and
- (d) the additional cost and expense that the Contractor is likely to incur.

On receiving any notice from the Contractor under this GCC Sub-Clause 35.1, the Project Manager shall promptly consult with the Employer and Contractor and decide upon the actions to be taken to overcome the physical conditions or artificial obstructions encountered. Following such consultations, the Project Manager shall instruct the Contractor, with a copy to the Employer, of the actions to be taken.

- 35.2 Any reasonable additional cost and expense incurred by the Contractor in following the instructions from the Project Manager to overcome such physical conditions or artificial obstructions referred to in GCC Sub-Clause 35.1 shall be paid by the Employer to the Contractor as an addition to the Contract Price.

If the Contractor is delayed or impeded in the performance of the Contract because of any such physical conditions or artificial obstructions referred to in GCC Sub-Clause 35.1, the Time for Completion shall be extended in accordance with GCC Clause 40.

**36. Change in
Laws and
Regulations**

36.1 If, after the date twenty-eight (28) days prior to the date of Bid submission, in the country where the Site is located, any law, regulation, ordinance, order or by-law having the force of law is enacted, promulgated, abrogated or changed which shall be deemed to include any change in interpretation or application by the competent authorities, that subsequently affects the costs and expenses of the Contractor and/or the Time for Completion, the Contract Price shall be correspondingly increased or decreased, and/or the Time for Completion shall be reasonably adjusted to the extent that the Contractor has thereby been affected in the performance of any of its obligations under the Contract. Notwithstanding the foregoing, such additional or reduced costs shall not be separately paid or credited if the same has already been accounted for in the price adjustment provisions where applicable, in accordance with the PCC pursuant to GCC Sub-Clause 11.2.

**37. Force
Majeure**

37.1 “Force Majeure” shall mean any event beyond the reasonable control of the Employer or of the Contractor, as the case may be, and which is unavoidable notwithstanding the reasonable care of the Party affected, and shall include, without limitation, the following:

- (a) war, hostilities or warlike operations whether a state of war be declared or not, invasion, act of foreign enemy and civil war
- (b) rebellion, revolution, insurrection, mutiny, usurpation of civil or military government, conspiracy, riot, civil commotion and terrorist acts
- (c) confiscation, nationalization, mobilization, commandeering or requisition by or under the order of any government or de jure or de facto authority or ruler or any other act or failure to act of any local state or national government authority
- (d) strike, sabotage, lockout, embargo, import restriction, port congestion, lack of usual means of public transportation and communication, industrial dispute, shipwreck, shortage or restriction of power supply, epidemics, quarantine and plague
- (e) earthquake, landslide, volcanic activity, fire, flood or inundation, tidal wave, typhoon or cyclone, hurricane, storm, lightning, or other inclement weather condition,

nuclear and pressure waves or other natural or physical disaster

- (f) shortage of labor, materials or utilities where caused by circumstances that are themselves Force Majeure.

37.2 If either Party is prevented, hindered or delayed from or in performing any of its obligations under the Contract by an event of Force Majeure, then it shall notify the other in writing of the occurrence of such event and the circumstances thereof within fourteen (14) days after the occurrence of such event.

37.3 The Party who has given such notice shall be excused from the performance or punctual performance of its obligations under the Contract for so long as the relevant event of Force Majeure continues and to the extent that such Party's performance is prevented, hindered or delayed. The Time for Completion shall be extended in accordance with GCC Clause 40.

37.4 The Party or Parties affected by the event of Force Majeure shall use reasonable efforts to mitigate the effect thereof upon its or their performance of the Contract and to fulfill its or their obligations under the Contract, but without prejudice to either Party's right to terminate the Contract under GCC Sub-Clauses 37.6 and 38.5.

37.5 No delay or nonperformance by either Party hereto caused by the occurrence of any event of Force Majeure shall

- (a) constitute a default or breach of the Contract, or
- (b) give rise to any claim for damages or additional cost or expense occasioned thereby, subject to GCC Sub-Clauses 32.2, 38.3 and 38.4

if and to the extent that such delay or nonperformance is caused by the occurrence of an event of Force Majeure.

37.6 If the performance of the Contract is substantially prevented, hindered or delayed for a single period of more than sixty (60) days or an aggregate period of more than one hundred and twenty (120) days on account of one or more events of Force Majeure during the currency of the Contract, the Parties will attempt to develop a mutually satisfactory solution, failing which either Party may terminate the Contract by giving a notice to the other, but without prejudice to either Party's right to terminate the Contract under GCC Sub-Clause 38.5.

37.7 In the event of termination pursuant to GCC Sub-Clause 37.6, the rights and obligations of the Employer and the Contractor shall be as specified in GCC Sub-Clauses 42.1.2 and 42.1.3.

37.8 Notwithstanding GCC Sub-Clause 37.5, Force Majeure shall not apply to any obligation of the Employer to make payments to the Contractor herein.

38. War Risks

38.1 “War Risks” shall mean any event specified in paragraphs (a) and (b) of GCC Sub-Clause 37.1 and any explosion or impact of any mine, bomb, shell, grenade or other projectile, missile, munitions or explosive of war, occurring or existing in or near the country (or countries) where the Site is located.

38.2 Notwithstanding anything contained in the Contract, the Contractor shall have no liability whatsoever for or with respect to

- (a) destruction of or damage to Facilities, Plant, or any part thereof;
- (b) destruction of or damage to property of the Employer or any third Party; or
- (c) injury or loss of life

if such destruction, damage, injury or loss of life is caused by any War Risks, and the Employer shall indemnify and hold the Contractor harmless from and against any and all claims, liabilities, actions, lawsuits, damages, costs, charges or expenses arising in consequence of or in connection with the same.

38.3 If the Facilities or any Plant or Contractor’s Equipment or any other property of the Contractor used or intended to be used for the purposes of the Facilities shall sustain destruction or damage by reason of any War Risks, the Employer shall pay the Contractor for

- (a) any part of the Facilities or the Plant so destroyed or damaged to the extent not already paid for by the Employer

and so far as may be required by the Employer, and as may be necessary for completion of the Facilities
- (b) replacing or making good any Contractor’s Equipment or other property of the Contractor so destroyed or damaged

- (c) replacing or making good any such destruction or damage to the Facilities or the Plant or any part thereof .

If the Employer does not require the Contractor to replace or make good any such destruction or damage to the Facilities, the Employer shall either request a change in accordance with GCC Clause 39, excluding the performance of that part of the Facilities thereby destroyed or damaged or, where the loss, destruction or damage affects a substantial part of the Facilities, shall terminate the Contract, pursuant to GCC Sub-Clause 42.1.

If the Employer requires the Contractor to replace or make good on any such destruction or damage to the Facilities, the Time for Completion shall be extended in accordance with GCC 40.

- 38.4 Notwithstanding anything contained in the Contract, the Employer shall pay the Contractor for any increased costs or incidentals to the execution of the Contract that are in any way attributable to, consequent on, resulting from, or in any way connected with any War Risks, provided that the Contractor shall as soon as practicable notify the Employer in writing of any such increased cost.
- 38.5 If during the performance of the Contract any War Risks shall occur that financially or otherwise materially affect the execution of the Contract by the Contractor, the Contractor shall use its reasonable efforts to execute the Contract with due and proper consideration given to the safety of its and its Subcontractors' personnel engaged in the work on the Facilities, provided, however, that if the execution of the work on the Facilities becomes impossible or is substantially prevented for a single period of more than sixty (60) days or an aggregate period of more than one hundred and twenty (120) days on account of any War Risks, the Parties will attempt to develop a mutually satisfactory solution, failing which either Party may terminate the Contract by giving a notice to the other.
- 38.6 In the event of termination pursuant to GCC Sub-Clauses 38.3 or 38.5, the rights and obligations of the Employer and the Contractor shall be specified in GCC Sub-Clauses 42.1.2 and 42.1.3.

H. Change in Contract Elements

39. Change in the Facilities 39.1 Introducing a Change

39.1.1 Subject to GCC Sub-Clauses 39.2.5 and 39.2.7, the Employer shall have the right to propose, and subsequently require, that the Project Manager order the Contractor from time to time during the performance of the Contract to make any change, modification, addition or deletion to, in or from the Facilities hereinafter called “Change”, provided that such Change falls within the general scope of the Facilities and does not constitute unrelated work and that it is technically practicable, taking into account both the state of advancement of the Facilities and the technical compatibility of the Change envisaged with the nature of the Facilities as specified in the Contract.

39.1.2 Value Engineering: The Contractor may prepare, at its own cost, a value engineering proposal at any time during the performance of the contract. The value engineering proposal shall, at a minimum, include the following;

- (a) the proposed change(s), and a description of the difference to the existing contract requirements;
- (b) a full cost/benefit analysis of the proposed change(s) including a description and estimate of costs (including life cycle costs) the Employer may incur in implementing the value engineering proposal; and
- (c) a description of any effect(s) of the change on performance/functionality.

The Employer may accept the value engineering proposal if the proposal demonstrates benefits that:

- (a) accelerates the delivery period; or
- (b) reduces the Contract Price or the life cycle costs to the Employer; or
- (c) improves the quality, efficiency, safety or sustainability of the Facilities; or
- (d) yields any other benefits to the Employer,

without compromising the necessary functions of the Facilities.

If the value engineering proposal is approved by the Employer and results in:

(a) a reduction of the Contract Price; the amount to be paid to the Contractor shall be the percentage specified **in the PCC** of the reduction in the Contract Price; or

(b) an increase in the Contract Price; but results in a reduction in life cycle costs due to any benefit described in (a) to (d) above, the amount to be paid to the Contractor shall be the full increase in the Contract Price.

39.1.3 Notwithstanding GCC Sub-Clauses 39.1.1 and 39.1.2, no change made necessary because of any default of the Contractor in the performance of its obligations under the Contract shall be deemed to be a Change, and such change shall not result in any adjustment of the Contract Price or the Time for Completion.

39.1.4 The procedure on how to proceed with and execute Changes is specified in GCC Sub-Clauses 39.2 and 39.3, and further details and forms are provided in the Employer's Requirements (Forms and Procedures).

39.2 Changes Originating from Employer

39.2.1 If the Employer proposes a Change pursuant to GCC Sub-Clause 39.1.1, it shall send to the Contractor a "Request for Change Proposal," requiring the Contractor to prepare and furnish to the Project Manager as soon as reasonably practicable a "Change Proposal," which shall include the following:

- (a) brief description of the Change
- (b) effect on the Time for Completion
- (c) estimated cost of the Change
- (d) effect on Functional Guarantees (if any)

- (e) effect on the Facilities
- (f) effect on any other provisions of the Contract.

39.2.2 Prior to preparing and submitting the “Change Proposal,” the Contractor shall submit to the Project Manager an “Estimate for Change Proposal,” which shall be an estimate of the cost of preparing and submitting the Change Proposal.

Upon receipt of the Contractor’s Estimate for Change Proposal, the Employer shall do one of the following:

- (a) accept the Contractor’s estimate with instructions to the Contractor to proceed with the preparation of the Change Proposal
- (b) advise the Contractor of any part of its Estimate for Change Proposal that is unacceptable and request the Contractor to review its estimate
- (c) advise the Contractor that the Employer does not intend to proceed with the Change.

39.2.3 Upon receipt of the Employer’s instruction to proceed under GCC Sub-Clause 39.2.2 (a), the Contractor shall, with proper expedition, proceed with the preparation of the Change Proposal, in accordance with GCC Sub-Clause 39.2.1.

39.2.4 The pricing of any Change shall, as far as practicable, be calculated in accordance with the rates and prices included in the Contract. If such rates and prices are inequitable, the Parties thereto shall agree on specific rates for the valuation of the Change.

39.2.5 If before or during the preparation of the Change Proposal it becomes apparent that the aggregate effect of compliance therewith and with all other Change Orders that have already become binding upon the Contractor under this GCC Clause 39 would be to increase or decrease the Contract Price as originally set forth in Article 2 (Contract Price) of the Contract Agreement by more than fifteen percent (15%), the Contractor may give a written notice of objection thereto prior to furnishing the Change Proposal as aforesaid. If the Employer accepts the Contractor’s objection, the Employer shall withdraw the

proposed Change and shall notify the Contractor in writing thereof.

The Contractor's failure to so object shall neither affect its right to object to any subsequent requested Changes or Change Orders herein, nor affect its right to take into account, when making such subsequent objection, the percentage increase or decrease in the Contract Price that any Change not objected to by the Contractor represents.

- 39.2.6 Upon receipt of the Change Proposal, the Employer and the Contractor shall mutually agree upon all matters therein contained. Within fourteen (14) days after such agreement, the Employer shall, if it intends to proceed with the Change, issue the Contractor with a Change Order.

If the Employer is unable to reach a decision within fourteen (14) days, it shall notify the Contractor with details of when the Contractor can expect a decision.

If the Employer decides not to proceed with the Change for whatever reason, it shall, within the said period of fourteen (14) days, notify the Contractor accordingly. Under such circumstances, the Contractor shall be entitled to reimbursement of all costs reasonably incurred by it in the preparation of the Change Proposal, provided that these do not exceed the amount given by the Contractor in its Estimate for Change Proposal submitted in accordance with GCC Sub-Clause 39.2.2.

- 39.2.7 If the Employer and the Contractor cannot reach agreement on the price for the Change, an equitable adjustment to the Time for Completion, or any other matters identified in the Change Proposal, the Employer may nevertheless instruct the Contractor to proceed with the Change by issue of a "Pending Agreement Change Order."

Upon receipt of a Pending Agreement Change Order, the Contractor shall immediately proceed with effecting the Changes covered by such Order. The Parties shall thereafter attempt to reach agreement on the outstanding issues under the Change Proposal.

If the Parties cannot reach agreement within sixty (60) days from the date of issue of the Pending Agreement Change Order, then the matter may be referred to the

Dispute Board in accordance with the provisions of GCC Sub-Clause 46.1.

39.3 Changes Originating from Contractor

39.3.1 If the Contractor proposes a Change pursuant to GCC Sub-Clause 39.1.2, the Contractor shall submit to the Project Manager a written “Application for Change Proposal,” giving reasons for the proposed Change and including the information specified in GCC Sub-Clause 39.1.2.

Upon receipt of the Application for Change Proposal, the Parties shall follow the procedures outlined in GCC Sub-Clauses 39.2.6 and 39.2.7. However, the Contractor shall not be entitled to recover the costs of preparing the Application for Change Proposal.

40. Extension of Time for Completion

40.1 The Time(s) for Completion specified in the PCC pursuant to GCC Sub-Clause 8.2 shall be extended if the Contractor is delayed or impeded in the performance of any of its obligations under the Contract by reason of any of the following:

- (a) any Change in the Facilities as provided in GCC Clause 39
- (b) any occurrence of Force Majeure as provided in GCC Clause 37, unforeseen conditions as provided in GCC Clause 35, or other occurrence of any of the matters specified or referred to in paragraphs (a), (b) and (c) of GCC Sub-Clause 32.2
- (c) any suspension order given by the Employer under GCC Clause 41 hereof or reduction in the rate of progress pursuant to GCC Sub-Clause 41.2 or
- (d) any changes in laws and regulations as provided in GCC Clause 36 or
- (e) any default or breach of the Contract by the Employer, Appendix to the Contract Agreement titled, or any activity, act or omission of the Employer, or the Project Manager, or any other contractors employed by the Employer, or
- (f) any delay on the part of a Subcontractor, provided such delay is due to a cause for which the Contractor himself would have been entitled to an extension of time under this sub-clause, or

(g) delays attributable to the Employer or caused by customs, or

(h) any other matter specifically mentioned in the Contract

by such period as shall be fair and reasonable in all the circumstances and as shall fairly reflect the delay or impediment sustained by the Contractor.

40.2 Except where otherwise specifically provided in the Contract, the Contractor shall submit to the Project Manager a notice of a claim for an extension of the Time for Completion, together with particulars of the event or circumstance justifying such extension as soon as reasonably practicable after the commencement of such event or circumstance. As soon as reasonably practicable after receipt of such notice and supporting particulars of the claim, the Employer and the Contractor shall agree upon the period of such extension. In the event that the Contractor does not accept the Employer's estimate of a fair and reasonable time extension, the Contractor shall be entitled to refer the matter to a Dispute Board, pursuant to GCC Sub-Clause 46.1.

40.3 The Contractor shall at all times use its reasonable efforts to minimize any delay in the performance of its obligations under the Contract.

40.4 In all cases where the Contractor has given a notice of a claim for an extension of time under GCC 40.2, the Contractor shall consult with the Project Manager in order to determine the steps (if any) which can be taken to overcome or minimize the actual or anticipated delay. The Contractor shall there after comply with all reasonable instructions which the Project Manager shall give in order to minimize such delay. If compliance with such instructions shall cause the Contractor to incur extra costs and the Contractor is entitled to an extension of time under GCC 40.1, the amount of such extra costs shall be added to the Contract Price.

41. Suspension

41.1 The Employer may request the Project Manager, by notice to the Contractor, to order the Contractor to suspend performance of any or all of its obligations under the Contract. Such notice shall specify the obligation of which performance is to be suspended, the effective date of the suspension and the reasons therefor. The Contractor shall thereupon suspend performance of such obligation, except those obligations necessary for the care or preservation of the Facilities, until ordered in writing to resume such performance by the Project Manager.

If, by virtue of a suspension order given by the Project Manager, other than by reason of the Contractor's default or breach of the Contract, the Contractor's performance of any of its obligations is suspended for an aggregate period of more than ninety (90) days, then at any time thereafter and provided that at that time such performance is still suspended, the Contractor may give a notice to the Project Manager requiring that the Employer shall, within twenty-eight (28) days of receipt of the notice, order the resumption of such performance or request and subsequently order a change in accordance with GCC Clause 39, excluding the performance of the suspended obligations from the Contract.

If the Employer fails to do so within such period, the Contractor may, by a further notice to the Project Manager, elect to treat the suspension, where it affects a part only of the Facilities, as a deletion of such part in accordance with GCC Clause 39 or, where it affects the whole of the Facilities, as termination of the Contract under GCC Sub-Clause 42.1.

41.2 If

- (a) the Employer has failed to pay the Contractor any sum due under the Contract within the specified period, has failed to approve any invoice or supporting documents without just cause pursuant to the Appendix to the Contract Agreement titled Terms and Procedures of Payment, or commits a substantial breach of the Contract, the Contractor may give a notice to the Employer that requires payment of such sum, with interest thereon as stipulated in GCC Sub-Clause 12.3, requires approval of such invoice or supporting documents, or specifies the breach and requires the Employer to remedy the same, as the case may be. If the Employer fails to pay such sum together with such interest, fails to approve such invoice or supporting documents or give its reasons for withholding such approval, or fails to remedy the breach or take steps to remedy the breach within fourteen (14) days after receipt of the Contractor's notice or
- (b) the Contractor is unable to carry out any of its obligations under the Contract for any reason attributable to the Employer, including but not limited to the Employer's failure to provide possession of or access to the Site or other areas in accordance with GCC Sub-Clause 10.2, or failure to obtain any governmental permit necessary for the execution and/or completion of the Facilities,

then the Contractor may by fourteen (14) days' notice to the Employer suspend performance of all or any of its obligations under the Contract, or reduce the rate of progress.

41.3 If the Contractor's performance of its obligations is suspended or the rate of progress is reduced pursuant to this GCC Clause 41, then the Time for Completion shall be extended in accordance with GCC Sub-Clause 40.1, and any and all additional costs or expenses incurred by the Contractor as a result of such suspension or reduction shall be paid by the Employer to the Contractor in addition to the Contract Price, except in the case of suspension order or reduction in the rate of progress by reason of the Contractor's default or breach of the Contract.

41.4 During the period of suspension, the Contractor shall not remove from the Site any Plant, any part of the Facilities or any Contractor's Equipment, without the prior written consent of the Employer.

42. Termination

42.1 Termination for Employer's Convenience

42.1.1 The Employer may at any time terminate the Contract for any reason by giving the Contractor a notice of termination that refers to this GCC Sub-Clause 42.1.

42.1.2 Upon receipt of the notice of termination under GCC Sub-Clause 42.1.1, the Contractor shall either immediately or upon the date specified in the notice of termination

- (a) cease all further work, except for such work as the Employer may specify in the notice of termination for the sole purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition
- (b) terminate all subcontracts, except those to be assigned to the Employer pursuant to paragraph (d) (ii) below
- (c) remove all Contractor's Equipment from the Site, repatriate the Contractor's and its Subcontractors' personnel from the Site, remove from the Site any wreckage, rubbish and debris of any kind, and leave the whole of the Site in a clean and safe condition, and

- (d) subject to the payment specified in GCC Sub-Clause 42.1.3,
 - (i) deliver to the Employer the parts of the Facilities executed by the Contractor up to the date of termination
 - (ii) to the extent legally possible, assign to the Employer all right, title and benefit of the Contractor to the Facilities and to the Plant as of the date of termination, and, as may be required by the Employer, in any subcontracts concluded between the Contractor and its Subcontractors; and
 - (iii) deliver to the Employer all non-proprietary drawings, specifications and other documents prepared by the Contractor or its Subcontractors as at the date of termination in connection with the Facilities.

42.1.3 In the event of termination of the Contract under GCC Sub-Clause 42.1.1, the Employer 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 Subcontractors' personnel
- (c) any amounts to be paid by the Contractor to its Subcontractors in connection with the termination of any subcontracts, including any cancellation charges
- (d) costs incurred by the Contractor in protecting the Facilities and leaving the Site in a clean and safe condition pursuant to paragraph (a) of GCC Sub-Clause 42.1.2
- (e) the cost of satisfying all other obligations, commitments and claims that the Contractor may in good faith have undertaken with third Parties in

connection with the Contract and that are not covered by paragraphs (a) through (d) above.

42.2 Termination for Contractor's Default

42.2.1 The Employer, without prejudice to any other rights or remedies it may possess, may terminate the Contract forthwith in the following circumstances by giving a notice of termination and its reasons therefor to the Contractor, referring to this GCC Sub-Clause 42.2:

- (a) if the Contractor becomes bankrupt or insolvent, has a receiving order issued against it, compounds with its creditors, or, if the Contractor is a corporation, a resolution is passed or order is made for its winding up, other than a voluntary liquidation for the purposes of amalgamation or reconstruction, a receiver is appointed over any part of its undertaking or assets, or if the Contractor takes or suffers any other analogous action in consequence of debt
- (b) if the Contractor assigns or transfers the Contract or any right or interest therein in violation of the provision of GCC Clause 43.
- (c) if the Contractor, in the judgment of the Employer has engaged in Fraud and Corruption, as defined in paragraph 2.2 a. of Appendix B to the GCC, in competing for or in executing the Contract.

42.2.2 If the Contractor

- (a) has abandoned or repudiated the Contract
- (b) has without valid reason failed to commence work on the Facilities promptly or has suspended, other than pursuant to GCC Sub-Clause 41.2, the progress of Contract performance for more than twenty-eight (28) days after receiving a written instruction from the Employer to proceed
- (c) persistently fails to execute the Contract in accordance with the Contract or persistently neglects to carry out its obligations under the Contract without just cause
- (d) refuses or is unable to provide sufficient materials, services or labor to execute and complete the

Facilities in the manner specified in the program furnished under GCC Sub-Clause 18.2 at rates of progress that give reasonable assurance to the Employer that the Contractor can attain Completion of the Facilities by the Time for Completion as extended,

then the Employer may, without prejudice to any other rights it may possess under the Contract, give a notice to the Contractor stating the nature of the default and requiring the Contractor to remedy the same. If the Contractor fails to remedy or to take steps to remedy the same within fourteen (14) days of its receipt of such notice, then the Employer may terminate the Contract forthwith by giving a notice of termination to the Contractor that refers to this GCC Sub-Clause 42.2.

42.2.3 Upon receipt of the notice of termination under GCC Sub-Clauses 42.2.1 or 42.2.2, the Contractor shall, either immediately or upon such date as is specified in the notice of termination,

- (a) cease all further work, except for such work as the Employer may specify in the notice of termination for the sole purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition
- (b) terminate all subcontracts, except those to be assigned to the Employer pursuant to paragraph (d) below
- (c) deliver to the Employer the parts of the Facilities executed by the Contractor up to the date of termination
- (d) to the extent legally possible, assign to the Employer all right, title and benefit of the Contractor to the Facilities and to the Plant as of the date of termination, and, as may be required by the Employer, in any subcontracts concluded between the Contractor and its Subcontractors
- (e) deliver to the Employer all drawings, specifications and other documents prepared by the Contractor or its Subcontractors as of the date of termination in connection with the Facilities.

42.2.4 The Employer may enter upon the Site, expel the Contractor, and complete the Facilities itself or by employing any third Party. The Employer may, to the exclusion of any right of the Contractor over the same, take over and use with the payment of a fair rental rate to the Contractor, with all the maintenance costs to the account of the Employer and with an indemnification by the Employer for all liability including damage or injury to persons arising out of the Employer's use of such equipment, any Contractor's Equipment owned by the Contractor and on the Site in connection with the Facilities for such reasonable period as the Employer considers expedient for the supply and installation of the Facilities.

Upon completion of the Facilities or at such earlier date as the Employer thinks appropriate, the Employer shall give notice to the Contractor that such Contractor's Equipment will be returned to the Contractor at or near the Site and shall return such Contractor's Equipment to the Contractor in accordance with such notice. The Contractor shall thereafter without delay and at its cost remove or arrange removal of the same from the Site.

42.2.5 Subject to GCC Sub-Clause 42.2.6, the Contractor shall be entitled to be paid the Contract Price attributable to the Facilities executed as of the date of termination, the value of any unused or partially used Plant on the Site, and the costs, if any, incurred in protecting the Facilities and in leaving the Site in a clean and safe condition pursuant to paragraph (a) of GCC Sub-Clause 42.2.3. Any sums due the Employer from the Contractor accruing prior to the date of termination shall be deducted from the amount to be paid to the Contractor under this Contract.

42.2.6 If the Employer completes the Facilities, the cost of completing the Facilities by the Employer shall be determined.

If the sum that the Contractor is entitled to be paid, pursuant to GCC Sub-Clause 42.2.5, plus the reasonable costs incurred by the Employer in completing the Facilities, exceeds the Contract Price, the Contractor shall be liable for such excess.

If such excess is greater than the sums due the Contractor under GCC Sub-Clause 42.2.5, the Contractor shall pay the balance to the Employer, and if such excess is less than the

sums due the Contractor under GCC Sub-Clause 42.2.5, the Employer shall pay the balance to the Contractor.

The Employer and the Contractor shall agree, in writing, on the computation described above and the manner in which any sums shall be paid.

42.3 Termination by the Contractor

42.3.1 If

- (a) the Employer has failed to pay the Contractor any sum due under the Contract within the specified period, has failed to approve any invoice or supporting documents without just cause pursuant to the Appendix to the Contract Agreement titled Terms and Procedures of Payment, or commits a substantial breach of the Contract, the Contractor may give a notice to the Employer that requires payment of such sum, with interest thereon as stipulated in GCC Sub-Clause 12.3, requires approval of such invoice or supporting documents, or specifies the breach and requires the Employer to remedy the same, as the case may be. If the Employer fails to pay such sum together with such interest, fails to approve such invoice or supporting documents or give its reasons for withholding such approval, fails to remedy the breach or take steps to remedy the breach within fourteen (14) days after receipt of the Contractor's notice, or
- (b) the Contractor is unable to carry out any of its obligations under the Contract for any reason attributable to the Employer, including but not limited to the Employer's failure to provide possession of or access to the Site or other areas or failure to obtain any governmental permit necessary for the execution and/or completion of the Facilities,

then the Contractor may give a notice to the Employer thereof, and if the Employer has failed to pay the outstanding sum, to approve the invoice or supporting documents, to give its reasons for withholding such approval, or to remedy the breach within twenty-eight (28) days of such notice, or if the Contractor is still unable to carry out any of its obligations under the Contract for any reason attributable to the Employer within twenty-eight (28)

days of the said notice, the Contractor may by a further notice to the Employer referring to this GCC Sub-Clause 42.3.1, forthwith terminate the Contract.

42.3.2 The Contractor may terminate the Contract forthwith by giving a notice to the Employer to that effect, referring to this GCC Sub-Clause 42.3.2, if the Employer becomes bankrupt or insolvent, has a receiving order issued against it, compounds with its creditors, or, being a corporation, if a resolution is passed or order is made for its winding up (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), a receiver is appointed over any part of its undertaking or assets, or if the Employer takes or suffers any other analogous action in consequence of debt.

42.3.3 If the Contract is terminated under GCC Sub-Clauses 42.3.1 or 42.3.2, then the Contractor shall immediately

- (a) cease all further work, except for such work as may be necessary for the purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition
- (b) terminate all subcontracts, except those to be assigned to the Employer pursuant to paragraph (d) (ii)
- (c) remove all Contractor's Equipment from the Site and repatriate the Contractor's and its Subcontractors' personnel from the Site, and
- (d) subject to the payment specified in GCC Sub-Clause 42.3.4,
 - (i) deliver to the Employer the parts of the Facilities executed by the Contractor up to the date of termination
 - (ii) to the extent legally possible, assign to the Employer all right, title and benefit of the Contractor to the Facilities and to the Plant as of the date of termination, and, as may be required by the Employer, in any subcontracts concluded between the Contractor and its Subcontractors, and

- (iii) deliver to the Employer all drawings, specifications and other documents prepared by the Contractor or its Subcontractors as of the date of termination in connection with the Facilities.

42.3.4 If the Contract is terminated under GCC Sub-Clauses 42.3.1 or 42.3.2, the Employer shall pay to the Contractor all payments specified in GCC Sub-Clause 42.1.3, and reasonable compensation for all loss, except for loss of profit, or damage sustained by the Contractor arising out of, in connection with or in consequence of such termination.

42.3.5 Termination by the Contractor pursuant to this GCC Sub-Clause 42.3 is without prejudice to any other rights or remedies of the Contractor that may be exercised in lieu of or in addition to rights conferred by GCC Sub-Clause 42.3.

42.4 In this GCC Clause 42, the expression “Facilities executed” shall include all work executed, Installation Services provided, and all Plant acquired, or subject to a legally binding obligation to purchase, by the Contractor and used or intended to be used for the purpose of the Facilities, up to and including the date of termination.

42.5 In this GCC Clause 42, in calculating any monies due from the Employer to the Contractor, account shall be taken of any sum previously paid by the Employer to the Contractor under the Contract, including any advance payment paid pursuant to the Appendix to the Contract Agreement titled Terms and Procedures of Payment.

43. Assignment

43.1 Neither the Employer nor the Contractor shall, without the express prior written consent of the other Party, which consent shall not be unreasonably withheld, assign to any third Party the Contract or any part thereof, or any right, benefit, obligation or interest therein or thereunder, except that the Contractor shall be entitled to assign either absolutely or by way of charge any monies due and payable to it or that may become due and payable to it under the Contract.

44. Export Restrictions

44.1 Notwithstanding any obligation under the Contract to complete all export formalities, any export restrictions attributable to the Employer, to the country of the Employer or to the use of the Plant and Installation Services to be supplied which arise from trade regulations from a country supplying those Plant and Installation

Services, and which substantially impede the Contractor from meeting its obligations under the Contract, shall release the Contractor from the obligation to provide deliveries or services, always provided, however, that the Contractor can demonstrate to the satisfaction of the Employer and of the Bank that it has completed all formalities in a timely manner, including applying for permits, authorizations and licenses necessary for the export of the Plant and Installation Services under the terms of the Contract. Termination of the Contract on this basis shall be for the Employer's convenience pursuant to Sub-Clause 42.1.

I. Claims, Disputes and Arbitration

45. Contractor's Claims

45.1 If the Contractor considers himself to be entitled to any extension of the Time for Completion and/or any additional payment, under any Clause of these Conditions or otherwise in connection with the Contract, the Contractor shall submit a notice to the Project Manager, describing the event or circumstance giving rise to the claim. The notice shall be given as soon as practicable, and not later than 28 days after the Contractor became aware, or should have become aware, of the event or circumstance.

If the Contractor fails to give notice of a claim within such period of 28 days, the Time for Completion shall not be extended, the Contractor shall not be entitled to additional payment, and the Employer shall be discharged from all liability in connection with the claim. Otherwise, the following provisions of this Sub-Clause shall apply.

The Contractor shall also submit any other notices which are required by the Contract, and supporting particulars for the claim, all as relevant to such event or circumstance.

The Contractor shall keep such contemporary records as may be necessary to substantiate any claim, either on the Site or at another location acceptable to the Project Manager. Without admitting the Employer's liability, the Project Manager may, after receiving any notice under this Sub-Clause, monitor the record-keeping and/or instruct the Contractor to keep further contemporary records. The Contractor shall permit the Project Manager to inspect all these records, and shall (if instructed) submit copies to the Project Manager.

Within 42 days after the Contractor became aware (or should have become aware) of the event or circumstance giving rise to the

claim, or within such other period as may be proposed by the Contractor and approved by the Project Manager, the Contractor shall send to the Project Manager a fully detailed claim which includes full supporting particulars of the basis of the claim and of the extension of time and/or additional payment claimed. If the event or circumstance giving rise to the claim has a continuing effect:

- (a) this fully detailed claim shall be considered as interim;
- (b) the Contractor shall send further interim claims at monthly intervals, giving the accumulated delay and/or amount claimed, and such further particulars as the Project Manager may reasonably require; and
- (c) the Contractor shall send a final claim within 28 days after the end of the effects resulting from the event or circumstance, or within such other period as may be proposed by the Contractor and approved by the Project Manager.

Within 42 days after receiving a claim or any further particulars supporting a previous claim, or within such other period as may be proposed by the Project Manager and approved by the Contractor, the Project Manager shall respond with approval, or with disapproval and detailed comments. He may also request any necessary further particulars, but shall nevertheless give his response on the principles of the claim within such time.

Each Payment Certificate shall include such amounts for any claim as have been reasonably substantiated as due under the relevant provision of the Contract. Unless and until the particulars supplied are sufficient to substantiate the whole of the claim, the Contractor shall only be entitled to payment for such part of the claim as he has been able to substantiate.

The Project Manager shall agree with the Contractor or estimate:

- (i) the extension (if any) of the Time for Completion (before or after its expiry) in accordance with GCC Clause 40, and/or (ii) the additional payment (if any) to which the Contractor is entitled under the Contract.

The requirements of this Sub-Clause are in addition to those of any other Sub-Clause which may apply to a claim. If the Contractor fails to comply with this or another Sub-Clause in relation to any claim, any extension of time and/or additional payment shall take account of the extent (if any) to which the failure has prevented or

prejudiced proper investigation of the claim, unless the claim is excluded under the second paragraph of this Sub-Clause.

In the event that the Contractor and the Employer cannot agree on any matter relating to a claim, either Party may refer the matter to the Dispute Board pursuant to GCC 46 hereof.

46. Disputes and Arbitration

46.1 Appointment of the Dispute Board

Disputes shall be referred to a DB for decision in accordance with GCC Sub-Clause 46.3. The Parties shall appoint a DB by the date stated **in the PCC**.

The DB shall comprise, as stated **in the PCC**, either one or three suitably qualified persons (“the members”), each of whom shall be fluent in the language for communication defined in the Contract and shall be a professional experienced in the type of activities involved in the performance of the Contract and with the interpretation of contractual documents. If the number is not so stated and the Parties do not agree otherwise, the DB shall comprise three persons, one of whom shall serve as chairman.

If the Parties have not jointly appointed the DB 21 days before the date stated in the PCC and the DB is to comprise three persons, each Party shall nominate one member for the approval of the other Party. The first two members shall recommend and the Parties shall agree upon the third member, who shall act as chairman.

However, if a list of potential members is included in the PCC, the members shall be selected from those on the list, other than anyone who is unable or unwilling to accept appointment to the DB.

The agreement between the Parties and either the sole member or each of the three members shall incorporate by reference the General Conditions of Dispute Board Agreement contained in the Appendix to these General Conditions, with such amendments as are agreed between them.

The terms of the remuneration of either the sole member or each of the three members, including the remuneration of any expert whom the DB consults, shall be mutually agreed upon by the Parties when agreeing the terms of appointment of the member or such expert (as the case may be). Each Party shall be responsible for paying one-half of this remuneration.

If a member declines to act or is unable to act as a result of death, disability, resignation or termination of appointment, a replacement shall be appointed in the same manner as the replaced person was required to have been nominated or agreed upon, as described in this Sub-Clause.

The appointment of any member may be terminated by mutual agreement of both Parties, but not by the Employer or the Contractor acting alone. Unless otherwise agreed by both Parties, the appointment of the DB (including each member) shall expire when the Operational Acceptance Certificate has been issued in accordance with GCC Sub-Clause 25.3.

46.2 Failure to Agree on the Composition of the Dispute Board

If any of the following conditions apply, namely:

- (a) the Parties fail to agree upon the appointment of the sole member of the DB by the date stated in the first paragraph of GCC Sub-Clause 46.1,
- (b) either Party fails to nominate a member (for approval by the other Party) of a DB of three persons by such date,
- (c) the Parties fail to agree upon the appointment of the third member (to act as chairman) of the DB by such date, or
- (d) the Parties fail to agree upon the appointment of a replacement person within 42 days after the date on which the sole member or one of the three members declines to act or is unable to act as a result of death, disability, resignation or termination of appointment,

then the appointing entity or official **named in the PCC** shall, upon the request of either or both of the Parties and after due consultation with both Parties, appoint this member of the DB. This appointment shall be final and conclusive. Each Party shall be responsible for paying one-half of the remuneration of the appointing entity or official.

46.3 Obtaining Dispute Board's Decision

If a dispute (of any kind whatsoever) arises between the Parties in connection with the performance of the Contract, including any dispute as to any certificate, determination, instruction, opinion or valuation of the Project Manager, either Party may refer the

dispute in writing to the DB for its decision, with copies to the other Party and the Project Manager. Such reference shall state that it is given under this Sub-Clause.

For a DB of three persons, the DB shall be deemed to have received such reference on the date when it is received by the chairman of the DB.

Both Parties shall promptly make available to the DB all such additional information, further access to the Site, and appropriate facilities, as the DB may require for the purposes of making a decision on such dispute. The DB shall be deemed to be not acting as arbitrator(s).

Within 84 days after receiving such reference, or within such other period as may be proposed by the DB and approved by both Parties, the DB shall give its decision, which shall be reasoned and shall state that it is given under this Sub-Clause. The decision shall be binding on both Parties, who shall promptly give effect to it unless and until it shall be revised in an amicable settlement or an arbitral award as described below. Unless the Contract has already been abandoned, repudiated or terminated, the Contractor shall continue with the performance of the Facilities in accordance with the Contract.

If either Party is dissatisfied with the DB's decision, then either Party may, within 28 days after receiving the decision, give notice to the other Party of its dissatisfaction and intention to commence arbitration. If the DB fails to give its decision within the period of 84 days (or as otherwise approved) after receiving such reference, then either Party may, within 28 days after this period has expired, give notice to the other Party of its dissatisfaction and intention to commence arbitration.

In either event, this notice of dissatisfaction shall state that it is given under this Sub-Clause, and shall set out the matter in dispute and the reason(s) for dissatisfaction. Except as stated in GCC Sub-Clauses 46.6 and 46.7, neither Party shall be entitled to commence arbitration of a dispute unless a notice of dissatisfaction has been given in accordance with this Sub-Clause.

If the DB has given its decision as to a matter in dispute to both Parties, and no notice of dissatisfaction has been given by either Party within 28 days after it received the DB's decision, then the decision shall become final and binding upon both Parties.

46.4 Amicable Settlement

Where notice of dissatisfaction has been given under GCC Sub-Clause 46.3 above, both Parties shall attempt to settle the dispute amicably before the commencement of arbitration. However, unless both Parties agree otherwise, arbitration may be commenced on or after the fifty-sixth day after the day on which notice of dissatisfaction and intention to commence arbitration was given, even if no attempt at amicable settlement has been made.

46.5 Arbitration

Unless **indicated otherwise in the PCC**, any dispute not settled amicably and in respect of which the DB's decision (if any) has not become final and binding shall be finally settled by arbitration. Unless otherwise agreed by both Parties, arbitration shall be conducted as follows:

- (a) For contracts with foreign contractors:
 - (i) international arbitration with proceedings administered by the international arbitration institution **appointed in the PCC**, in accordance with the rules of arbitration of the appointed institution,
 - (ii) the place of arbitration shall be the city where the headquarters of the appointed arbitration institution is located or such other place selected in accordance with the applicable arbitration rules; and
 - (iii) the arbitration shall be conducted in the language for communications defined in Sub-Clause 5.3; and
- (b) For contracts with domestic contractors, arbitration with proceedings conducted in accordance with the laws of the Employer's Country.

The arbitrator(s) shall have full power to open up, review and revise any certificate, determination, instruction, opinion or valuation of the Project Manager, and any decision of the DB, relevant to the dispute. Nothing shall disqualify the Project Manager from being called as a witness and giving evidence before the arbitrator(s) on any matter whatsoever relevant to the dispute.

Neither Party shall be limited in the proceedings before the arbitrator(s) to the evidence or arguments previously put before the DB to obtain its decision, or to the reasons for dissatisfaction given in its notice of dissatisfaction. Any decision of the DB shall be admissible in evidence in the arbitration.

Arbitration may be commenced prior to or after completion of the Works. The obligations of the Parties, the Project Manager and the DB shall not be altered by reason of any arbitration being conducted during the progress of the Works.

46.6 Failure to Comply with Dispute Board's Decision

In the event that a Party fails to comply with a DB decision which has become final and binding, then the other Party may, without prejudice to any other rights it may have, refer the failure itself to arbitration under GCC Sub-Clause 46.5. GCC Sub-Clauses 46.3 and 46.4 shall not apply to this reference.

46.7 Expiry of Dispute Board's Appointment

If a dispute arises between the Parties in connection with the performance of the Contract, and there is no DB in place, whether by reason of the expiry of the DB's appointment or otherwise:

- (a) GCC Sub-Clauses 46.3 and 46.4 shall not apply, and
- (b) the dispute may be referred directly to arbitration under GCC Sub-Clause 46.5

APPENDIX A

General Conditions of Dispute Board Agreement

1. Definitions

Each “Dispute Board Agreement” is a tripartite agreement by and between:

the “Employer”;

the “Contractor”; and

the “Member” who is defined in the Dispute Board Agreement as being:

- (i) the sole member of the “DB” and, where this is the case, all references to the “Other Members” do not apply, or
- (ii) one of the three persons who are jointly called the “DB” (or “dispute board”) and, where this is the case, the other two persons are called the “Other Members”.

The Employer and the Contractor have entered (or intend to enter) into a contract, which is called the “Contract” and is defined in the Dispute Board Agreement, which incorporates this Appendix. In the Dispute Board Agreement, words and expressions which are not otherwise defined shall have the meanings assigned to them in the Contract.

2. General Provisions

Unless otherwise stated in the Dispute Board Agreement, it shall take effect on the latest of the following dates:

- (a) the Commencement Date defined in the Contract,
- (b) when the Employer, the Contractor and the Member have each signed the Dispute Board Agreement, or
- (c) when the Employer, the Contractor and each of the Other Members (if any) have respectively each signed a dispute board agreement.

This employment of the Member is a personal appointment. At any time, the Member may give not less than 70 days’ notice of resignation to the Employer and to the Contractor, and the Dispute Board Agreement shall terminate upon the expiry of this period.

3. Warranties

The Member warrants and agrees that he/she is and shall be impartial and independent of the Employer, the Contractor and the Project Manager. The Member shall promptly disclose, to each of them and to the Other Members (if any), any fact or circumstance which might appear inconsistent with his/her warranty and agreement of impartiality and independence.

When appointing the Member, the Employer and the Contractor relied upon the Member's representations that he/she is:

- (a) experienced in the work which the Contractor is to carry out under the Contract,
- (b) experienced in the interpretation of contract documentation, and
- (c) fluent in the language for communications defined in the Contract.

4. General Obligations of the Member

The Member shall:

- (a) have no interest financial or otherwise in the Employer, the Contractor or the Project Manager, nor any financial interest in the Contract except for payment under the Dispute Board Agreement;
- (b) not previously have been employed as a consultant or otherwise by the Employer, the Contractor or the Project Manager, except in such circumstances as were disclosed in writing to the Employer and the Contractor before they signed the Dispute Board Agreement;
- (c) have disclosed in writing to the Employer, the Contractor and the Other Members (if any), before entering into the Dispute Board Agreement and to his/her best knowledge and recollection, any professional or personal relationships with any director, officer or employee of the Employer, the Contractor or the Project Manager, and any previous involvement in the overall project of which the Contract forms part;
- (d) not, for the duration of the Dispute Board Agreement, be employed as a consultant or otherwise by the Employer, the Contractor or the Project Manager, except as may be agreed in writing by the Employer, the Contractor and the Other Members (if any);
- (e) comply with the annexed procedural rules and with GCC Sub-Clause 46.3;
- (f) not give advice to the Employer, the Contractor, the Employer's Personnel or the Contractor's Personnel concerning the conduct of the Contract, other than in accordance with the annexed procedural rules;
- (g) not while a Member enter into discussions or make any agreement with the Employer, the Contractor or the Project Manager regarding employment by any of them, whether as a consultant or otherwise, after ceasing to act under the Dispute Board Agreement;
- (h) ensure his/her availability for all site visits and hearings as are necessary;
- (i) become conversant with the Contract and with the progress of the Facilities (and of any other parts of the project of which the Contract forms part) by studying all documents received which shall be maintained in a current working file;

- (j) treat the details of the Contract and all the DB's activities and hearings as private and confidential, and not publish or disclose them without the prior written consent of the Employer, the Contractor and the Other Members (if any); and
- (k) be available to give advice and opinions, on any matter relevant to the Contract when requested by both the Employer and the Contractor, subject to the agreement of the Other Members (if any).

5. General Obligations of the Employer and the Contractor

The Employer, the Contractor, the Employer's Personnel and the Contractor's Personnel shall not request advice from or consultation with the Member regarding the Contract, otherwise than in the normal course of the DB's activities under the Contract and the Dispute Board Agreement. The Employer and the Contractor shall be responsible for compliance with this provision, by the Employer's Personnel and the Contractor's Personnel respectively.

The Employer and the Contractor undertake to each other and to the Member that the Member shall not, except as otherwise agreed in writing by the Employer, the Contractor, the Member and the Other Members (if any):

- (a) be appointed as an arbitrator in any arbitration under the Contract;
- (b) be called as a witness to give evidence concerning any dispute before arbitrator(s) appointed for any arbitration under the Contract; or
- (c) be liable for any claims for anything done or omitted in the discharge or purported discharge of the Member's functions, unless the act or omission is shown to have been in bad faith.

The Employer and the Contractor hereby jointly and severally indemnify and hold the Member harmless against and from claims from which he is relieved from liability under the preceding paragraph.

Whenever the Employer or the Contractor refers a dispute to the DB under GCC Sub-Clause 46.3, which will require the Member to make a site visit and attend a hearing, the Employer or the Contractor shall provide appropriate security for a sum equivalent to the reasonable expenses to be incurred by the Member. No account shall be taken of any other payments due or paid to the Member.

6. Payment

The Member shall be paid as follows, in the currency named in the Dispute Board Agreement:

- (a) a retainer fee per calendar month, which shall be considered as payment in full for:
 - (i) being available on 28 days' notice for all site visits and hearings;
 - (ii) becoming and remaining conversant with all project developments and maintaining relevant files;

- (iii) all office and overhead expenses including secretarial services, photocopying and office supplies incurred in connection with his duties; and
- (iv) all services performed hereunder except those referred to in sub-paragraphs (b) and (c) of this Clause.

The retainer fee shall be paid with effect from the last day of the calendar month in which the Dispute Board Agreement becomes effective; until the last day of the calendar month in which the Operational Acceptance Certificate is issued for the whole of the Works.

With effect from the first day of the calendar month following the month in which Operational Acceptance Certificate is issued for the whole of the Works, the retainer fee shall be reduced by one third. This reduced fee shall be paid until the first day of the calendar month in which the Member resigns or the Dispute Board Agreement is otherwise terminated.

- (b) a daily fee which shall be considered as payment in full for:
 - (i) each day or part of a day up to a maximum of two days' travel time in each direction for the journey between the Member's home and the site, or another location of a meeting with the Other Members (if any);
 - (ii) each working day on site visits, hearings or preparing decisions; and
 - (iii) each day spent reading submissions in preparation for a hearing.
- (c) all reasonable expenses including necessary travel expenses (air fare in less than first class, hotel and subsistence and other direct travel expenses) incurred in connection with the Member's duties, as well as the cost of telephone calls, courier charges, faxes and telexes: a receipt shall be required for each item in excess of five percent of the daily fee referred to in sub-paragraph (b) of this Clause;
- (d) any taxes properly levied in the Country on payments made to the Member (unless a national or permanent resident of the Country) under this Clause 6.

The retainer and daily fees shall be as specified in the Dispute Board Agreement. Unless it specifies otherwise, these fees shall remain fixed for the first 24 calendar months, and shall thereafter be adjusted by agreement between the Employer, the Contractor and the Member, at each anniversary of the date on which the Dispute Board Agreement became effective.

If the Parties fail to agree on the retainer fee or the daily fee the appointing entity or official named in the PCC shall determine the amount of the fees to be used.

The Member shall submit invoices for payment of the monthly retainer and air fares quarterly in advance. Invoices for other expenses and for daily fees shall be submitted following the conclusion of a site visit or hearing. All invoices shall be accompanied by a brief description of activities performed during the relevant period and shall be addressed to the Contractor.

The Contractor shall pay each of the Member's invoices in full within 56 calendar days after receiving each invoice and shall apply to the Employer (in the Statements under the Contract)

for reimbursement of one-half of the amounts of these invoices. The Employer shall then pay the Contractor in accordance with the Contract.

If the Contractor fails to pay to the Member the amount to which he/she is entitled under the Dispute Board Agreement, the Employer shall pay the amount due to the Member and any other amount which may be required to maintain the operation of the DB; and without prejudice to the Employer's rights or remedies. In addition to all other rights arising from this default, the Employer shall be entitled to reimbursement of all sums paid in excess of one-half of these payments, plus all costs of recovering these sums and financing charges calculated at the rate specified in accordance with GCC Sub-Clause 12.3.

If the Member does not receive payment of the amount due within 70 days after submitting a valid invoice, the Member may (i) suspend his/her services (without notice) until the payment is received, and/or (ii) resign his/her appointment by giving notice under Clause 7.

7. Termination

At any time: (i) the Employer and the Contractor may jointly terminate the Dispute Board Agreement by giving 42 days' notice to the Member; or (ii) the Member may resign as provided for in Clause 2.

If the Member fails to comply with the Dispute Board Agreement, the Employer and the Contractor may, without prejudice to their other rights, terminate it by notice to the Member. The notice shall take effect when received by the Member.

If the Employer or the Contractor fails to comply with the Dispute Board Agreement, the Member may, without prejudice to his other rights, terminate it by notice to the Employer and the Contractor. The notice shall take effect when received by them both.

Any such notice, resignation and termination shall be final and binding on the Employer, the Contractor and the Member. However, a notice by the Employer or the Contractor, but not by both, shall be of no effect.

8. Default of the Member

If the Member fails to comply with any of his obligations under Clause 4 concerning his impartiality or independence in relation to the Employer or the Contractor, he/she shall not be entitled to any fees or expenses hereunder and shall, without prejudice to their other rights, reimburse each of the Employer and the Contractor for any fees and expenses received by the Member and the Other Members (if any), for proceedings or decisions (if any) of the DB which are rendered void or ineffective by the said failure to comply.

9. Disputes

Any dispute or claim arising out of or in connection with this Dispute Board Agreement, or the breach, termination or invalidity thereof, shall be finally settled by institutional arbitration. If no other arbitration institute is agreed, the arbitration shall be conducted under the Rules of Arbitration of the International Chamber of Commerce by one arbitrator appointed in accordance with these Rules of Arbitration.

Appendix A

DISPUTE BOARD GUIDELINES

1. Unless otherwise agreed by the Employer and the Contractor, the DB shall visit the site at intervals of not more than 140 days, including times of critical construction events, at the request of either the Employer or the Contractor. Unless otherwise agreed by the Employer, the Contractor and the DB, the period between consecutive visits shall not be less than 70 days, except as required to convene a hearing as described below.
2. The timing of and agenda for each site visit shall be as agreed jointly by the DB, the Employer and the Contractor, or in the absence of agreement, shall be decided by the DB. The purpose of site visits is to enable the DB to become and remain acquainted with the progress of the Works and of any actual or potential problems or claims, and, as far as reasonable, to prevent potential problems or claims from becoming disputes.
3. Site visits shall be attended by the Employer, the Contractor and the Project Manager and shall be coordinated by the Employer in co-operation with the Contractor. The Employer shall ensure the provision of appropriate conference facilities and secretarial and copying services. At the conclusion of each site visit and before leaving the site, the DB shall prepare a report on its activities during the visit and shall send copies to the Employer and the Contractor.
4. The Employer and the Contractor shall furnish to the DB one copy of all documents which the DB may request, including Contract documents, progress reports, variation instructions, certificates and other documents pertinent to the performance of the Contract. All communications between the DB and the Employer or the Contractor shall be copied to the other Party. If the DB comprises three persons, the Employer and the Contractor shall send copies of these requested documents and these communications to each of these persons.
5. If any dispute is referred to the DB in accordance with GCC Sub-Clause 46.3, the DB shall proceed in accordance with GCC Sub-Clause 46.3 and these Guidelines. Subject to the time allowed to give notice of a decision and other relevant factors, the DB shall:
 - (a) act fairly and impartially as between the Employer and the Contractor, giving each of them a reasonable opportunity of putting his case and responding to the other's case, and
 - (b) adopt procedures suitable to the dispute, avoiding unnecessary delay or expense.
6. The DB may conduct a hearing on the dispute, in which event it will decide on the date and place for the hearing and may request that written documentation and arguments from the Employer and the Contractor be presented to it prior to or at the hearing.
7. Except as otherwise agreed in writing by the Employer and the Contractor, the DB shall have power to adopt an inquisitorial procedure, to refuse admission to hearings or audience at hearings to any persons other than representatives of the Employer, the Contractor and the Project Manager, and to proceed in the absence of any Party who the DB is satisfied

received notice of the hearing; but shall have discretion to decide whether and to what extent this power may be exercised.

8. The Employer and the Contractor empower the DB, among other things, to:

- (a) establish the procedure to be applied in deciding a dispute,
- (b) decide upon the DB's own jurisdiction, and as to the scope of any dispute referred to it,
- (c) conduct any hearing as it thinks fit, not being bound by any rules or procedures other than those contained in the Contract and these Guidelines,
- (d) take the initiative in ascertaining the facts and matters required for a decision,
- (e) make use of its own specialist knowledge, if any,
- (f) decide upon the payment of financing charges in accordance with the Contract,
- (g) decide upon any provisional relief such as interim or conservatory measures,
- (h) open up, review and revise any certificate, decision, determination, instruction, opinion or valuation of the Project Manager, relevant to the dispute, and
- (i) appoint, should the DB so consider necessary and the Parties agree, a suitable expert at the cost of the Parties to give advice on a specific matter relevant to the dispute.

9. The DB shall not express any opinions during any hearing concerning the merits of any arguments advanced by the Parties. Thereafter, the DB shall make and give its decision in accordance with GCC Sub-Clause 46.3, or as otherwise agreed by the Employer and the Contractor in writing. If the DB comprises three persons:

- (a) it shall convene in private after a hearing, in order to have discussions and prepare its decision;
- (b) it shall endeavor to reach a unanimous decision: if this proves impossible the applicable decision shall be made by a majority of the Members, who may require the minority Member to prepare a written report for submission to the Employer and the Contractor; and
- (c) if a Member fails to attend a meeting or hearing, or to fulfil any required function, the other two Members may nevertheless proceed to make a decision, unless:
 - (i) either the Employer or the Contractor does not agree that they do so, or
 - (ii) the absent Member is the chairman and he/she instructs the other Members to not make a decision.

APPENDIX B

Fraud and Corruption

1. Purpose

1.1 The Bank's Anti-Corruption Guidelines and this annex apply with respect to procurement under Bank Investment Project Financing operations.

2. Requirements

2.3 The Bank requires that Borrowers (including beneficiaries of Bank financing); bidders (applicants/proposers), consultants, contractors and suppliers; any sub-contractors, sub-consultants, service providers or suppliers; any agents (whether declared or not); and any of their personnel, observe the highest standard of ethics during the procurement process, selection and contract execution of Bank-financed contracts, and refrain from Fraud and Corruption.

2.4 To this end, the Bank:

a. Defines, for the purposes of this provision, the terms set forth below as follows:

- i. "corrupt practice" is the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;
- ii. "fraudulent practice" is any act or omission, including misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain financial or other benefit or to avoid an obligation;
- iii. "collusive practice" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;
- iv. "coercive practice" is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;
- v. "obstructive practice" is:
 - (a) deliberately destroying, falsifying, altering, or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a Bank investigation into allegations of a corrupt, fraudulent, coercive, or collusive practice; and/or threatening, harassing, or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or
 - (b) acts intended to materially impede the exercise of the Bank's inspection and audit rights provided for under paragraph 2.2 e. below.

- b. Rejects a proposal for award if the Bank determines that the firm or individual recommended for award, any of its personnel, or its agents, or its sub-consultants, sub-contractors, service providers, suppliers and/ or their employees, has, directly or indirectly, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for the contract in question;
- c. In addition to the legal remedies set out in the relevant Legal Agreement, may take other appropriate actions, including declaring misprocurement, if the Bank determines at any time that representatives of the Borrower or of a recipient of any part of the proceeds of the loan engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices during the procurement process, selection and/or execution of the contract in question, without the Borrower having taken timely and appropriate action satisfactory to the Bank to address such practices when they occur, including by failing to inform the Bank in a timely manner at the time they knew of the practices;
- d. Pursuant to the Bank's Anti- Corruption Guidelines and in accordance with the Bank's prevailing sanctions policies and procedures, may sanction a firm or individual, either indefinitely or for a stated period of time, including by publicly declaring such firm or individual ineligible (i) to be awarded or otherwise benefit from a Bank-financed contract, financially or in any other manner;¹ (ii) to be a nominated² sub-contractor, consultant, manufacturer or supplier, or service provider of an otherwise eligible firm being awarded a Bank-financed contract; and (iii) to receive the proceeds of any loan made by the Bank or otherwise to participate further in the preparation or implementation of any Bank-financed project;
- e. Requires that a clause be included in bidding/request for proposals documents and in contracts financed by a Bank loan, requiring (i) bidders (applicants/proposers), consultants, contractors, and suppliers, and their sub-contractors, sub-consultants, service providers, suppliers, agents personnel, permit the Bank to inspect³ all accounts, records and other documents relating to the procurement process, selection and/or contract execution, and to have them audited by auditors appointed by the Bank.

¹ For the avoidance of doubt, a sanctioned party's ineligibility to be awarded a contract shall include, without limitation, (i) applying for pre-qualification, expressing interest in a consultancy, and bidding, either directly or as a nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider, in respect of such contract, and (ii) entering into an addendum or amendment introducing a material modification to any existing contract.

² A nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider (different names are used depending on the particular bidding document) is one which has been: (i) included by the bidder in its pre-qualification application or bid because it brings specific and critical experience and know-how that allow the bidder to meet the qualification requirements for the particular bid; or (ii) appointed by the Borrower.

³ Inspections in this context usually are investigative (i.e., forensic) in nature. They involve fact-finding activities undertaken by the Bank or persons appointed by the Bank to address specific matters related to investigations/audits, such as evaluating the veracity of an allegation of possible Fraud and Corruption, through the appropriate mechanisms. Such activity includes but is not limited to: accessing and examining a firm's or individual's financial records and information, and making copies thereof as relevant; accessing and examining any other documents, data and information (whether in hard copy or electronic format) deemed relevant for the investigation/audit, and making copies thereof as relevant; interviewing staff and other relevant individuals; performing physical inspections and site visits; and obtaining third party verification of information.

Appendix C

(Refer GCC 22.2.3)

Salient Features of Labour & Environment Protection Laws¹

SALIENT FEATURES OF SOME MAJOR LABOUR LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN BUILDING AND OTHER CONSTRUCTION WORK

- (a) Employees Compensation Act 1923: The Act provides for compensation in case of injury, disease or death arising out of and during the course of employment.
- (b) Payment of Gratuity Act 1972: gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.
- (c) Employees P.F. and Miscellaneous Provision Act 1952 (since amended): The Act provides for monthly contribution by the employer plus workers @ 10% or 8.33%. The benefits payable under the Act are:
 - (i) Pension or family pension on retirement or death, as the case may be.
 - (ii) Deposit linked insurance on the death in harness of the worker.
 - (iii) Payment of P.F. accumulation on retirement/death etc.
- (d) Maternity Benefit Act 1961: The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.
- (e) Sexual Harassment of Women at the Workplace (Prevention, Prohibition and Redressal) Act, 2013: This Act defines sexual harassment in the workplace, provides for an enquiry procedure in case of complaints and mandates the setting up of an Internal Complaints Committee or a Local Complaints Committee

¹ This list is only illustrative and not exhaustive. Bidders and Contractors are responsible for checking the correctness and completeness of the list. The law as current on the date of bid opening will apply.

- (f) Contract Labour (Regulation & Abolition) Act 1970: The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by law. The Principal Employer is required to take Certificate of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Employer if they employ 20 or more contract labour.
- (g) Minimum Wages Act 1948: The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employments.
- (h) Payment of Wages Act 1936: It lays down the mode, manner and by what date the wages are to be paid, what deductions can be made from the wages of the workers.
- (i) Equal Remuneration Act 1976: The Act provides for payment of equal wages for work of equal nature to male and female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.
- (j) Payment of Bonus Act 1965: The Act is applicable to all establishments employing 20 or more employees. Some of the State Governments have reduced this requirement from 20 to 10. The Act provides for payments of annual bonus subject to a minimum of 8.33% of the wages drawn in the relevant year. It applies to skilled or unskilled manual, supervisory, managerial, administrative, technical or clerical work for hire or reward to employees who draw a salary of Rs. 10,000/- per month or less. To be eligible for bonus, the employee should have worked in the establishment for not less than 30 working days in the relevant year. The Act does not apply to certain establishments.
- (k) Industrial Disputes Act 1947: the Act lays down the machinery and procedure for resolution of Industrial disputes, in what situations, a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.
- (l) Trade Unions Act 1926: The Act lays down the procedure for registration of trade unions of workmen and employers. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities.
- (m) Child Labour (Prohibition & Regulation) Act 1986: The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes.

Employment of Child Labour is prohibited in the Building and Construction Industry.

- (n) Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service) Act 1979: The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home upto the establishment and back, etc.
- (o) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act 1996 and the Building and Other Construction Workers Welfare Cess Act, 1996 (BOCWW Cess Act): All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under these Acts. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be notified by the Government. The Employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as Canteens, First – Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.
- (p) Factories Act 1948: the Act lays down the procedure for approval of plans before setting up a factory engaged in manufacturing processes, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power.
- (q) Weekly Holidays Act -1942
- (r) Bonded Labour System (Abolition) Act, 1976: The Act provides for the abolition of bonded labour system with a view to preventing the economic and physical exploitation of weaker sections of society. Bonded labour covers all forms of forced labour, including that arising out of a loan, debt or advance.
- (s) Employer's Liability Act, 1938: This Act protects workmen who bring suits for damages against employers in case of injuries endured in the course of employment. Such injuries could be on account of negligence on the part of the employer or persons employed by them in maintenance of all machinery, equipment etc. in healthy and sound condition.

- (t) Employees State Insurance Act 1948: The Act provides for certain benefits to insured employees and their families in case of sickness, maternity and disablement arising out of an employment injury. The Act applies to all employees in factories (as defined) or establishments which may be so notified by the appropriate Government. The Act provides for the setting up of an Employees' State Insurance Fund, which is to be administered by the Employees State Insurance Corporation. Contributions to the Fund are paid by the employer and the employee at rates as prescribed by the Central Government. The Act also provides for benefits to dependents of insured persons in case of death as a result of an employment injury.
- (u) The Personal Injuries (Compensation Insurance) Act, 1963: This Act provides for the employer's liability and responsibility to pay compensation to employees where workmen sustain personal injuries in the course of employment.
- (v) Industrial Employment (Standing Order) Act 1946: It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get the same certified by the designated Authority.

**SALIENT FEATURES OF SOME OF THE MAJOR LAWS THAT ARE
APPLICABLE FOR PROTECTION OF ENVIRONMENT.
(Refer GCC 22.2.3)**

1. The Environment (Protection) Act, 1986 and as amended: This provides for the protection and improvement of environment and for matters connected therewith, and the prevention of hazards to human beings, other living creatures, plants and property. 'Environment' includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.
2. The Forest Conservation Act, 1980, as amended, and Forest (Conservation) Rules, 1981 as amended: These provides for protection of forests by restricting conversion of forested areas into non- forested areas and prevention of deforestation, and stipulates the procedures for cutting any trees that might be required by the applicable rules. Permissions under the Act also stipulates the norms and compliance requirements of the employer and any contractor on behalf of the employer.
3. State Tree Preservation Acts as may be in force: These provide for protection of trees of important species. Contractors will be required to obtain prior permission for full or partial cutting, uprooting, or pruning of any such trees.

4. The Wildlife (Protection) Act, 1972, and as amended: This provides for protection of wildlife through notifying National Parks and Sanctuaries and buffer areas around these zones; and to protect individuals of nationally important species listed in the Annex of the Act.
5. The Biological Diversity Act, 2002: This provides for conservation of biological diversity, sustainable use of components of biological diversity, and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith or incidental thereto.
6. The Public Liability Insurance Act, 1991 as amended and The Public Liability Insurance Rules, 1991 as amended: These provide for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under the Environment (Protection) Act 1986, and exceeding such quantity as may be specified by notification by the Central Government.
7. The Ancient Monuments and Archaeological Sites and Remains Act, 1958 and the Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010, the Ancient Monuments and Archaeological Sites and Remains Rules, 1959 amended 2011, the National Monuments Authority Rules, 2011 and the similar State Acts: These provide for conservation of cultural and historical remains found in India. Accordingly, area within the radii of 100m and 300m from the “protected property” are designated as “protected area” and “controlled area” respectively. No development activity (including building, mining, excavating, blasting) is permitted in the “protected area” and development activities likely to damage the protected property is not permitted in the “controlled area” without prior permission of the Archaeological Survey of India (ASI) or the State Departments of Art and Culture or Archaeology as applicable.
8. The Environmental Impact Assessment Notification, 2006 and as amended: This provides for prior environmental clearance for new, modernization and expansion projects listed in Schedule 1 of the Notification. Contractors will be required to ensure that no work starts until applicable clearances under the Notification is not available. Contractors will be responsible for implementation of any environmental management plan stipulated as per the permission under this Notification; and will be required to prepare and submit to the employer and compliance report stipulated in the permission under the Notification.
9. The Water (Prevention and Control of Pollution) Act, 1974 as amended, and the Water (Prevention and Control of Pollution) Rules, 1975 as amended: These provide for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of water. ‘Pollution’ means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms. Contractors will need to obtain

consent for establishment and consent for operation of any item of work or installation of equipment that generates waste water, and observe the required standards of establishment and operation of these items of work or installations; as well as install and operate all required waste water treatment facilities.

10. The Water (Prevention and Control of Pollution) Cess Act, 1977 and The Water (Prevention and Control of Pollution) Cess Rules, 1978: These provide for the levy and collection of a cess on water consumed by persons carrying on certain industries and by local authorities, with a view to augment the resources of the Central Board and the State Boards for the prevention and control of water pollution under the Water (Prevention and Control of Pollution) Act, 1974.
11. The Air (Prevention and Control of Pollution) Act, 1981 as amended, and the Air (Prevention and Control of Pollution) Rules, 1982: These provides for prevention, control and abatement of air pollution. 'Air Pollution' means the presence in the atmosphere of any 'air pollutant', which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment. Contractors will need to obtain consent for establishment and consent for operation of any item of work or installation of equipment that generates air pollution such as batching plants, hot mix plants, power generators, backup power generation, material handling processes, and observe the required standards of establishment and operation of these items of work or installations.
12. Noise Pollution (Control and Regulation) Rules, 2000, and as amended: This provides for standards for noise for day and night for various land uses and specifies special standards in and around sensitive receptors of noise such as schools and hospitals. Contractors will need to ensure compliance to the applicable standards, and install and operate all required noise control devices as may be required for all plants and work processes.
13. Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996: This provides for Requirement of preparation of on-site and off-site Disaster Management Plans for accident-prone areas.
14. The Explosives Act 1884 and the Explosives Rules, 2008: These provide for safe manufacture, possession, sale, use, transportation and import of explosive materials such as diesel, Oil and lubricants etc.; and also for regulating the use of any explosives used in blasting and/or demolition. All applicable provisions will need compliance by the contractors.
15. The Petroleum Rules, 2002: This provides for safe use and storage of petroleum products, and will need to be complied by the contractors.
16. The Gas Cylinder Rules 2004 and amendments: This provides for regulations related to storage of gas, and possession of gas cylinder more than the exempted quantity. Contractors should comply with all the requirements of this Rule.
17. Manufacture, Storage and Import of Hazardous Chemical Rules of 1989 and as amended: These provide for use and storage of hazardous material such as highly inflammable liquids

like HSD/LPG. Contractors will need to ensure compliance to the Rules; and in the event where the storage quantity exceeds the regulated threshold limit, the contractors will be responsible for regular safety audits and other reporting requirements as prescribed in the Rules.

18. Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016: These provide for protection of general public from improper handling storage and disposal of hazardous waste. The rules prescribe the management requirement of hazardous wastes from its generation to final disposal. Contractors will need to obtain permission from the State Pollution Control Boards and other designated authorities for storage and handling of any hazardous material; and will to ensure full compliance to these rules and any conditions imposed in the permit.
19. The Bio Medical Waste Management Rules, 2016: This provides for control, storage, transportation and disposal of bio-medical wastes. As and where the contractor has any first aid facility and dispensaries, established in either temporary or permanent manner, compliance to these Rules are mandatory.
20. Construction and Demolition Waste Management Rules, 2016: This provides for management of construction and demolition waste (such as building materials possible to be reused, rubble and debris or the like); and applies to all those waste resulting from construction, re-modelling, repair or demolition of any civil structure. Contractor will need to prepare a waste disposal plan and obtain required approval from local authorities, if waste generation is more than 20 tons in any day or 300 tons in any month during the contract period; and ensure full compliance to these rules and any conditions imposed in the regulatory approval.
21. The E-Waste (Management) Rules, 2016: This provides for management of E-wastes (but not covering lead acid batteries and radio-active wastes) aiming to enable the recovery and/or reuse of useful material from e-waste, thereby reducing the hazardous wastes destined for disposal and to ensure the environmentally sound management of all types of waste of electrical and electronic equipment. This Rule applies to every manufacturer, producer, consumer, bulk consumer, collection centers, dealers, e-retailer, refurbisher, dismantler and recycler involved in manufacture, sale, transfer, purchase, collection, storage and processing of e-waste or electrical and electronic equipment listed in Schedule I, including their components, consumables, parts and spares which make the product operational.
22. Plastic waste Management Rules, 2016: This provides for control and management of the plastic waste generated from any activity. Contractors will ensure compliance to this Rule.
23. The Batteries (Management and Handling) Rules 2001: This provides for ensuring safe disposal and recycling of discarded lead acid batteries likely to be used in any equipment during construction and operation stage. Rules require proper control and record keeping on the sale or import of lead acid batteries and recollection of the used batteries by registered recyclers to ensure environmentally sound recycling of used batteries. Contractors will ensure compliance to this Rule.

24. The Ozone Depleting Substances (Regulation and Control) Rules, 2000 and as amended: This provides for regulation of production and consumption of ozone depleting substances in the country, and specifically prohibits export to or import from countries not specified in the Rules, and prohibits unless specifically permitted, any use of ozone depleting substance.
25. The Coastal Regulation Zone Notifications, 1991 and as amended: This provides for regulation of development activities within the 500m of high tide line in coastal zone and 100m of stretches of rivers and estuaries influenced by tides. Contractors will be required to ensure that no work starts until applicable clearances under the Notification is not available. Contractors will be responsible for implementation of any plan stipulated as per the permission under this Notification; and will be required to prepare and submit to the employer and compliance report stipulated in the permission under the Notification.
26. The Motor Vehicle Act 1988 as amended (and State Motor Vehicle Acts as may be in force) and the Motor Vehicle Rules, 1989, and as amended (and State Motor Vehicle Rules as may be in force): To minimize the road accidents, penalizing the guilty, provision of compensation to victim and family and check vehicular air and noise pollution. Contractors will be required to ensure full compliance to these rules.
27. Easement Act, 1882: This provides for the rights of landowners on groundwater. Contractors will need to ensure that other landowners' rights under the Act is not affected by any groundwater abstraction by the contractors.
28. State Groundwater Acts and Rules as may be in force and the Guidelines for Groundwater Abstraction for drinking and domestic purposes in Notified Areas and Industry/Infrastructure project proposals in Non-Notified areas, 2012: These provide for regulating extraction of ground water for construction/industrial and drinking and domestic purposes. Contractors will need to obtain permission from Central/State Groundwater Boards prior to groundwater abstraction through digging any bore well or through any other means; and will to ensure full compliance to these rules and any conditions imposed in the permit.
29. The Mines Act, 1952 as amended; the Minor Mineral and concession Rules as amended; and the State Mineral (Rights and Taxation) Acts as may be in force: These provide for for safe and sound mining activity. The contractors will procure aggregates and other building materials from quarries and borrow areas approved under such Acts. In the event the contractors open any new quarry and/or borrow areas, appropriate prior permission from the State Departments of Minerals and Geology will need to be obtained. Contractors will also need to ensure full compliance to these rules and any conditions imposed in the permit.
30. The Insecticides Act, 1968 and Insecticides Rules, 1971 and as amended: These provide for regulates the manufacture, sale, transport, distribution, export, import and use of pesticides to prevent risk to human beings or animals, and for matters connected therewith. No one should import or manufacture; sell, stock or exhibit foe sale; distribute, transport, use: (i) any misbranded insecticides, (ii) any insecticide the sale, distribution or use of which is for the

time being prohibited under the Act; and (iii) any insecticide except in accordance with the condition on which it was registered under the Act.

31. National Building Codes of India, 2005 and as amended: This provides guidelines for regulating the building construction activities in India. The code mainly contains administrative regulations, development control rules and general building requirements; stipulations regarding materials, structural design and construction; and building and plumbing services. Contractors will be required to comply with all Bureau of Indian Standards Codes dealing with: (i) use and disposal of asbestos containing materials in construction; (ii) paints containing lead; (iii) permanent and temporary ventilations in workplace; (iv) safety, and hygiene at the workplace; (v) prevention of fire; (vi) prevention of accidents from faulty electrical gadgets, equipment and accessories; and all other such codes incidental to the Contract.

Section IX - Particular Conditions of Contract

The following Particular Conditions of Contract shall supplement the General Conditions of Contract in Section VIII. Whenever there is a conflict, the provisions herein shall prevail over those in the General Conditions.

Particular Conditions of Contract (PCC)

The following Particular Conditions (PCC) shall supplement the General Conditions (GCC). Whenever there is a conflict, the provisions herein shall prevail over those in the GCC. The clause number of the PCC is the corresponding clause number of the GCC.

PCC 1. Definitions	The Employer is: Solar Energy Corporation of India Limited (SECI), New Delhi The Project Manager is: TBN The Bank is: International Bank for Reconstruction & Development (IBRD) Country of Origin: all countries and territories as indicated in Section V of the bidding document, Eligible Countries.
PCC 5. Law and Language	PCC 5.1 The Contract shall be interpreted in accordance with the laws of: India. PCC 5.2 The ruling language is: English PCC 5.3 The language for communications is: English
PCC 7. Scope of Facilities [Spare Parts] (GCC Clause 7)	PCC 7.3 The Contractor agrees to supply spare parts for a period of years: During the entire O&M period of 10 years The Contractor shall carry sufficient inventories to ensure an ex-stock supply of consumable spares for the Plant. Other spare parts and components shall be supplied as promptly as possible. In addition, in the event of termination of the production of spare parts, advance notification will be made to the Employer of the pending termination, with sufficient time to permit the Employer to procure the needed requirement. Following such termination, the Contractor will furnish to the extent possible and at no cost to the Employer the blueprints, drawings and specifications of the spare parts, if requested.
PCC 8. Time for Commencement and Completion	PCC 8.1 The Contractor shall commence work on the Facilities within 20 (Twenty) Days from the Effective Date of the contract agreement as specified in the Contract Agreement. PCC 8.2 The Time for Completion of the whole of the Plant Facilities shall be 18 (Eighteen) Months till commissioning from the Effective Date as described in the Contract Agreement. And Operation & Maintenance (O&M) of the Plant facility for a period of 10 (Ten) years from the date of Operational acceptance of the Plant Facilities.

	The complete Operation & Maintenance is part of this contract, the scope of work, service level agreement and specific payment for O&M is consolidated and Annexed as “<u>Annexure C</u>” to the bidding document as “ Part of Operations and Maintenance Agreement For 160 MW Hybrid Plant “
PCC 9. Contractor’s Responsibilities	PCC 9.6 - Substitute the word ‘persons’ with ‘firms’ in lines 2 and 4. Add a new PCC subclause PCC 9.9 as: PCC 9.9 The Contractor shall be overall responsible for monitoring, implementation & compliance of the environmental and social norms for the Project related activities as per the “Environment & Social Management Plan” attached as “<u>Annexure B</u> “with the contract. In line with the environmental and social norms requirements of the Projects, the contractor will appoint/hire suitable Environmental and social development officers/Experts, so as to execute the laid down ESMP effectively. The contractor will be overall responsible for ESMP and RAP implementation, coordinating and liaising with NREDCAP, sub-contractors and other agencies,, with respect to different social and environmental issues. The contractor will also be responsible for progress monitoring of Environmental and social safeguards during project construction and execution stage and submission of monthly report (during construction stage) and quarterly report (during operations stage) on ESMP compliance to SECI. In case of any default or Non-compliance to the ESMP plan as stated in the Contract, Employer reserve the discretion to recover the cost of such default/Noncompliance as penalty for a maximum of 2% (Two Percent) of the Total Performance Security amount as submitted by the contractor. EHS Guidelines: The Contractor (or whatever is the Term in the Contract) shall follow the World Bank Group Environmental, Health and Safety Guidelines (WBG EHSG) during the execution of the Contract to the extent that their activities are covered in these operations. These are available at:

	https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES; https://www.ifc.org/wps/wcm/connect/66b56e00488657eeb36af36a6515bb18/Final%2B-%2BElectric%2BTransmission%2Band%2BDistribution.pdf?MOD=AJPERES&id=1323162154847 and https://www.ifc.org/wps/wcm/connect/2c410700497a7933b04cf1ef20a40540/FINAL_Aug+2015_Wind+Energy_EHS+Guideline.pdf?MOD=AJPERES
PCC 10.3 Employer's Responsibility	10.3 The Employer shall facilitate the contractor in acquiring and obtaining for all permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings in the country where the Site is located which (a) such authorities or undertakings are to obtain in the Employer's name, (b) are necessary for the execution of the Contract, including those required for the performance by both the Contractor and the Employer of their respective obligations under the Contract, and (c) are specified in the Appendix (Scope of Works and Supply by the Employer). The related payments/fees of obtaining permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings in the country where the Site is located will be in the contractor scope.
PCC 10.5, 10.6 & 10.7 Employer's Responsibility	Not applicable as the comprehensive O&M for 10 years is in the scope of the contractor.
PCC 11. Contract Price	PCC 11.2 The Contract Price shall be adjusted in accordance with the provisions of the Appendix to the Contract Agreement titled Adjustment Clause: NA
PCC 13. Securities	PCC 13.3.1 The amount of Performance Security, as a percentage of the Contract Price for the Plant Facility, shall be in following stages: • First Stage: The value of the Contract Performance Security shall be 10% (Ten) of the Contract Value {i.e. total sum of the Supply (Abroad & Employer's country), Service (Freight,

	Design, Installation & Civil Works) & absolute value of O&M contract} and will remain valid for 90 (Ninety) days beyond the Operational Acceptance of the Plant Facilities. Second Stage: The value of the Contract Performance Security shall be 5% (Five) of the Contract Value {i.e. total sum of the Supply (Abroad & Employer's country), Service (Freight, Design, Installation & Civil Works) & absolute value of O&M contract} starting from the Operational Acceptance of the Plant Facilities, valid till the end of 10th year of the O&M period. Contractor needs to furnish the revised Contract Performance Security in the Second Stage amounting to 5% of the total Contract Value as mentioned above within the validity period of the Contract Performance Security submitted at First Stage. In case of extension of the Operational Acceptance, the validity of the Performance Security will be extended suitably. - In case the Contractor fails to furnish the Contract, Performance Security mentioned under the Second Stage within the indicated time period as mentioned above (Within the due validity period of the existing Performance Security) Employer at their sole discretion will forfeit the Contract Performance Security furnished at the respective stage. - Contract Performance Security submitted at the Second Stage shall be released to the Contractor without any interest not later than 75 (Seventy-Five) days after the successful completion of the complete O&M period (10 Years) subject to the approval and acceptance of the O&M period deliverables by the Engineer in charge/Technical Team. - O&M Period will start from the Operational acceptance of the Plant Facilities - The Bidder will be responsible to operate and maintain the Plant after Commissioning till the Operational acceptance of Plant Facilities, without any additional cost to the Employer. GCC 13.3.1 - Add the following at the end of the para: If the performance security is a bank guarantee, it shall be issued either (a) by a Nationalized or Scheduled bank in India; or (ii) by a foreign bank through a correspondent Nationalized or Scheduled Bank located in India; or (c) directly by a foreign bank which has been determined in advance to be acceptable to the Employer.

	PCC 13.3.2 The Performance Security shall be in the form of the bank guarantee attached hereto in Section X, Contract Forms. PCC 13.3.3 The Performance Security shall not be reduced on the date of the Operational Acceptance.
PCC 14.2 Taxes and Duties	In GCC 14.2 (b) replace the words ‘sales tax and value added tax (VAT)’ with ‘GST and other similar taxes, in respect of direct transaction between the Employer and the Contractor’. J. Billing Break-up (BBU): • The successful bidder will be mandatorily required to provide the detailed Billing break up (BBU) with GST/Taxation in line with SOR 1,2,3,4 & 5 at the time of Award of Contract Agreement. Same will form the part of Contract Agreement (CA) • For each item of SOR 1,2,3,4 & 5, the BBU shall be prepared in the same SOR format (Item name, UoM, Quantity, unit Ex Works price, GST, Total price etc) and the sum of all billing break-up item prices shall be equivalent to the each respective SORs item price with discounted rate • The Contractor would be required to provide detailed Bill of Quantity (BOQ) along with the break-up of Contract Price (including taxes) and HSN code of the respective goods/services, at the time of signing of Contract Agreement which should match with the Price Quoted by the Contractor in its Price Bids and accepted by the Employer/Owner. This will be used by the Employer/Owner at the time of payment to the Contractor. Accordingly, bidders should diligently quote the taxes in the bid. • Employer/Owner shall reimburse the amount of taxes as per the rates mentioned by Contractor in the detailed BOQ. In case of any statutory variation in GST during the currency of the Contract, same will be reimbursed to the Contractor subject to the statutory variation clause of the Bidding document, only in respect of the items/quantity which have been mentioned by the Contractor in the detailed BOQ. • If there is difference in HSN/SAC classification and corresponding rate of GST of an item as confirmed/deemed confirmed by the bidder in its bid/detailed BOQ and HSN/SAC and corresponding rate of GST as interpreted under any interpretation/ judgment/ Notification/ Circular issued under the GST law before the award of contract, GST reimbursable

	to the bidder/Bidder shall be lower of the GST applicable at the rate as confirmed/deemed confirmed in the bid or actual GST paid/payable by the bidder for that item. • In case of imported Equipment/items purchased from third party (Bought-Out Items) are supplied to the Employer/Owner in execution of the Project, the price of such Goods shall be inclusive of all cost as well as any duties paid/payable in relation to import/purchase of such goods (viz., customs duties, GST & levies etc.) considering and taking into account the ITC as may be available under the applicable laws including GST. • In case of any statutory variation in GST during the currency of the Contract, same will be reimbursed to the Contractor only in respect of the taxes which are levied during the direct transaction held between Employer/Owner and the Contractor. Any statutory variation applicable in respect of the items/services procurement between third party/sub-contractor and the Contractor would not be reimbursed by SECI.
PCC 22 Installation	GCC 22.2.3 – Add the following at the end of GCC 22.2.3 ‘Salient features of major labour and other laws that are applicable to construction industry in India are given as Appendix C to these General Conditions of Contract.’ PCC 22.2.5 Working Hours Normal working hours are: 08 Hours Shift
PCC 23 Test & Inspection	Add Sub Clause 23.12 as The cost of inspection/ pre-dispatch inspection/ in-stage inspection shall be borne by Contractor. Such pre-dispatch inspection(s) at the manufacturer’s facility shall be carried out in the presence of the Employer or their authorized representatives, for such items as is specified by the Engineer-in-Charge/Project Manager. Travel expenses for such inspections shall be borne by the Employer. However, in case re-inspection is necessitated on account of non-acceptance of item(s) due to failure on Factory Acceptance Test(s), the cost of associated travel and accommodation borne by the Employer shall be on account of the Contractor
PCC 24.2	NA as the comprehensive O&M for 10 years is in the scope

Completion of the facilities	of the contractor
PCC 24.8 Completion of the facilities	NA as the comprehensive O&M for 10 years is in the scope of the contractor
PCC 25. Commissioning and Operational Acceptance	PCC 25.2.2 The functional guarantee tests & their respective penalty clauses related to the Plant facility & individual plants (Solar PV, Wind and BESS) is mentioned under Part II (PG Test Procedure) of Annexure – A, Employer's Requirements.
PCC 26. Completion Time Guarantee	PCC 26.2 Applicable rate for liquidated damages: 0.5% per Week There shall not be any intermediate LDs for the delays in commissioning of the individual plant (Solar, Wind, BESS & Common Infrastructure). The LD for delay is applicable only if the entire plant facility is not commissioned by the Schedule Date of Completion/Contract Period as mentioned in the bidding document. The above rate applies to the price of the part of the Facilities, as quoted in the Price Schedule, for that part for which the Contractor fails to achieve Completion within the schedule Time for Completion. Maximum deduction for liquidated damages: 5% PCC 26.3 No bonus will be given for earlier Completion of the Facilities or part thereof. If the BESS provider is participating as a subcontractor to the bidder then the bidder will be required to establish subcontracting agreement with the BESS supplier in the format as provided by the Owner within 90 days from the effective date of the Contract Agreement. Further, any delay beyond 90 (Ninety) days in signing of the subcontracting agreement as mentioned above, shall attract interest @ 1.25% as penalty per month on the total price of the BESS Plant (Supply) as mentioned under Schedule No 1/Schedule No 2, calculated on pro-rata basis accordingly.

PCC 27. Defect Liability	PCC 27.10 The critical components covered under the extended defect liability are _____, and the period shall be _____ : NA
PCC 30. Limitation of Liability	Sample Clause PCC 30.1 (b) The multiplier of the Contract Price is: 1 (One)
PCC 31.1 Transfer of Ownership	Ownership of the Plant (including spare parts) to be imported into the country where the Site is located shall be transferred to the Employer when the Plant are brought on to the Site.
PCC 39. Value Engineering	PCC 39.1.2 If the value engineering proposal is approved by the Employer the amount to be paid to the Contractor shall be ____% (insert appropriate percentage. : NA
PCC46. Disputes and Arbitration	PCC 46.1 The DB shall be appointed within [28 days] after the Effective Date. PCC 46.1 The DB shall be: 01 member, to be appointed prior to contract signing. _____ <i>or</i> _____ PCC 46.1 List of potential DB members is: _____ PCC 46.2 Appointment (if not agreed) to be made by: (a) In case the Contractor is an : Institution of Engineers, Indian firm India (b) In case the Contractor is a : Court of Arbitration of firm from foreign country the International Chamber of Commerce, Paris.

Section X - Contract Forms

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Notification of Intention to Award

[This Notification of Intention to Award shall be sent to each Bidder that submitted a Bid.]

[Send this Notification to the Bidder's Authorized Representative named in the Bidder Information Form]

For the attention of Bidder's Authorized Representative

Name: *[insert Authorized Representative's name]*

Address: *[insert Authorized Representative's Address]*

Telephone/Fax numbers: *[insert Authorized Representative's telephone/fax numbers]*

Email Address: *[insert Authorized Representative's email address]*

[IMPORTANT: insert the date that this Notification is transmitted to Bidders. The Notification must be sent to all Bidders simultaneously. This means on the same date and as close to the same time as possible.]

DATE OF TRANSMISSION: This Notification is sent by: *[email/fax]* on *[date]* (local time)

Notification of Intention to Award

Employer: *[insert the name of the Employer]*

Project: *[insert name of project]*

Contract title: *[insert the name of the contract]*

Country: *[insert country where RFB is issued]*

Loan No. /Credit No. / Grant No.: *[insert reference number for loan/credit/grant]*

RFB No: *[insert RFB reference number from Procurement Plan]*

This Notification of Intention to Award (Notification) notifies you of our decision to award the above contract. The transmission of this Notification begins the Standstill Period. During the Standstill Period, you may:

- a) request a debriefing in relation to the evaluation of your Bid, and/or
- b) submit a Procurement-related Complaint in relation to the decision to award the contract.

1. The successful Bidder

Name:	<i>[insert name of successful Bidder]</i>
Address:	<i>[insert address of the successful Bidder]</i>

Contract price:	[insert contract price of the successful Bid]

2. **Other Bidders** *[INSTRUCTIONS: insert names of all Bidders that submitted a Bid. If the Bid's price was evaluated include the evaluated price as well as the Bid price as read out.]*

Name of Bidder	Bid price	Evaluated Bid Cost
[insert name]	[insert Bid price]	[insert evaluated cost]
[insert name]	[insert Bid price]	[insert evaluated cost]
[insert name]	[insert Bid price]	[insert evaluated cost]
[insert name]	[insert Bid price]	[insert evaluated cost]
[insert name]	[insert Bid price]	[insert evaluated cost]

3. **Reason/s why your Bid was unsuccessful**

<i>[INSTRUCTIONS: State the reason/s why <u>this</u> Bidder's Bid was unsuccessful. Do NOT include: (a) a point by point comparison with another Bidder's Bid or (b) information that is marked confidential by the Bidder in its Bid.]</i>

4. **How to request a debriefing**

DEADLINE: The deadline to request a debriefing expires at midnight on [insert date] (local time). You may request a debriefing in relation to the results of the evaluation of your Bid. If you decide to request a debriefing, your written request must be made within three (3) Business Days of receipt of this Notification of Intention to Award. Provide the contract name, reference number, name of the Bidder, contact details; and address the request for debriefing as follows: Attention: [insert full name of person, if applicable] Title/position: [insert title/position] Agency: [insert name of Employer] Email address: [insert email address] Fax number: [insert fax number] <i>delete if not used</i> If your request for a debriefing is received within the 3 Business Days deadline, we will provide the debriefing within five (5) Business Days of receipt of your request. If we are unable to provide the debriefing within this period, the Standstill Period shall be extended

by five (5) Business Days after the date that the debriefing is provided. If this happens, we will notify you and confirm the date that the extended Standstill Period will end.

The debriefing may be in writing, by phone, video conference call or in person. We shall promptly advise you in writing how the debriefing will take place and confirm the date and time.

If the deadline to request a debriefing has expired, you may still request a debriefing. In this case, we will provide the debriefing as soon as practicable, and normally no later than fifteen (15) Business Days from the date of publication of the Contract Award Notice.

5. How to make a complaint

Period: Procurement-related Complaint challenging the decision to award shall be submitted by midnight, [insert date] (local time).

Provide the contract name, reference number, name of the Bidder, contact details; and address the Procurement-related Complaint as follows:

Attention: [insert full name of person, if applicable]

Title/position: [insert title/position]

Agency: [insert name of Employer]

Email address: [insert email address]

Fax number: [insert fax number] **delete if not used**

At this point in the procurement process, you may submit a Procurement-related Complaint challenging the decision to award the contract. You do not need to have requested, or received, a debriefing before making this complaint. Your complaint must be submitted within the Standstill Period and received by us before the Standstill Period ends.

Further information:

For more information see the [Procurement Regulations for IPF Borrowers \(Procurement Regulations\)](https://policies.worldbank.org/sites/ppf3/PPFDocuments/Forms/DispPage.aspx?docid=4005) [https://policies.worldbank.org/sites/ppf3/PPFDocuments/Forms/DispPage.aspx?docid=4005] (Annex III). You should read these provisions before preparing and submitting your complaint. In addition, the World Bank's Guidance "[How to make a Procurement-related Complaint](http://www.worldbank.org/en/projects-operations/products-and-services/brief/procurement-new-framework#framework)" [http://www.worldbank.org/en/projects-operations/products-and-services/brief/procurement-new-framework#framework] provides a useful explanation of the process, as well as a sample letter of complaint.

In summary, there are four essential requirements:

1. You must be an 'interested party'. In this case, that means a Bidder who submitted a Bid in this bidding process, and is the recipient of a Notification of Intention to Award.
2. The complaint can only challenge the decision to award the contract.

3. You must submit the complaint within the period stated above.
4. You must include, in your complaint, all of the information required by the Procurement Regulations (as described in Annex III).

6. Standstill Period

DEADLINE: The Standstill Period is due to end at midnight on [insert date] (local time).

The Standstill Period lasts ten (10) Business Days after the date of transmission of this Notification of Intention to Award.

The Standstill Period may be extended as stated in Section 4 above.

If you have any questions regarding this Notification please do not hesitate to contact us.

On behalf of the Employer:

Signature: _____

Name: _____

Title/position: _____

Telephone: _____

Email: _____

Beneficial Ownership Disclosure Form²

(To be submitted by all JV Partners in case of JV)

INSTRUCTIONS TO BIDDERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE FORM

This Beneficial Ownership Disclosure Form (“Form”) is to be completed by the successful Bidder. In case of joint venture, the Bidder must submit a separate Form for each member. The beneficial ownership information to be submitted in this Form shall be current as of the date of its submission.

For the purposes of this Form, a Beneficial Owner of a Bidder is any natural person who ultimately owns or controls the Bidder by meeting one or more of the following conditions:

- *directly or indirectly holding 25% or more of the shares*
- *directly or indirectly holding 25% or more of the voting rights*
- *directly or indirectly having the right to appoint a majority of the board of directors or equivalent governing body of the Bidder*

RFB No.: *[insert number of RFB process]*

Request for Bid No.: *[insert identification]*

To: *[insert complete name of Employer]*

In response to your request in the Letter of Acceptance dated *[insert date of letter of Acceptance]* to furnish additional information on beneficial ownership: *[select one option as applicable and delete the options that are not applicable]*

(i) we hereby provide the following immediate beneficial ownership information.

Details of beneficial ownership

² Delete this form if not applicable.

Identity of Beneficial Owner	Directly or indirectly holding 25% or more of the shares (Yes / No)	Directly or indirectly holding 25 % or more of the Voting Rights (Yes / No)	Directly or indirectly having the right to appoint a majority of the board of the directors or an equivalent governing body of the Bidder (Yes / No)
<i>[include full name (last, middle, first), nationality, country of residence]</i>			

OR

(ii) *We declare that there is no Beneficial Owner meeting one or more of the following conditions:*

- directly or indirectly holding 25% or more of the shares
- directly or indirectly holding 25% or more of the voting rights
- directly or indirectly having the right to appoint a majority of the board of directors or equivalent governing body of the Bidder

OR

(iii) *We declare that we are unable to identify any Beneficial Owner meeting one or more of the following conditions. [If this option is selected, the Bidder shall provide explanation on why it is unable to identify any Beneficial Owner]*

- directly or indirectly holding 25% or more of the shares
- directly or indirectly holding 25% or more of the voting rights
- directly or indirectly having the right to appoint a majority of the board of directors or equivalent governing body of the Bidder]

Name of the Bidder: **[insert complete name of the Bidder]*_____

Name of the person duly authorized to sign the Bid on behalf of the Bidder: ***[insert complete name of person duly authorized to sign the Bid]*_____

Title of the person signing the Bid: *[insert complete title of the person signing the Bid]*_____

Signature of the person named above: *[insert signature of person whose name and capacity are shown above]*

Date signed *[insert date of signing]* **day of** *[insert month]*, *[insert year]*

* In the case of the Bid submitted by a Joint Venture specify the name of the Joint Venture as Bidder. In the event that the Bidder is a joint venture, each reference to “Bidder” in the Beneficial Ownership Disclosure Form (including this Introduction thereto) shall be read to refer to the joint venture member.

** Person signing the Bid shall have the power of attorney given by the Bidder. The power of attorney shall be attached with the Bid Schedules.

Letter of Acceptance

To: _____

This is to notify you that your Bid dated _____ for execution of the _____ for the Contract Price in the aggregate of _____, as corrected and modified in accordance with the Instructions to Bidders is hereby accepted by our Agency.

You are requested to furnish (i) the Performance Security, plus additional security for unbalanced bids in terms of ITB Clause 50 within 28 days in accordance with the Conditions of Contract, using for that purpose one of the Performance Security Forms and (ii) the additional information on beneficial ownership in accordance with BDS ITB 49.1, within eight (8) Business days using the Beneficial Ownership Disclosure Form, included in Section X, - Contract Forms, of the bidding document.

Authorized Signature: _____

Name and Title of Signatory: _____

Name of Agency: _____

Attachment: Contract Agreement

Contract Agreement

THIS AGREEMENT is made the _____ day of _____, _____,
BETWEEN

(1) _____, a corporation incorporated under the laws of _____ and having its principal place of business at _____ (hereinafter called “the Employer”), and (2) _____, a corporation incorporated under the laws of _____ and having its principal place of business at _____ (hereinafter called “the Contractor”).

WHEREAS the Employer desires to engage the Contractor to design, manufacture, test, deliver, install, complete and commission certain Facilities, viz. _____ (“the Facilities”), and the Contractor has agreed to such engagement upon and subject to the terms and conditions hereinafter appearing.

NOW IT IS HEREBY AGREED as follows:

Article 1. Contract Documents

1.1 Contract Documents (Reference GCC Clause 2)

The following documents shall constitute the Contract between the Employer and the Contractor, and each shall be read and construed as an integral part of the Contract:

- (a) This Contract Agreement and the Appendices hereto
- (b) Letter of Bid and Price Schedules submitted by the Contractor
- (c) Particular Conditions
- (d) General Conditions
- (e) Specification
- (f) Drawings
- (g) Other completed Bidding forms submitted with the Bid
- (h) Any other documents forming part of the Employer’s Requirements
- (i) Any other documents shall be added here

1.2 Order of Precedence (Reference GCC Clause 2)

In the event of any ambiguity or conflict between the Contract Documents listed above, the order of precedence

shall be the order in which the Contract Documents are listed in Article 1.1 (Contract Documents) above.

1.3 Definitions (Reference GCC Clause 1)

Capitalized words and phrases used herein shall have the same meanings as are ascribed to them in the General Conditions.

Article 2. Contract Price and Terms of Payment

2.1 Contract Price (Reference GCC Clause 11)

The Employer hereby agrees to pay to the Contractor the Contract Price in consideration of the performance by the Contractor of its obligations hereunder. The Contract Price shall be the aggregate of: _____, _____ as specified in Price Schedule No. 5 (Grand Summary), and _____, _____, or such other sums as may be determined in accordance with the terms and conditions of the Contract.

2.2 Terms of Payment (Reference GCC Clause 12)

The terms and procedures of payment according to which the Employer will reimburse the Contractor are given in the Appendix (Terms and Procedures of Payment) hereto.

The Employer may at its option instruct its bank to issue an irrevocable confirmed documentary credit made available to the Contractor in a bank in the country of the Contractor. The credit shall be for an amount of _____; and shall be subject to the Uniform Customs and Practice for Documentary Credits 2007 Revision, ICC Publication No. 600.

In the event that the amount payable under Schedule No. 1 is adjusted in accordance with GCC 11.2 or with any of the other terms of the Contract, the Employer shall arrange for the documentary credit to be amended accordingly.

Article 3. Effective Date

3.1 Effective Date (Reference GCC Clause 1)

The Effective Date from which the Time for Completion of the Facilities shall be counted is the date when all of the following conditions have been fulfilled:

- (a) This Contract Agreement has been duly executed for and on behalf of the Employer and the Contractor;
- (b) The Contractor has submitted to the Employer the Performance Security and the advance payment guarantee;

Each party shall use its best efforts to fulfill the above conditions for which it is responsible as soon as practicable.

**Article 4.
Communications**

4.1 The address of the Employer for notice purposes, pursuant to GCC 4.1 is: _____.

4.2 The address of the Contractor for notice purposes, pursuant to GCC 4.1 is: _____.

**Article 5.
Appendices**

5.1 The Appendices listed in the attached List of Appendices shall be deemed to form an integral part of this Contract Agreement.

5.2 Reference in the Contract to any Appendix shall mean the Appendices attached hereto, and the Contract shall be read and construed accordingly.

IN WITNESS WHEREOF the Employer and the Contractor have caused this Agreement to be duly executed by their duly authorized representatives the day and year first above written.

Signed by, for and on behalf of the Employer

[Signature]

[Title]

in the presence of _____

Signed by, for and on behalf of the Contractor

[Signature]

[Title]

in the presence of _____

APPENDICES

- Appendix 1 Terms and Procedures of Payment
- Appendix 2 Price Adjustment
- Appendix 3 Insurance Requirements
- Appendix 4 Time Schedule
- Appendix 5 List of Major Items of Plant and Installation Services and List of Approved Subcontractors
- Appendix 6 Scope of Works and Supply by the Employer
- Appendix 7 List of Documents for Approval or Review
- Appendix 8 Functional Guarantees

Appendix 1. Terms and Procedures of Payment

In accordance with the provisions of GCC Clause 12 (Terms of Payment), the Employer shall pay the Contractor in the following manner and at the following times, on the basis of the Price Breakdown given in the section on Price Schedules. Payments will be made in the currencies quoted by the Bidder unless otherwise agreed between the Parties. Applications for payment in respect of part deliveries may be made by the Contractor as work proceeds. The complete plant is an integration of Solar or Wind or BESS or Common Infrastructure. Below mentioned payment terms will apply uniformly for Solar or Wind or BESS or Common Infrastructure

TERMS OF PAYMENT

Schedule No. 1. Plant and Equipment Supplied from Abroad

In respect of plant and equipment supplied from abroad, the following payments shall be made:

Ten percent (10%) of the total amount (of Schedule No. 1) as an advance payment against receipt of Proforma invoice and an irrevocable advance payment security for the 110% amount made out in favor of the Employer. The advance payment security may be reduced in proportion to the value of the 10% advance payment adjusted against plant and equipment delivered to the site, as evidenced by shipping and delivery documents³.

Seventy percent (70%) of the total or pro rata amount (of Schedule No. 1), upon delivery to the destination within forty-five (45) days after receipt of materials and relevant documents⁴⁵.

Ten percent (10%) of the total or pro rata amount (of Schedule No. 1), upon successful erection, testing and commissioning of materials at site and Operational Acceptance of the plant pursuant to successful functional Guarantee Tests.

Ten percent (10 %) of the total or pro rata amount (of Schedule No. 1) within forty-five (45) days of receipt of invoice after final acceptance of the Plant facilities or completion of First year of O&M of Plant, whichever is later, pursuant to submission of all requisite documentation including submission of all as-built drawings and documents.

³ Income Tax Order/Tax Residency Certificate in case of CIP Entry Border Point/CIF Indian Port of Entry supplies,

⁴ Packing list, evidence of dispatch (GR/ LR/BL/AWB copy), Copies of Custom Duty/Taxation, Insurance Certificate, Manufacturer's/ Contractor's Guarantee certificate and MDCC (Material Dispatch Clearance Certificate) issued by Employer's authorized representative in original.

⁵ At this stage, contractor shall submit the Invoice against for adjustment of advance payment apart from the mentioned milestone.

All the above requirements will be suitably for all other Schedules, wherever applicable.

Schedule No. 2. Plant and Equipment Supplied from within the Employer's Country

In respect of plant and equipment supplied from within the Employer's Country, the following payments shall be made:

Ten percent (10%) of the total amount (of Schedule No. 2) as an advance payment against receipt of invoice and an irrevocable advance payment security for the 100% amount made out in favor of the Employer. The advance payment security may be reduced in proportion to the value of the 10% advance payment adjusted against plant and equipment delivered to the site, as evidenced by shipping and delivery documents.

Seventy percent (70%) of the total or pro rata amount (of Schedule No. 2), upon delivery to the destination within forty-five (45) days after receipt of materials and relevant documents.

Ten percent (10%) of the total or pro rata amount (of Schedule No. 2), upon successful erection, testing and commissioning of materials at site and Operational Acceptance of the plant pursuant to successful functional Guarantee Tests.

Ten percent (10 %) of the total or pro rata amount (of Schedule No. 2) within forty-five (45) days of receipt of invoice after final acceptance of the Plant facilities or completion of First year of O&M of Plant, whichever is later, pursuant to submission of all requisite documentation including submission of all as-built drawings and documents.

Schedule No. 3. Design Services

In respect of design services for both the foreign currency and the local currency portions, the following payments shall be made:

Ten percent (10%) of the total design services amount as an advance payment against receipt of invoice, and an irrevocable advance payment security for the 110% amount made out in favor of the Employer.

Ninety percent (90%) of the total or pro rata design services amount upon acceptance of design in accordance with GCC Clause 20 by the Project Manager within forty-five (45) days after receipt of invoice. Ten percent (10%) advance would be adjusted while making payments of this installment on pro-rata basis.

Schedule No. 4. Installation and other Services

In respect of installation and other services for both the foreign and local currency portions, the following payments shall be made:

Ten percent (10%) of the total installation and other services amount (of Schedule No. 4) as an advance payment against receipt of invoice, and an irrevocable advance payment security for the 110% amount made out in favor of the Employer. The advance payment security may be reduced in proportion to the value of 10% advance payment adjusted

against work performed by the Contractor as evidenced by the invoices for installation and other services.

Eighty percent (80%) of the measured value of work performed by the Contractor, as identified in the said Program of Performance, during the preceding month, as evidenced by the Employer's authorization of the Contractor's application, will be made monthly within forty-five (45) days after receipt of invoice.

Five percent (5%) of the total or pro rata value of installation and other services (of Schedule No. 4) within forty-five (45) days of Operational Acceptance of the plant pursuant to successful integration with existing internal grid system & functional Guarantee Tests and completion of all the civil works including finishing and debris removal.

Five percent (5%) of the total or pro rata value of installation and services (of Schedule No. 4) within forty-five (45) days after receipt of invoice after final acceptance of the Plant facilities or completion of First year of O&M of Plant, whichever is later, pursuant to submission of all requisite documentation including submission of all as-built drawings and documents.

Interest on Delayed Payments:

In the event that the Employer fails to make any payment on its respective due date, the Employer shall pay to the Contractor interest on amount of such delayed payment at the rate as applicable for 46 days term deposit scheme as established by State Bank of India for Local currency payment and London Inter Bank Offered Rate (LIBOR) for Foreign currency payment, shall become payable for the period of delay until payment has been made in full.

PAYMENT PROCEDURES

Method of Payment

In case of an Indian bidder, following additional clauses will be applicable

(a) In case of supply from within India or wherever the GST is applicable in the tendering process, if there is difference in HSN/SAC classification and corresponding rate of GST of an item as confirmed/deemed confirmed by the bidder in its bid and HSN/SAC and corresponding rate of GST as interpreted under any interpretation/ judgment/ Notification/ Circular issued under the GST law before or after the award of contract, GST reimbursable to the bidder/Bidder shall be lower of the GST applicable at the rate as confirmed/deemed confirmed in the bid or actual GST paid/payable by the bidder for that item.

(b) While raising invoice/proforma invoice for Supply of Goods from within India, Contactor shall bill to and ship to the address of the Employer where the Goods or part thereof is to be Supplied and mention GSTIN of Employer. In case of Supply of Services from within India , the Bidder shall invoice the Employer using the GSTIN of Employer in the state in which the service or part thereof is to be rendered. In the event that the Bidder fails to provide the invoice

in the form and manner prescribed under the GST Act and Rules, the Employer shall not be liable to make any payment against such invoice.

(c) The recovery of TDS under GST/Income Tax Act and any other acts as per Govt. regulation related to this work shall be done by the Employer. TDS so deducted by Employer shall be deposited with the relevant tax authorities and TDS certificates shall be issued using PAN, TIN, TAN of Employer accordingly. Relevant challans and copies of the TDS certificates shall be forwarded to Employer for filing necessary returns. In case, wherever E-filing system is applicable, the relevant information would be given to the Employer for issuing TDS certificate, filing returns, etc.

(d) Notwithstanding anything above or elsewhere in the Contract, in the event that the input tax credit of the GST charged by the Bidder is denied by the tax authorities to the Employer for reasons associated with non-compliance/ incorrect compliance by the Bidder, the Employer shall be entitled to recover such amount from the Bidder by way of adjustment from any of the subsequent invoices submitted by the Bidder to the Employer. In addition to the amount of GST, the Employer shall also be entitled to recover interest and penalty, in case any interest and/or penalty are imposed by the tax authorities on the Employer for incorrect/wrong availment of Input Tax Credit. The Employer shall determine whether the denial of credit is linked to the non-compliance/ incorrect compliance of the Bidder and the said determination shall be binding on the Bidder.

(e) Any income tax payable in respect of supervisory services rendered by foreign Seller under the Contract shall be as per the Indian Income Tax Act and shall be borne by SELLER. It is up to the bidder/seller to ascertain the amount of these taxes and to include them in his bid price. The bidder will have to bear all income tax liability, if any both Corporate as well as for his personal.

(f) The Employer shall make payments promptly within thirty (30) days of submission of an invoice/claim by the Contractor, complete in all respects and supported by the requisite documents and fulfillment of stipulated conditions, if any. All the payment shall be released to the Contractor directly.

(g) All payments to be made directly to the Contractor shall be made by the Employer through electronic payment mechanism (e-payment) for which necessary details shall be tied up during execution of the Contract. However, a request for payment to be released through cheque shall be considered on case to case basis and merit of the same.

(h) All invoices shall be raised in the name of Employer, Solar Energy Corporation of India (SECI) Limited, New Delhi

(i) In case of Contractor being a Joint Venture of two or more firms, the payment under the Contract shall be received by the Lead Partner on behalf of the Joint Venture, as per power conferred to it in the Power of Attorney. The payment under the Contract, however, can also be received by other Partner (s) based on authorization of the Lead Partner.

The day the payment is made, a mail stating the “Bill number, net payment amount and details of the bank from where the payment has been made” will be sent to the Contractor.

Note: Pro-rata shall refer to functionally complete part(s) of the facilities, for which rates are identified in the contract.

Appendix 2. Price Adjustment

Not Applicable

Appendix 3. Insurance Requirements

Insurances to be Taken Out by the Contractor

In accordance with the provisions of GCC Clause 34, the Contractor shall at its expense take out and maintain in effect, or cause to be taken out and maintained in effect, during the performance of the Contract, the insurances set forth below in the sums and with the deductibles and other conditions specified. The identity of the insurers and the form of the policies shall be subject to the approval of the Employer, such approval not to be unreasonably withheld.

(a) Cargo Insurance

Covering loss or damage occurring, while in transit from the supplier's or manufacturer's works or stores until arrival at the Site, to the Facilities (including spare parts therefor) and to the construction equipment to be provided by the Contractor or its Subcontractors.

Amount	Deductible limits	Parties Insured	From	To
110% of the (Ex-works value/CIF Indian Port of Entry value/ CIP Entry Border Point value)	NIL	Contractor & Employer	Warehouse	Warehouse + 60 days

(b) Installation All Risks Insurance

Covering physical loss or damage to the Facilities at the Site, occurring prior to completion of the Facilities, with an extended maintenance coverage for the Contractor's liability in respect of any loss or damage occurring during the defect liability period while the Contractor is on the Site for the purpose of performing its obligations during the defect liability period.

Amount	Deductible limits	Parties Insured	From	To
110% of the (Contract Price)	NIL	Contractor/ Sub-contractor & Employer	Receipt at site	Upto Defect Liability period

(c) Third Party Liability Insurance

Covering bodily injury or death suffered by third parties (including the Employer's personnel) and loss of or damage to property (including the Employer's property and any parts of the Facilities that have been accepted by the Employer) occurring in connection with the supply and installation of the Facilities.

Amount	Deductible limits	Parties Insured	From	To

Rs. 0.5 million per person per occasion	NIL	Contractor/ Sub-contractor	Commencement of work	Upto Defect Liability period

(d) Automobile Liability Insurance

Covering use of all vehicles used by the Contractor or its Subcontractors (whether or not owned by them) in connection with the supply and installation of the Facilities. Comprehensive insurance in accordance with statutory requirements.

(e) Workers' Compensation

In accordance with the statutory requirements applicable in any country where the Facilities or any part thereof is executed.

(f) Employer's Liability

In accordance with the statutory requirements applicable in any country where the Facilities or any part thereof is executed.

(g) Other Insurances

The Contractor is also required to take out and maintain at its own cost the following insurances:

Details:

Amount	Deductible limits	Parties Insured	From	To
To be indicated by the Contractor	NIL	Contractor/ Sub-contractor & Employer	Receipt at site	Upto Defect Liability period

The Employer shall be named as co-insured under all insurance policies taken out by the Contractor pursuant to GCC Sub-Clause 34.1, except for the Third Party Liability, Workers' Compensation and Employer's Liability Insurances, and the Contractor's Subcontractors shall be named as co-insureds under all insurance policies taken out by the Contractor pursuant to GCC Sub-Clause 34.1, except for the Cargo, Workers' Compensation and Employer's Liability Insurances. All insurer's rights of subrogation against such co-insureds for losses or claims arising out of the performance of the Contract shall be waived under such policies.

Insurances To Be Taken Out By The Employer

The Employer shall at its expense take out and maintain in effect during the performance of the Contract the following insurances.

Details:

<u>Amount</u>	<u>Deductible limits</u>	<u>Parties insured</u>	<u>From</u>	<u>To</u>

NIL

Appendix 4. Time Schedule

Appendix 5. List of Major Items of Plant and Installation Services and List of Approved Subcontractors

A list of major items of Plant and Installation Services is provided below.

The following Subcontractors and/or manufacturers are approved for carrying out the items of the Facilities indicated below. Where more than one Subcontractor is listed, the Contractor is free to choose between them, but it must notify the Employer of its choice in good time prior to appointing any selected Subcontractor. In accordance with GCC Sub-Clause 19.1, the Contractor is free to submit proposals for Subcontractors for additional items from time to time. No Subcontracts shall be placed with any such Subcontractors for additional items until the Subcontractors have been approved in writing by the Employer and their names have been added to this list of Approved Subcontractors.

Major Items of Plant and Installation Services	Approved Subcontractors/Manufacturers	Nationality

Appendix 6. Scope of Works and Supply by the Employer

The following personnel, facilities, works and supplies will be provided/supplied by the Employer, and the provisions of GCC Clauses 10, 21 and 24 shall apply as appropriate.

All personnel, facilities, works and supplies will be provided by the Employer in good time so as not to delay the performance of the Contractor, in accordance with the approved Time Schedule and Program of Performance pursuant to GCC Sub-Clause 18.2.

Unless otherwise indicated, all personnel, facilities, works and supplies will be provided free of charge to the Contractor.

<u>Personnel</u>	<u>Charge to Contractor (if any)</u>

<u>Facilities</u>	<u>Charge to Contractor (if any)</u>

<u>Works</u>	<u>Charge to Contractor (if any)</u>

<u>Supplies</u>	<u>Charge to Contractor (if any)</u>

Appendix 7. List of Documents for Approval or Review

Pursuant to GCC Sub-Clause 20.3.1, the Contractor shall prepare, or cause its Subcontractor to prepare, and present to the Project Manager in accordance with the requirements of GCC Sub-Clause 18.2 (Program of Performance), the following documents for

A. Approval

1.

2.

3.

B. Review

1.

2.

3.

Appendix 8. Functional Guarantees

1. General

This Appendix sets out

- (a) the functional guarantees referred to in GCC Clause 28 (Functional Guarantees)
- (b) the preconditions to the validity of the functional guarantees, either in production and/or consumption, set forth below
- (c) the minimum level of the functional guarantees
- (d) the formula for calculation of liquidated damages for failure to attain the functional guarantees.
- (e) Part II (PG Test Procedure) of Annexure – A, Employer’s Requirements.

2. Preconditions

The Contractor gives the functional guarantees (specified herein) for the facilities, subject to the following preconditions being fully satisfied:

3. Functional Guarantees

Subject to compliance with the foregoing preconditions, the Contractor guarantees as follows:

3.1 Production Capacity

and/or

3.2 Raw Materials and Utilities Consumption

4. Failure in Guarantees and Liquidated Damages

4.1 Failure to Attain Guaranteed Production Capacity

If the production capacity of the facilities attained in the guarantee test, pursuant to GCC Sub-Clause 25.2, is less than the guaranteed figure specified in para. 3.1 above, but the actual production capacity attained in the guarantee test is not less than the minimum level specified in para. 4.3 below, and the Contractor elects to pay liquidated damages to the Employer in lieu of making changes, modifications and/or additions to the Facilities, pursuant to GCC Sub-Clause 28.3, then the Contractor shall pay liquidated damages at the rate of _____ for every complete one percent (1%) of the deficiency in the production capacity of the

Facilities, or at a proportionately reduced rate for any deficiency, or part thereof, of less than a complete one percent (1%).

4.2 Raw Materials and Utilities Consumption in Excess of Guaranteed Level

If the actual measured figure of specified raw materials and utilities consumed per unit (or their average total cost of consumption) exceeds the guaranteed figure specified in para. 3.2 above (or their specified average total cost of consumption), but the actual consumption attained in the guarantee test, pursuant to GCC Sub-Clause 25.2, is not more than the maximum level specified in para. 4.3 below, and the Contractor elects to pay liquidated damages to the Employer in lieu of making changes, modifications and/or additions to the Facilities pursuant to GCC Sub-Clause 28.3, then the Contractor shall pay liquidated damages at the rate of *[amount in the contract currency]* for every complete one percent (1%) of the excess consumption of the Facilities, or part thereof, of less than a complete one percent (1%).

4.3 Minimum Levels

Notwithstanding the provisions of this paragraph, if as a result of the guarantee test(s), the following minimum levels of performance guarantees (and consumption guarantees) are not attained by the Contractor, the Contractor shall at its own cost make good any deficiencies until the Facilities reach any of such minimum performance levels, pursuant to GCC Sub-Clause 28.2:

- (a) production capacity of the Facilities attained in the guarantee test: ninety-five percent (95%) of the guaranteed production capacity (the values offered by the Contractor in its Bid for functional guarantees represents 100%).

and/or

- (b) average total cost of consumption of all the raw materials and utilities of the Facilities: one hundred and five percent (105%) of the guaranteed figures (the figures offered by the Contractor in its Bid for functional guarantees represents 100%).

4.4 Limitation of Liability

Subject to para. 4.3 above, the Contractor's aggregate liability to pay liquidated damages for failure to attain the functional guarantees shall not exceed Ten percent (10 %) of the Contract price.

Performance Security Form– Bank Guarantee⁶

[Guarantor letterhead or SWIFT identifier code]

Date: _ *[Insert date of issue]*

PERFORMANCE GUARANTEE No.: ____ *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that _____ (hereinafter called “the Applicant”) has entered into Contract No. _____ dated _____ with the Beneficiary, for the execution of _____ (hereinafter called “the Contract”).

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Applicant, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of _____ (____)⁷, such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of the Beneficiary’s complying demand supported by the Beneficiary’s statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant is in breach of its obligation(s) under the Contract, without the Beneficiary needing to prove or to show grounds for your demand or the sum specified therein.

This guarantee shall be reduced by half upon receipt **of following upon prior consent of the Employer**

- (a) a copy of the Operational Acceptance Certificate; or
- (b) a registered letter from the Applicant (i) attaching a copy of its notice requesting issuance of the Operational Acceptance Certificate and (ii) stating that the Project Manager has failed to issue such Certificate within the time required or provide in writing justifiable reasons why such Certificate has not been issued, so that Operational Acceptance is deemed to have occurred.

This guarantee shall expire no later than the earlier of:⁸

⁶ The Employer should insert either the Bank Guarantee or the Conditional Guarantee.

- (a) twelve months after our receipt **of (a) above; or**
- (b) eighteen months after our receipt of:
 - (i) a copy of the Completion Certificate; or
- (c) the ____ day of ____, 2____.⁹

Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

[signature(s)]

Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.

Performance Security Form- Conditional Bank Guarantee

Not Applicable

Date: _____

Loan/Credit N°: _____

RFB N°: _____

To: _____

Dear Ladies and/or Gentlemen,

We refer to the Contract Agreement (“the Contract”) signed on [date] between you and _____ (“the Contractor”) concerning design, execution and completion of _____.

By this letter we, the undersigned, [name of Bank], a Bank (or company) organized under the laws of _____ and having its registered/principal office at _____, do hereby jointly and severally with the Contractor irrevocably guarantee payment owed to you by the Contractor, pursuant to the Contract, up to the sum of _____, equivalent to _____ percent (%) of the Contract Price until the date of the Operational Acceptance Certificate and thereafter up to a sum of _____, equivalent to _____ percent (%) of the Contract Price, until twelve (12) months after the date of Operational Acceptance, or eighteen (18) months after Completion of the Facilities, whichever comes first.

Where it is agreed between you and the Contractor that the Facilities are to be accepted in parts, and thus where there are separate Completion and Operational Acceptance Certificates for each part, this Letter of Guarantee shall be apportioned to the value of each such part and shall reduce or expire as provided above on or following Completion or Operational Acceptance of each part.

We shall only undertake to make payment under this Letter of Guarantee upon our receipt of a written demand signed by your duly authorized officer for a specified sum, where such demand sets out the reasons for your claim under this Letter of Guarantee and is accompanied by

- (a) a copy of the written notice sent by you to the Contractor before making the claim under this Guarantee, specifying the Contractor’s breach of contract and requesting the Contractor to remedy it
- (b) a letter signed by your duly authorized officer certifying that the Contractor has failed to remedy the default within the period allowed for remedial action
- (c) a copy of your written notice to the Contractor stating your intent to claim under this Letter of Guarantee because of the Contractor’s failure to remedy the default in accordance with the request referred to in para. (a) above.

Our liability under this Letter of Guarantee shall be to pay to you whichever is the lesser of the sum so requested or the amount then guaranteed hereunder in respect of any demand duly made hereunder prior to expiry of this Letter of Guarantee, without being entitled to inquire whether or not this payment is lawfully demanded.

This Letter of Guarantee shall be valid from the date of issue until the earlier of twelve (12) months after the date of Operational Acceptance or eighteen (18) months after the date of Completion of the Facilities or, where the Facilities are to be accepted in parts, twelve (12) months after the date of Operational Acceptance or eighteen (18) months after the date of Completion of the last part or [date], whichever comes first.

Except for the documents herein specified, no other documents or other action shall be required, notwithstanding any applicable law or regulation.

If the Defect Liability Period is extended with respect to any part of the Facilities in accordance with the Contract, you shall notify us, and the validity of this Letter of Guarantee shall be extended with respect to the percentage of the Contract Price stipulated in the notification until expiry of such extended Defect Liability Period.

Our liability under this Letter of Guarantee shall become null and void immediately upon its expiry, whether it is returned or not, and no claim may be made hereunder after such expiry or after the aggregate of the sums paid by us to you shall equal the sums guaranteed hereunder, whichever is the earlier.

All notices to be given hereunder shall be given by registered (airmail) post to the addressee at the address herein set out or as otherwise advised by and between the parties hereto.

We hereby agree that any part of the Contract may be amended, renewed, extended, modified, compromised, released or discharged by mutual agreement between you and the Contractor, and this security may be exchanged or surrendered without in any way impairing or affecting our liabilities hereunder without notice to us and without the necessity for any additional endorsement, consent or guarantee by us, provided, however, that the sum guaranteed shall not be increased or decreased.

No action, event or condition which by any applicable law should operate to discharge us from liability hereunder shall have any effect and we hereby waive any right we may have to apply such law, so that in all respects our liability hereunder shall be irrevocable and, except as stated herein, unconditional in all respects.

Yours truly,

Authorized Signature

Advance Payment Security

Demand Guarantee

[Guarantor letterhead or SWIFT identifier code]

Beneficiary: *Name and Address of Employer*

Date: *[Insert date of issue]*

Advance Payment Guarantee No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

.....
We have been informed that (hereinafter called “the Applicant”) has entered into Contract No. dated with the Beneficiary, for the execution of, ... (hereinafter called “the Contract”).

Furthermore, we understand that, according to the Conditions of the Contract, an advance payment in the sum (.....) is to be made against an advance payment guarantee.

At the request of the Applicant, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of . (.....) ¹⁰ upon receipt by us of the Beneficiary’s complying demand supported by the Beneficiary’s statement whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating either that the applicant:

- (a) has used the advance payment for purposes other than the costs of mobilization in respect of the Facilities; or
- (b) has failed to repay the advance payment in accordance with the Contract conditions, specifying the amount which the Applicant has failed to repay.

A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Beneficiary’s bank stating that the advance payment referred to above has been credited to the Applicant on its account number _____ at _____.

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Applicant as indicated in copies of interim statements or payment certificates which shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of documentation indicating full repayment by the Applicant of the amount of the advance payment, or on the . . . day of ¹¹, whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

_____ [signature(s)]

Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.

BESS SUBCONTRACTING AGREEMENT

(To be executed within 03 months of signing of CA)

THIS AGREEMENT made on this.....day of.....BETWEEN, a company registered under, having its registered office at..... (hereinafter referred to as “A”) of the one part AND....., a firm/Company registered under/ having its principal place of business at.....(hereinafter called “B”) of the other part.

WHEREAS “A” is engaged in the business of setting up on Design, Supply & Installation basis and has considerable engineering know-how and technical information and equipment regarding said Projects with its Equipment , is keenly interested to participate in competitive bid invited by Solar Energy Corporation of India, for the Design, Engineering, Supply, Construction, Erection, Testing & Commissioning of 160 MW Solar-Wind Hybrid Power Plant with BESS including 10 Years Plant O&M at under International competitive bidding.

AND WHEREAS “A” in addition to MW Generator is desirous of setting up MWh energy storage system requirements, in Collaboration with manufacturers of such Battery Energy Storage System suppliers, of proven credentials suitable for the Technical requirements for the specific ambient conditions of RfB (refer SECI RfB No RfB No. SECI/C&P/RfB/2018/160MWH/WB/01) which are annexed herewith.

AND Whereas ‘B’ having the requisite wherewithal, technical knowhow and past experience of execution of such MWh BESS and operating in such ambient conditions, have expressed their interested to participate and contribute to the Project in a subcontracting manner with A’.

All the Parties concerned have noted and understood that though there are two (02) independent systems of & Battery Energy Storage system and each is required to function satisfactorily as per their design requirements, all are also required to function

satisfactorily as a composite system of the composite Project. To ensure this, all the parties have agreed to not only keep their portion of the system in optimum working condition but have agreed to coordinate and cooperate with other system suppliers so that the combined plant facility as a whole is executed and operates to its true potential.

NOW THEREFORE IT IS AGREED between the parties that:

1. Know how” means and includes all inventions, processes, patents, engineering and manufacturing skill and other technical information whether patent or patentable or not which are presently owned by “B” or which may be so owned, during the term of this agreement including without limitation regarding**MWh BESS** :

- Technical and engineering data, calculations and information.
- Design data, calculations and information.
- Details of layout of works, civil foundations, Electrical, Mechanical, Control & Instrumentation details & including details and specification of machinery
- All other forms of recovered information, technique and design in making of jigs, tools, dies, patterns and moulds.

2.

a. “B” shall fully and promptly furnish “A” with drawings, schemes, brochures, maintenance manuals literature for its BESS and its complete system for the required capacity power generation for the project, and its transmission, for approval of the Employer as may be required to meet the project schedule and such “know-how” as “A” may require from time to time during the term of this agreement in connection with the equipment & system of the Project..

b. “B” will supply fully and promptly its BESS as approved by Employer, along with all its systems and subsystems, equipment, cables, tools, tackles, consumables and spares to meet the requirement of the project completion schedule and depute

Engineers, and technicians at the expense of “A” to help set up, establish and operate the BESS for the duration of the agreement as per requirement of the

SECI referred RfB at the designed output and also to train A's technicians in its work in.....at expense of "A".

3. In consideration of "B" having agreed to work as a subcontractor in the Project and supply to "A" the latest PRODUCTS of BESS and other processes and having further agreed to supply spares for the entire duration of the project, technical advice and required Engineers.
4. "A" shall maintain secrecy at all time during this agreement of all the know-how, drawings and the like disclosed by "B" to "A" and/or pursuant to the terms herein or about which "A" learns during the performance of this agreement.
5. This subcontracting agreement shall become effective after it has been duly approved and signed by "A" and "B" and the approval of the Employer has been obtained thereto (if necessary).
6. This agreement shall remain effective for a period of..... years (period should not be less than the Construction and O&M period of the Project as specified in RfB) from the date of signing the agreement and shall be irrevocable by either of the parties to the agreement, unless rendered null and void by any government instrumentality.
7. This agreement shall be binding upon and ensure to the benefit of the successors and assigns of the respective parties hereto, and the obligations hereunder shall not be assignable by either party without written consent being first obtained from the other as well as Employer.
8. This agreement embodies entire understanding of the parties as to its subject matter, and it shall not be amended except in writing executed by both parties to the agreement with the consent of Employer.
9. Either party may by notice in writing to the other terminate this agreement in the event of :
 - a. Judicial proceedings for bankruptcy, composition with creditors, sequestration of assets for creditors, or receivership instituted by or against such other party, insolvency of such other party or its failure to meet its obligations as they mature for any material period of time.
 - b. Liquidation , compulsory or voluntary of such other party except in connection with an amalgamation, reconstruction, merger, consolidation, re-organisation or disposition of assets as a going concern voluntarily undertaken and with a view to the

continuance of the business by the transferee thereof, provided, however, that upon such event the business entity continuing the business formerly carried on by such other party shall, in an appropriate instrument delivered to the other party to this agreement, undertake to perform all of the obligations of such other party hereunder.

10. Neither party shall be in default under this agreement by reason of its failure or delay in the performance of its obligations if such failure or delay is caused by acts of God, Government laws and regulations, strikes, lock-outs, war or any other cause beyond its control and without its fault or negligence.
11. All disputes, questions, or differences, etc., arising in connection with this agreement shall be referred to a single arbitrator in India in case parties agree upon one, otherwise two arbitrators in India are to be appointed by each party in accordance with and subject to the provision of the Arbitration & Conciliation Act, 1996, or any other enactment or statutory modification thereof for the time being in force.
12. Notices and other communications under the agreement shall be in writing, or by established cable, radio or facsimile service, addressed as indicated in the description of parties above or as either party may request in writing, and the effective date of each is the date of its repaid deposit in the mail for dispatch by air or such service properly addressed.
13. The agreement should be construed in accordance with and be governed by the laws of India.

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the date first above written.

For “B”

.....

For “A”

.....

Note: The above format provides for minimum and a skeletal scope of subcontracting between A and B for the purpose of the RfB. However the parties will be at liberty to further enlarge their scope or incorporate details of the scope of subcontracting envisaged between themselves

and suitable for Work concerned, provided the same are in conformity with the scope and essence of the Work as laid down in the Section VII of the Bidding document.

Operations and Maintenance Contract

“ Scope of work, Service Level Agreement and special payment terms for 10 Years Plant Operation & Maintenance of 160 MW Solar-Wind Hybrid Power Plant with BESS at Ramagiri, Andhra Pradesh”

as

Annexure C

“Part of Operations and Maintenance Agreement For 160 MW Hybrid Plant”

EMPLOYER'S REQUIREMENT

Annexure – A

PART I

**Pre-dispatch Inspection Protocol for Crystalline PV Modules by
Employer or Employer Deputed Agency**



SOLAR ENERGY CORPORATION OF INDIA

(A Government of India Enterprise)

1st floor, Wing A, Prius Platinum Building, D – 3,

District Centre, Saket, New Delhi – 17

Tel: 011 – 71989200, Fax: 011 – 71989241

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Pre-dispatch inspection procedure

1. Objective:

The objective of this document is to establish General inspection protocol with objectivity for verification of Quality Parameters of Solar Modules by the customer (or its authorised inspection agency) prior to dispatch. The decision rules and procedure specified herein seek to uphold quality standards based on industry best practices and technical specifications laid out in tender documents as well as to control risks associated with item procurement.

2. Standard:

Sampling for determining Acceptance Quality Level (AQL) shall follow ISO2859-1:1999.

3. Definitions:

1. Lot: All products/items manufactured in one batch.
Notwithstanding the aforementioned definition, the customer or authorized inspection agency can lay down alternate/additional criteria for determining a lot.
2. Major Defect: A defect that reduces the usability or causes the product to fail to fulfil its nominal characteristic function.
3. Minor Defect: A defect that does not reduce the usability of the product, but does not meet the quality standard.

4. Inspection Schedule:

Customer representative shall propose the schedule for Pre despatch Inspection of Finished Goods to the Customer well in advance, and in no case less than 3 working days prior to commencement of Inspection at a location within India and 7 days in case of a foreign country.

5. Scope of Inspection:

Supplier representative will accompany the Inspector while doing the inspection which shall typically consist of 2 steps for clearance of each Lot:

BOM verification: To be conducted prior to the commencement of production.

The details of materials used will be verified from the ERP/Manufacturing data and corroborated with the Construction Data Form (CDF). This shall include verification of following:

Item	Method of Verification
Shelf life of the following BOM items: - EVA - PV Module Back sheet - Sealant and potting material (Silicone)	1. Verify the expiry date/shelf life and storage conditions <i>The PV Module manufacturer shall submit all required information to prove that materials being used are within their shelf life.</i>

Note: Supplier shall provide the necessary documents for approval of BOM as per IEC standards and tender Technical Specifications.

Witness Tests:

Manufacturer shall assist the Inspecting agency to witness following checks, the details of which are provided elsewhere in this document:

- I. Flash test- As per sampling Plan
- II. Visual Inspection- As per sampling Plan
- III. EL Inspection-As per Sampling Plan
- IV. Electrical Characteristics (Other than Flash Test)- As per Sampling Plan

Note: The Supplier shall furnish soft and hard copy of the Production Quality Plan prior to commencement of the Inspection.

6. Sampling Process:

- a. Supplier shall provide the list of modules in a lot ready for despatch, along with flash test data (Measured Electrical Data, P_{max}) prior to commencement of Inspection tests.

Note: Smallest lot size for Inspection: 20% of the capacity as per the PO.

- b. Supplier will arrange to move the PV Modules from FG to Inspection area.
- c. Same samples shall be used for all Witness Tests stated at 5.2 above.
- d. Inspector shall commence Inspection process by randomly selecting samples from the list of serial nos. (pallet-wise) provided by Supplier as per ISO 2859: Single Sampling Plan for Normal Inspection, General Inspection plan level-II. However, the Inspector shall reserve the right to switch to tightened or reduced level of Inspection as per the lot quality.

7. Decision Rules for Acceptance/Rejection

Following is a summary of Decision Rules for Acceptance/Rejection of a given Sample in a lot offered for Inspection:

Table 1: AQL Levels

Defect Type	AQL (%)
Major (Ma)	2.5
Minor (Mi)	4

Table 2: Inspection Levels

Inspection steps	Inspection item	Inspection level
1.	Flash Test	General inspection level I
2.	Visual	General inspection level I
3.	EL	General inspection level I
4.	EC (Other than Flash Test)	10 Nos. per lot

8. Inspection Process

a. Electrical Inspection – Flash Tests

For Electrical inspection following preparation will be done:

- Module Temp Stabilisation : Modules will be kept in controlled environmental condition till it reaches $25 \pm 2^\circ\text{C}$
- Calibration of Sun-simulator: Sun-simulator will be calibrated as per Calibration Reference .Reference should calibrated against Calibration Reference tested from reputed testing lab TUV / Fraunhofer etc. Testing of modules will be done at STC condition, AM=1.5

Note:

- All modules selected for sampling inspection will be re-tested in the sun-simulator. A $P_{\max}$ retest (repeatability test) variation of $\pm 2\%$ on actual flash $P_{\max}$ value will be acceptable.
- The Supplier shall provide a valid calibration certificate of the apparatus used.

b. Visual Inspection:

- Customer representative will verify the module visual characteristics as per the Visual Acceptance norms.
- The Visual Inspection shall be carried out in a well-lit room. It shall be the responsibility of the Supplier to ensure adequate brightness in the room.

c. Electroluminescence (EL) Inspection:

- The EL image shall have sufficient resolution for analysis of defects.

- Hi-pot test shall be done as per IEC procedure. The Supplier shall provide a valid calibration certificate of the apparatus used.

9. Re-inspection and review

In case of minor non-conformities like cleaning issues, label mismatch, etc. which can be easily reworked, Supplier shall rework/replace the modules and offer them for re-inspection to Inspector.

10. Inspection Summary:

Once the inspection is completed Customer Representative will compile his Inspection Summary Report and share with Supplier and give necessary recommendation on despatch depending upon the audit findings based on the observations made. This report shall be provided within same day of inspection (Format Attached).

11. Disclaimer:

Inspection by SECI/ Employer does not absolve the responsibility of the Supplier/vendor to ensure quality during production of the material and its transport to site. Any damages during transport/ handling shall be replaced before erection at site as directed by Engineer-in-charge without any extra cost to the purchaser.

Sampling Plan

(Sampling Plan as Per ISO 2859) -1

Table 1 - Sample size code letters (see 10.1 and 10.2)

Lot size	Special inspection levels				General inspection levels		
	S-1	S-2	S-3	S-4	I	II	III
2 to 8	A	A	A	A	A	A	B
9 to 15	A	A	A	A	A	B	C
16 to 25	A	A	B	B	B	C	D
26 to 50	A	B	B	C	C	D	E
51 to 90	B	B	C	C	C	E	F
91 to 150	B	B	C	D	D	F	G
151 to 280	B	C	D	E	E	G	H
281 to 500	B	C	D	E	F	H	J
501 to 1 200	C	C	E	F	G	J	K
1 201 to 3 200	C	D	E	G	H	K	L
3 201 to 10 000	C	D	F	G	J	L	M
10 001 to 35 000	C	D	F	H	K	M	N
35 001 to 150 000	D	E	G	J	L	N	P
150 001 to 500 000	D	E	G	J	M	P	Q
500 001 and over	D	E	H	K	N	Q	R

(Sampling Plan as Per ISO 2859) – 2 – Normal, Tightened and Reduced)

Table 2-A — Single sampling plans for normal inspection (Master table)

Acceptance quality limit, AQL, in percent nonconforming items and nonconformities per 100 items (normal inspection)																											
Sample size code letter	Sample size																										
	0,010	0,015	0,025	0,040	0,065	0,10	0,15	0,25	0,40	0,65	1,0	1,5	2,5	4,0	6,5	10	15	25	40	65	100	150	250	400	650	1 000	
A	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
B	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
C	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
D	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
E	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
F	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
G	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
H	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
J	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
K	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
L	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
M	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
N	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
P	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
Q	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	
R	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	

↘ = Use the first sampling plan below the arrow. If sample size equals, or exceeds, lot size, carry out 100 % inspection.

↗ = Use the first sampling plan above the arrow.

Ac = Acceptance number

Re = Rejection number

Table 2-B — Single sampling plans for tightened inspection (Master table)

Sample size code letter	Acceptance quality limit, AQL, in percent nonconforming items and nonconformities per 100 items (tightened inspection)																				
	0,010	0,015	0,025	0,040	0,065	1,0	1,5	2,5	4,0	6,5	10	15	25	40	65	100	150	250	400	650	1 000
	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
A	↓	↓	↓	↓	↓	↓	↓	↓	↓	↗	0 1	↓	↗	1 2	2 3	3 4	5 6	8 9	12 13	18 19	27 28
B	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↓	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	27 28	41 42
C	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↓	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	27 28	41 42	↓
D	↓	↓	↓	↓	↓	↓	↓	0 1	↓	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	27 28	41 42	↓	↓
E	↓	↓	↓	↓	↓	↓	0 1	↓	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	27 28	41 42	↓	↓	↓
F	↓	↓	↓	↓	↓	0 1	↓	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↓	↓	↓	↓	↓	↓
G	↓	↓	↓	↓	0 1	↓	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↓	↓	↓	↓	↓	↓	↓
H	↓	↓	↓	0 1	↓	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↓	↓	↓	↓	↓	↓	↓	↓
J	↓	↓	↓	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
K	↓	↓	↓	↓	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↓	↓	↓	↓	↓	↓	↓	↓	↓
L	↓	↓	↓	↓	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↓	↓	↓	↓	↓	↓	↓	↓	↓
M	↓	↓	↓	↓	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↓	↓	↓	↓	↓	↓	↓	↓	↓
N	↓	↓	↓	0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↓	↓	↓	↓	↓	↓	↓	↓	↓
P	↓	↓	↓	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Q	↓	↓	↓	↓	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↓	↓	↓	↓	↓	↓	↓	↓	↓
R	0 1	↔	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
S	1 2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

↗ = Use the first sampling plan below the arrow. If sample size equals, or exceeds, lot size, carry out 100 % inspection.

↖ = Use the first sampling plan above the arrow.

Ac = Acceptance number

Re = Rejection number

Table 2-C — Single sampling plans for reduced inspection (Master table)

Sample size code letter	Sample size	Acceptance quality limit, AQL, in percent nonconforming items and nonconformities per 100 items (reduced inspection)																									
		0,010	0,015	0,025	0,040	0,065	1,0	1,5	2,5	4,0	6,5	10	15	25	40	65	100	150	250	400	650	1 000					
		Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re				
A	2	↓	↓	↓	↓	↓	↓	↓	↗	↗	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					
B	2	↓	↓	↓	↓	↓	↓	↓	0 1	↖	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					
C	2	↓	↓	↓	↓	↓	↓	↓	0 1	↗	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					
D	3	↓	↓	↓	↓	↓	↓	0 1	↗	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					
E	5	↓	↓	↓	↓	↓	0 1	↖	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					
F	8	↓	↓	↓	↓	0 1	↖	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					
G	13	↓	↓	↓	0 1	↖	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					
H	20	↓	↓	0 1	↖	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					
J	32	↓	↓	0 1	↖	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					
K	50	↓	0 1	↖	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					
L	80	↓	0 1	↖	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					
M	125	↓	0 1	↖	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					
N	200	↓	0 1	↖	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					
P	315	↓	0 1	↖	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					
Q	500	↓	0 1	↖	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					
R	800	↕	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓					

↘ = Use the first sampling plan below the arrow. If sample size equals, or exceeds, lot size, carry out 100 % inspection.

↗ = Use the first sampling plan above the arrow.

Ac = Acceptance number

Re = Rejection number

Customer inspection Report

CUSTOMER INSPECTION REPORT			
Ref. No. & Date:			
Client:	PMC: SECI	EPC Contractor: PO Ref. No.:	
Place of Inspection:	Date of inspection:	Lot Size	Sample Quantity
Problem Quantity: Detail: Inspection Result (OK/Not OK):			
Visual Inspection Problem Quantity: Detail:			
Flash Test Problem Quantity: Detail:			
EL Inspection: Problem Quantity: Detail:			
EC Inspection (Hipot,DC Continuity,IR): Problem Quantity: Detail:			
Any Other Criteria/Remarks:			
Is the shipment qualified to be released? ☐ Yes ☐ No			
From Client	From EPC Contractor	Solar Energy Corporation of India Limited	

Enclosed: Test Details, Flash Test Report, EL test (images- soft copy), EC Test Report

Disclaimer: This Inspection by SECI/ Employer does not absolve the responsibility of the vendor to ensure quality during production of the material and its transport to site. Any damages during transport/ handling shall be replaced before erection at site as directed by Engineer-in-charge without any extra cost to the purchaser.

Details:

Lot :				Date
S.No.	Defect	Module Id	Type (Ma/Mi)	Details
1				
2				
....				



EMPLOYER'S REQUIREMENT

Annexure – A

PART II

PG Test Procedure

SOLAR ENERGY CORPORATION OF INDIA LIMITED

(A Government of India Enterprise)

1st floor, Wing A, Prius Platinum Building, D – 3, District Centre, Saket, New Delhi – 17

Tel: 011 – 71989200, Fax: 011 – 71989241

PERFORMANCE GUARANTEE TEST PROCEDURE

Project: 160 MW Solar Wind Hybrid Project with BESS

Employer: Solar Energy Corporation of India Limited

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1 INTRODUCTION

This document lays down the procedures and requirements for conducting Functional Guarantee tests including scope of the tests, procedures for the tests, reporting formats and process for determining test results in accordance with the Tender Specifications, applicable standards and industry best practices.

2 FUNCTIONAL GUARANTEE TESTS FOR SOLAR PV PLANT

Functional Guarantee for Solar PV Plant shall comprise of following Guarantees:

- (1) Performance Ratio Guarantee test for provisional acceptance.
- (2) Annual Generation Guarantee up to a period of 10 years (O&M Period), starting from the date of Provisional Acceptance.

2.1 PERFORMANCE RATIO TEST

A Performance Ratio Guarantee test shall be commenced within 60 days of the commissioning of Plant Facilities to demonstrate that the plant has achieved the Guaranteed Performance Ratio in line with requirements under section VII of the bidding document. This will be one of the pre-conditions for the Plant Operational Acceptance. Performance Ratio (PR) test period would be continuous measurement of 30 consecutive days. The test shall be conducted in accordance with the IEC-61724 as per the methodology described in Technical Specifications under section VII of the bidding document. The procedure of PR test is described further in Section 2.4. The report shall contain all the measured energy and Met data values, calculations, results and conclusions.

2.1.1 Performance Ratio

The Performance Ratio (PR) of the PV Plant is calculated as follows (according to IEC 61724 Ed.2).

$$PR = \frac{E_{out}}{\sum_k \left(\frac{(C_k \times P_o) \times (G_{i,k} \times \tau_k)}{G_{i,ref}} \right)}$$

where

PR Temperature Corrected Performance Ratio

E_{out} Cumulative AC energy measured at the plant end ABT meter over the duration of reporting period (kWh)

τ_k Duration of the k^{th} recording interval, i.e. (1/60) hour

$\sum_k$ Summation over all recording intervals in the reporting period, (1/4) hour

C_k Power rating temperature adjustment factor and can be calculated as below

$$C_k = 1 + \gamma \times (T_{avg\_mod,k} - T_{ref})$$

γ Temperature coefficient of power with negative sign ($^{\circ}C^{-1}$)

$T_{avg\_mod,k}$ Average PV Module temperature measured at the commencement of time interval ' τ_k ' ($^{\circ}C$)

T_{ref} PV Module temperature at which P_o is determined, i.e. $25^{\circ}C$

P_o Installed nominal peak power of PV modules, i.e. Nameplate rating at STC (kW_p)

$G_{i,k}$ Average irradiance measured at the Plane of Array (POA) at the commencement of time interval τ_k (kW/m^2)

$G_{i,ref}$ Irradiance value at which P_o is determined, i.e. 1 kW/m²

2.1.2 General Requirements

- The Functional Guarantee shall comprise of a set of visual/mechanical/Electrical checks followed by a Performance Ratio (PR) test of the Plant Facilities.
- The PR test shall be carried out for a period of 30 consecutive days at site by the Contractor in presence of the Employer/ Employer's Representative/ Owner's Engineer.
- These tests shall be binding on both the parties to the contract to determine compliance of the equipment with the guaranteed performance parameters.
- The test will consist of guaranteeing the correct operation of the Plant Facilities, by way of the performance ratio based on the reading of the energy produced and delivered to the grid at the plant end ABT meter and the Plane of Array incident solar radiation.
- PR is calculated as per the formula given in Clause no. 2.1 and recorded as per the format provided at **Annexure A Part I**.
- All the end of each day, the filled-in format shall be signed by both the parties (EPC Contractor and SECI) and each party will keep one copy for record. **The same will continue for 30 consecutive days.**
- The Functional Guarantee condition for the purpose of Provisional Acceptance of Part 1 of the Plant Facilities shall be considered to have been met if the guaranteed Performance Ratio (PR) is achieved on a daily basis for 30 consecutive days.
- During this PR test, equipment failure/interruption of any kind, except for SCADA communication failures, will not be accountable. In case of a breakdown, the test may be resumed once the complete system is rectified and working properly.

2.1.3 Pre-PR Test

2.1.3.1 The EPC Contractor shall perform start-up tests after successful completion of visual inspection and functional testing. Such testing shall be conducted under the SECI's / Owner's Engineers supervision. The test results shall be recorded as part of a signed-off commissioning record.

2.1.3.2 Preliminary Test Check

The preliminary checks include all the warranty certificates for the major equipment, pre – commissioning test reports, field quality checklists verified through the FQP documents of all equipment and works along with the calibration reports of all the instruments and sensors, wherever applicable.

2.1.3.3 Visual /Mechanical Test

Visual checks shall be done on all the components that form part of the plant including the grid connection equipment in compliance with the field quality plans. The following critical elements as a minimum shall be subjected to visual inspection:

- Module mounting structure and foundations.

- PV module and DC installation.
- Inverters.
- Transformers.
- Switchgear.
- Lightning protection systems.
- Earthing protection systems.
- Electrical protection systems, junction boxes and cabling.
- Grid connection compliance protection and disconnection systems.
- Monitoring systems (including meteorological sensors).

2.1.3.4 Electrical Tests

Subsequent to mechanical completion and visual testing of the plants, following functional electrical tests shall be performed. These tests also referred as start-ups tests shall be the first step for PG guarantee of the plant. These tests shall essentially include:

2.1.3.5 Open circuit voltage (V_{oc}) test.

This test verifies that strings are properly connected (module and string polarity) and that all modules are producing the expected voltage according to the module data sheet. To measure V_{oc} , the following procedure shall be used:

- (a) DC string combiner box is opened; fuses leading to the sub main junction box are removed.
- (b) The voltage is measured with a calibrated, industry accepted instrument from the negative bus bar to the string positive lead.

2.1.3.6 Functional Guarantee Test shall commence immediately after all issues arising from the functional/ start-up test have been rectified.

Note:

- (a) All measurement(s) procedure should be carried out taking proper safety precaution.
- (b) Also it should be ensured that to avoid any loose connection at the terminal points for which measurement procedure is conducted.
- (c) Ensure proper functioning (e.g. Multimeters shall be calibrated) of all measuring instruments before conducting above measurement procedure.
- (d) The above test procedure shall be conducted in presence of site in-charge.

2.1.4 PR Test Procedure

The date of commencement of the PR Test shall be communicated in advance and agreed upon by both parties i.e. SECI and EPC Contractor. Any consecutive 30 days period (excluding interruptions that last entire day on account of grid outage or as per hindrance record maintained at site only) for the purpose of conducting PR test shall be mutually discussed and agreed between SECI and EPC Contractor. It shall comprise of the following procedures.

2.1.4.1 Pre-test Procedure

- (1) Before the commencement of Performance Ratio (PR) test, the plant shall have achieved visual/mechanical/Electrical completion as per Clause 2.3 above and SCADA system and WMS shall be fully commissioned and functional.
- (2) Trial Run: The PG Test for Plant Facilities shall commence with a trial run for 7 consecutive days. The EPC Contractor shall provide the data in requisite formats (specified elsewhere in the document) to SECI. SECI shall vet the data for any discrepancies and systemic errors and revert within 3 working days. Post the trial run period, the 30 days PR test will commence after communication from SECI in this regard.
- (3) Pyranometer Tilt Angle & Cleanness: The pyranometers & Tilt Angle shall be verified before the test commences and **then visually inspected at regular intervals for cleanliness during the tests.**
- (4) The average of all the Pyranometers (GTI) shall be considered for the calculation of PR. The average of module temperatures recorded by all the temperature sensors shall be used for calculation of PR. The Pyranometers and Temperature sensors used for the purpose of the PR Test shall have valid calibration certificates.

2.1.4.2 Following the completion of the pre-test procedures, Performance Ratio Test of plant shall commence in accordance with the procedures, conditions and requirements provided in the next section.

2.1.4.3 General Procedure for the PR Test

The PR Test Procedure shall include the following components:

- (1) Data Collection: PV Power Plant test related parameters are collected in one-minute and 15 intervals for the 30 (Thirty) days (consecutive) reference period. The data shall consist of the following at a minimum:
 - Irradiance at Collector's (i.e. PV Module) POA; (Source: SCADA, Temporal Resolution: 1 minute)
 - Other Met Data received from installed WMS; (Source: SCADA, Temporal Resolution: 1 minute)
 - Energy generated at Plant (kWh) (Source: Plant MFM Meter from SCADA, Temporal Resolution: 1 minute)
 - Energy injected into grid (kWh) (Source: Plant ABT Meter at GSS/injection point, Temporal Resolution: 15 minute)
 - PV Module Temperature recorded from the temperature Sensors (°C) (Source: SCADA, Temporal Resolution: 1 minute)
- (2) **Data Filtering:** The data shall be filtered so that the data set is free of nuisance data points and bad data that exhibit a high degree of error (such as errors caused by faulty instrumentation). The EPC Contractor shall document data which is to be eliminated along with reasons. The following criteria shall be excluded from the dataset used for this test:
 - **Nuisance or bad data** – Nuisance data points or bad data that clearly exhibit a high degree

of error including required meteorological measurement equipment that is identified as being out of calibration or requiring adjustment. A 15-minute time-block shall be *explicitly* flagged through a flag parameter on account of this factor after recording reasons thereof (**Note:** no filtration shall be done at site level). The same shall be corroborated/verified by SECI.

- Time blocks with insufficient (less than equal to 10) 1-minute records.
- **Grid Interruptions** – Time periods (in 15-minute time blocks) of the grid interruptions at the utility substation, recorded manually jointly by EPC Contractor and SECI representatives shall be eliminated. Grid outage period, if any, shall be verified from SCADA.
- Any Force majeure conditions
- **Radiation Criteria** – Radiation on Plane of Array (POA) less than 200 W/m²
- Shutdown explicitly demanded by the Owner/DISCOM/STU.
- As per the hindrance record maintained at site.

Note: Minimum 24 Nos of 15-minute time blocks shall be considered to account the day for PR measurement. Otherwise the PR test shall be extended to another day.

2.1.5 Determination of PR Test

Daily PR shall be calculated as the average of the PR calculated for valid 15-minute time blocks (Refer Clause 2.1.4.3) for the 30-day duration. If the EPC Contractor is not able to demonstrate guaranteed PR during this period, the two more chances shall be given to demonstrate the same after incorporation of suitable corrective measures. In case the contractor fails to achieve guaranteed PR even after the two more chances, further action shall be taken as per the provisions of contract.

The test shall be repeated for 30 days in case of any outage of following equipment for more than 7 days.

- Power Transformer
- Power Conditioning Unit
- HT Switchgear Panel
- SCADA and data logger combined
- Tilted pyranometer
- Other WMS sensors.

2.1.6 Raw Data Formats and Reports

The EPC Contractor shall submit to SECI the raw data from the Plant SCADA on daily basis in the following format.

TEMPORAL RESOLUTION: 1 MINUTE

Date & Time dd/mm/yyyy hh:mm:ss format	Wind Speed (m/s)	Module Temp. (°C)	Ambient Temp. (°C)	Horizontal Irradiance (W/m ²)	POA Irradiance (W/m ²)	POA Radiation (kWh/m ²)	Humidity (%)	Wind Direction (°)	Generation (kWh) (Source: TVM)

TEMPORAL RESOLUTION: 15 MINUTE (EVERY 15TH MIN RECORD FROM THE 1 MIN DATA)

Date & Time Dd/mm/yyyy hh:mm:ss format	Wind Speed (m/s)	Module Temp. (° C)	Ambient Temp. (° C)	Horizontal Irradiance (W/m²)	POA Irradiance (W/m²)	POA Radiation (kWh/m²)	Humidity (%)	Wind Direction (°)	Generation (kWh) (Source: TVM)	Explicit Removal Flag* (0 or1)	Remarks

* Explicit Removal Flag: 0 indicates time block considered; 1 indicates time block not considered.

PR Test Report shall be generated from the Raw Data (Sample Report provided in the Annexure) after data filtering as per criteria laid out in **Error! Reference source not found.** The Report shall contain the signature of both representatives (SECI/Employer & EPC Contractor).

2.2 ANNUAL GENERATION GUARANTEE

The Contractor shall demonstrate minimum guaranteed annual generation from Part 1: Solar Plant of the Plant Facilities year-on-year as measured on the Energy metered at the 33kV incoming feeder(s) of the solar plant as per below table:

Year	Guaranteed Solar Energy generation (KWh)
1	231264000
2	229645152
3	228037636
4	226441372
5	224856283
6	223282289
7	221719313
8	220167278
9	218626107
10	217095724
Total Generation	<u>2,241,135,154</u>

2.3 LIQUIDATED DAMAGES**2.3.1 Performance Ratio**

Any shortfall in the Performance Ratio (PR) as determined through the PR Test shall attract imposition of penalty. For every 0.01 shortfall in PR below 0.78 by the Contractor, a penalty of 0.5% of the Solar Plant Contract Value (i.e., total sum of all the Supply, Service Contract and absolute value of O & M Contract) shall be levied. In case, the Plant PR result is 0.05 below 0.78, i.e., 0.73 or lower, the total Contract Performance Security submitted by the Contractor will be forfeited. In case, the Contract Performance Security has already been encashed on account of delays, the due amount will be recovered from the remaining Instalments of the payable at the end of the first year (as per the Terms and procedures of payments) If the Contractor fails to achieve the Annual CUF Guarantee at the end of such respective year,

then the Contractor will pay compensation to Owner for an amount equal to the revenue loss @ Tariff rate as per PPA, for the difference of energy corresponding to the Annual Guaranteed CUF and the actual energy for the respective year.

2.3.2 Annual Generation Guarantee

- i. If the Contractor fails to achieve the Annual CUF Guarantee at the end of such respective year, then the Contractor will pay compensation to Owner for an amount equal to the revenue loss @ Tariff rate as per PPA, for the difference of energy corresponding to the Annual Guaranteed CUF and the actual energy for the respective year.
- ii. If the Contractor fails to achieve the Annual CUF Guarantee at the end of 10th year, then the Contractor will pay compensation to Owner for an amount equal to the Net Present Value (NPV) of the revenue loss for 10th to 25th year calculated as below:
 - a. % CUF drop i.e. $[(\text{Guaranteed CUF of 10th year} - \text{Actual CUF of 10th year}) / \text{Guaranteed CUF of 10th year}]$ in the 10th year shall be considered as the representative CUF drop in each subsequent years starting from 11th to 25th year.
 - b. Actual estimated revenue loss @ Tariff rate of PPA for each subsequent year will be calculated based on % CUF drop multiplied by the respective year estimated CUF.
 - c. The Net Present Value (NPV) of the revenue loss for 10th to 25th year will be considered as the LD payable by the Contractor.
 - d. Discounting Rate for NPV calculation is considered as 9.08%
- iii. In case the Project fails to generate any power continuously for 1 month any time during the O&M period, apart from the force majeure and grid outages as certified by competent authority from STU/CTU, it shall be considered as “an event of default”. In the case of default the entire Contract Performance Security will be forfeited.
- iv. Penalty during O&M period against breakdown of other Infrastructure of Solar Power Plant which doesn't affect the generation of power, directly such as but not limited to civil infrastructure, water supply system/network, other Infrastructure developed by the Contractor as a Scope of Work for the Project shall be penalised @ Rs.1000/day, per incident of breakdown reported beyond 48 Hours of such reporting. Cumulative value of such penalty shall be limited to 50% of yearly O&M cost.

3 FUNCTIONAL GUARANTEE TESTS FOR WIND PLANT

3.1 POWER CURVE GUARANTEE TEST PROCEDURE

The Power Curve Guarantee Test shall be conducted for the Functional Guarantee Verification of the Wind Power Plant. The Test shall be conducted during first high wind season after completion of stabilization period of 60 days from the commissioning.

Test can be conducted by a mutually agreed and appointed MEASNET accredited Consultant for the Power Curve Verification of the Wind Turbines.

3.1.1 Location of Test site

One representative WTG among all the WTGs of the Project will be selected for the test. The turbine on which test is to be conducted shall be decided upon mutual consent between the Contractor, Owner and the third-party consultant. A Joint survey may be conducted by the Owner, the Contractor and the appointed Consultant for the identification of suitable WTGs of the Project for conducting the PCGT in accordance with the applicable standard and agreed procedure. The final recommendation on the selection of the turbine among the suitable turbines for PCGT must be given by the Owner.

In general, the Test site shall be free from flow distortion affected by other WTGs or obstacles in pre-dominant wind direction. The measurement sector shall be selected as per the conditions prescribed in IEC 61400-12-1: 2017.

3.1.2 Location of meteorological mast

Contractor shall install a wind mast at a distance between 2D-4D (D is rotor diameter of Test WTG) from the designated turbine in consultation with Owner and the Consultant. This mast shall record wind data for the test and shall be maintained at site for the period required for successful power curve testing. Erection of wind mast and onsite facilities/support for testing and monitoring shall be the responsibility of the Contractor.

All the sensors to be used shall have valid calibration certificate from a MEASNET accredited organization. Any sensor, though having validity period, if it is already used for any other prior test, such a sensor needs to be re-calibrated before using it for said test.

3.1.3 Test Equipment

All the test equipment and Instruments such as Wind mast with all measurement sensors, CT, PT, metering arrangement etc. shall be installed as per Annexure-A Part III of IEC-61400-12-1: 2017.

Metering arrangement CTs duly calibrated shall be provided at LCS.

Calibration certificate for the CTs, PTs and energy meter to be used for the testing should be provided in advance before conducting the test.

- Accuracy class of all the measuring equipment shall be 0.5 or better. Contractor shall furnish calibration certificates only from the accredited test house (accreditation certificate should be enclosed) for all measuring instruments before their installation at site.
- Calibration certificates of measuring equipment from the State Electricity Board/DISCOM will be acceptable.

The Contractor shall submit a detailed report on the Test Wind Mast Installation as well as the other equipments and instruments installed for the PCGT purpose along with all the drawings for reference and verification.

3.1.4 Test Period and Duration

The Test shall be conducted during first high wind season after completion of stabilization period of 60 days from the commissioning. The duration of the data measurement period shall be minimum 3 months and shall be continued till the time the desired completeness of the datasets as stipulated in the IEC standard is achieved.

3.1.5 Data Collection and Analysis

The data recorded at the test wind mast and the power output data recorded at the metering system installed at LCS shall be collected on daily/weekly basis and analyzed for its appropriateness, any error, adequacy and the data completeness to derive the measured power curve as per the IEC standard.

Database shall be considered complete when it has met following criteria

- Atleast 3 datasets (10-minute average, i.e. 30 minute data) for each wind speed bins shall be achieved as well as the peak wind speed conditions shall be achieved.
- Total duration of the measurement period (database) includes at-least a minimum of 180 hour of sampled data.
- Selected datasets shall cover at-least IEC wind speed bin ranges.
- The grid frequency, RPM, Blade pitch angles, nacelle wind speed and yaw angles shall have been recorded for all useful datasets.
- The datasets shall be received by the Owner from the Contractor and shall be verified by the Owner or the designated Power Curve Verification Consultant.

3.1.6 Measured Power Curve Calculation

The Measured Power Curve shall be calculated as per the procedure given in the IEC-61400-12-1 based on the reference measured wind speed distribution from the test mast and the site-specific air density calculated based on the measured data at the site during the test period.

The measured Power Curve shall be adjusted to the reference site air density in order to make it comparable to the contracted (warranted) power curve as per the air density correction methodology given in the standard.

All the uncertainties of calculation shall be based on the IEC-61400-12-1.

3.1.7 Verified Power Curve Performance Calculation

The Validation of the Power Curve Performance shall be based on the Estimated AEP from the measured Power Curve of the test WTG as per above given procedure and the Estimated AEP from the Warranted Power Curve, both at the reference site air density.

The AEP from both the measured Power Curve and the Warranted Power Curve at reference site air density shall be calculated based on a reference nominal wind speed distribution at the site. This could be the wind data from the reference wind mast installed by SECI at the Project site before start of the Project or any other mutually agreed wind speed distribution dataset.

The Theoretical annual energy production (AEP) based on the Measured Power Curve of the Wind Turbine and the nominal wind distribution is called as the Measured Power Output (MPO)

The Theoretical annual energy production (AEP) based on the Warranted Power Curve of the Wind Turbine and the nominal wind distribution is called as the Warranted Power Output (WPO)

Following formula shall be used for the calculation of Verified Power Curve Performance (VPC) of the WTG

$$VPC = MPO/WPO * 100\% \text{ in \% terms}$$

If VPC is greater than or equal to 98% then the Power Curve Guarantee Test is considered to be passed.

If the VPC is lesser than 98% then the Liquidated Damages as per the conditions given in SCC shall be applicable.

3.2 SHORT TERM PERFORMANCE TEST (STPT) PROCEDURE FOR WTG

- (a) The Short-Term Performance Test shall be conducted for each WTG of the Project within 60 days upon commissioning of the respective WTG. Before commencement of the test the Contractor shall inform to the Owner of its intention to conduct the test and the proposed start date for the test. Owner or its representative will have the right to witness the test.
- (b) On start of the test all the initial readings shall be recorded.
- (c) Test shall be conducted for 96 hours.
- (d) During the test the Wind Turbine shall achieve atleast 98% of Machine Availability.
- (e) If any turbine has not achieved the Machine Availability of 98% during the test period, then the test can be re-conducted for that specific wind turbine.
- (f) During the test period the Contractor shall ensure that all alarms are functioning properly.
- (g) During the test the reiterated turbines alarms of 3 times only can be allowed for remote restart. After that local reset has to be done with proper inspection and failure rectification.
- (h) If during the test the stoppage duration is more than 2 hours due to external causes like Grid drop, Force Majeure Conditions of Extreme Weather Conditions, the down hours which is above 2 hours will be extended from 96 hours test duration.
- (i) If stoppage duration is more than 24 hours due to causes mentioned above, then the test shall be repeated.
- (j) Upon passing of the Test for a WTG, the Owner may issue a **Certificate on STPT Completion** for that respective WTG within 3 business days.
- (k) If the Owner or its representative fails to either:
 - i. Issue the Certificate on STPT Completion for a WTG; or
 - ii. Issue a notice advising that the relevant WTG and associated equipment has not passed STPT in accordance with the test condition within 3 business days after receipt of Contractor's Notice of completion of the tests along with all results,

the STPT on that WTG will be deemed to have been achieved within 5 days of Contractor's notice.

3.2.1 Machine Availability

- Machine Availability includes the availability of WTG as well as the power evacuation system for Wind energy up to interface with the system of power utility; i.e. till Pooling Substation.
- Contractor shall maintain all WTGs so as to ensure at least/minimum Machine Availability as defined in the clauses hereunder and elsewhere in the bidding document.
- Contractor shall keep Six-month average minimum Machine Availability of not less than
 - (i) 98% during the high wind season i.e. May to October after Stabilization period, and
 - (ii) Minimum average wind farm availability of not less than 96% during low wind period i.e. during the months of November to April.

- (iii) In case Stabilization period falls during high wind season, the machine availability will be considered for the remaining high wind months for the first year.
- In case the Machine Availability is found less than as stated above then the Contractor pay LDs defined in the subsequent section of the bidding document.
- Formula for average Machine Availability Factor (MAF) for the wind farm shall be as follows:
Average MAF = (Sum of the MA calculated for each WTG) / (No. of WTGs installed at site)

$$MA = \frac{\{D - (GF + FM + S + U)\} \times 100}{\{D - (GF + FM)\}}$$

Where,

D is total number of hours for a machine in the applicable period,

GF is Grid Failure hours, For more clarification this includes the hours of grid failure beyond PSS interconnection point.

FM is Force Majeure hours,

S is Scheduled Maintenance hours,

U is Unscheduled or Forced Maintenance hours

- The Contractor must provide evidence for calculation of the Machine Availability. Machine Availability value or figure as such provided by the Contractor under the Daily Generation Report (DGR) or Monthly report shall not be accepted directly unless Contractor attach relevant proof for the values or calculation. Relevant arrangement for verification or validation or audit for the evaluation of MA must be provided by the Contractor to the Owner.

3.3 LIQUIDATED DAMAGES FOR PERFORMANCE SHORTFALL IN WIND PLANT

3.3.1 LD for Short Term Performance Test Failure

If the Contractor fails to satisfy the STPT of a WTG within 120 (one hundred and twenty) days from the Commissioning Date of the relevant WTG even after repeated tests, then Owner will have the right to reject the WTG and obtain a refund. Contractor will refund all amounts paid by Owner for that WTG along with interest cost (@13% (thirteen percent) per annum) from the date of payments made for WTG including Advance Payment. Further, Owner will pay to Contractor, an amount equivalent to 50% of the amounts received from Discom or as any other benefit against generation from the rejected WTG(s). Said rejected WTG shall not be considered for Availability calculation.

3.3.2 LD for Power Curve Warranty Failure

If the PCGT fails pursuant to procedure described above, the Contractor shall Pay compensation to Owner as per following:

In the event upon completion of the first Power Curve Guarantee test, if it is found that WTG is not meeting the Power Curve Guarantee, Contractor may opt to re-conduct the test at its own cost after

resolving the defect in the test WTG and such solution will be replicated on all the WTGs in the Project. If Contractor chooses to repeat PCGT in the next wind season at its own cost, then Contractor will compensate Owner for the shortfall in performance during the first year of operation at the PPA tariff rate for the estimated generation loss units due to such shortfall in the Power Curve Performance. If the 2nd PCGT also fails then the Contractor shall compensate to the Owner as per following

- a. Compensation to Owner of an amount equal to the estimated loss for the Project life. This shall be calculated as the NPV of annual loss for 25 years . Annual loss of revenue will be estimated based on the actual electricity sale tariff for the power generated from the Project and estimated annual generation loss due to shortfall in power curve performance. For more clarification the formula to be used for estimated annual revenue loss from the Wind Power Plant is Estimated Annual Revenue Loss due to shortfall in PCW = %Shortfall in PCW * Project Capacity (kW) * Estimated Annual CUF *PPA Tariff.
- b. If the repeated PCGT is below 93% then Contractor will provide technical plan to improve the Power Curve. Contractor shall hire an internationally reputable third-party agency in consultation with Owner for the purpose of analyzing and reporting the reasons for not achieving the PCW and Contractor shall follow the advice of such agency to improve the Power Curve and such advice to be implemented at the Contractor's cost to ensure that the power curve performance is not less than 98 % of warranted. After that the PCGT shall be conducted again. If still the PCGT fails and is below 93% then the Owner will have the right to reject the WTG and obtain a refund. In case of rejection the Contractor will be required to refund entire amount paid by the Owner to the Contractor with respect to the wind plant including supply and services as per the breakup given in the contract. Contractor will refund all amounts paid by Owner for the wind plant along with interest cost (@13% (thirteen percent) per annum) from the date of payments made for WTG including Advance Payment. Further Owner will pay to Contractor, an amount equivalent to 50% of the amounts received from Discom or as any other benefit against generation from the rejected WTG(s).

3.3.3 LD for Machine Availability Shortfall

- a. For Machine Availability of complete wind farm below 98% during high wind season:

In this case the compensation shall be calculated as:

$$COM = \{((98 - MAF)/MAF) \times C \times E\}$$

Where,

COM is Compensation payable to Owner in Rs.

MAF is Machine Availability factor as calculated under Clause 5.2

C is the applicable tariff as per PPA.

E is the actual generation of saleable energy in kWh during the period under consideration.

- b. For Machine Availability of complete wind farm below 96% during low wind season

In this case the compensation shall be calculated as:

$$\text{COM} = \{((96 - \text{MAF})/\text{MAF}) \times C \times E\}$$

Where,

COM is Compensation payable to Owner in Rs.

MAF is Machine Availability Factor as calculated under Clause 5.2

C is the applicable tariff as per PPA.

E is the actual generation of saleable energy in kWh during the period under consideration

3.3.4 LD for Reactive Power (KVARh) drawl

In the event of levy of any charges by state grid on account of low power factor than the minimum mandatory requirement, such charges at actual amount shall be deducted from the Contractor's bills/outstanding credit amount.

In case the reactive power drawl is more than 3% of the active power, then in such case the Contractor shall be responsible to compensate the Owner for an amount equivalent to the reactive power charges required to be paid by the Owner to the DISCOM for the reactive power consumed over and above 3% of the total active power generated from the wind turbines.

In case of change in tariff for reactive power by SERC during O&M period, the difference will be paid by the Owner on written intimation by Contractor as early as such change is notified.

4 FUNCTIONAL GUARANTEE TEST FOR BESS

The BESS Service Functional Guarantee shall comprise of a BESS Service Performance Assessment based on a set of criteria as elaborated below.

4.1 NOMINAL RATINGS

BESS rating, including rated power, energy available at rated power, and the performance of the BESS associated with performance metrics mentioned herein taken at the beginning of life shall be based on a set of ambient operating conditions specified by the BESS Original Equipment Manufacturer (OEM) for the Project site. The Contractor shall also provide an indication of how the performance of the BESS with respect to the metrics is expected to change over time, to account for time and use of the system, and report the same periodically. An energy capacity test shall be performed at the time of Commissioning, in accordance with procedure mentioned below and is intended to be used to determine the dispatchable energy capacity of the BESS at the time of commencement of Operation. In conducting the energy capacity test, the SPD shall provide a detailed and documented charging procedure within the specifications of the BESS. The energy capacity tests conducted on the BESS shall be documented to allow for tracking performance degradation.

4.1.1 Measurement

The BESS shall be discharged and charged at rated power between the lower and upper SOC* limit (as

recommended by the OEM for current application). Power during charge and discharge shall be recorded at regular intervals of time documented by the OEM to provide a statistically valid resolution. The associated energy input (Ei), including all BESS functional, parasitic and auxiliary consumption and energy output (Eo) of the BESS shall be calculated from the recorded power.

* SOC recorded, shall be as reported by the Battery Management System.

The above process may be repeated multiple times, with a minimum rest period between charging and discharging, if so recommended, so as to record data for a specified no. of cycles (n). The reference performance test value for stored energy shall be calculated as the mean of the values of Eo and Ei as measured for discharge and charge respectively. The procedure shall be repeated (one cycle each) with power levels at 75%, 50%, and 25% of rated power and documented.

Criterion: BESS Energy capacity shall be at least 20 MWh (dispatchable) at rated Power (10MW) at the time of commissioning. Also during annual verification, the BESS Energy capacity shall not be less than 16MWh (i.e. 80% of the rated capacity).

Note: The Contractor is free to specify nameplate ratings for Energy, keeping in consideration the DOD recommendations of the OEM, as long as the dispatchability criterion specified here is met.

4.2 SYSTEM ROUND-TRIP ENERGY EFFICIENCY (RTE, H)

The system RtE shall be determined as a function of the charge and discharge power and calculated using the following formula:

$$\eta_p = \frac{\sum E_o}{\sum E_i}$$

where,

$\sum E_i$ is the sum of Energy input to the BESS over n cycles

$\sum E_o$ is the sum of Energy output from the BESS over n cycles η_p is the Round Trip Efficiency at charge/discharge Power, P (expressed as a percentage of rated power)

Eo and Ei shall be determined as per point 1. above.

Criterion: η_p , as determined through the process described above shall be >80% at the time of commissioning.

Note: The tests are intended to be carried out on a single day. The value of n shall be at least 3 for 100% rated Power and 1 for 25%, 50% and 75% of rated power as per procedure laid down above.

4.3 BESS RESPONSE TIME:

BESS Response Time shall be measured as the sum of the following two entities:

- The time elapsed between the instant when a command to change set point from rest to discharge is sent to the ESS (T_0) and the instant when the ESS starts responding to the discharge command signal (T_1), the BESS being in active standby state and 50% SOC at T_0 i.e., $T_1 - T_0$
- Time elapsed in seconds between the instant the ESS output transitions from no discharge i.e. 0% (T_1) to discharge and the instant it attains the power capacity as aforementioned (T_2) (or from no

charge (T_1) to charge state and the instant it attains power as aforementioned(T_2) i.e. $T_2 - T_1$

Criteria:

Real power output shall achieve $\pm 5\%$ of setpoint within < 500 msec and $\pm 1\%$ within 4 seconds. Reactive power output shall achieve $\pm 5\%$ of setpoint within 500 msec and $\pm 0.5\%$ within 4 seconds. The response, rise, and settling times shall be determined starting the battery storage system at 50% SOC and shall be tested under charging and discharging conditions.

$$RT = (T_2 - T_1) + (T_1 - T_0) = T_2 - T_0$$

Where T_0 , T_1 and T_2 are timestamps:

T_0 : Instant when a command to change set point is received at ESS boundary (to be identified in advance);

4.4 NO. OF CYCLES:

The Contractor shall demonstrate minimum 365 cycles of operation of BESS every year for any or all of the Use Cases as described below. All possible modes of operation/Use cases shall be demonstrated as requirement for Provisional Acceptance of the Plant Facilities.

4.5 EQUIPMENT AVAILABILITY

a) Operator shall maintain all BESS equipment to ensure at least/minimum Equipment Availability as defined in the clauses hereunder and elsewhere in the document.

b) Operator shall keep Annual average minimum Equipment Availability of not less than 99%.

c) Equipment Availability includes the availability of Batteries as well as the power evacuation system for BESS up to interface with the system of power utility; i.e. till Pooling Substation.

d) Formula for average Equipment Availability Factor (EAF) for the BESS shall be as defined in the Section VII: Technical Specifications.

e) In case the Equipment Availability is found less than as stated above then the Operator pay to the Owner pre-determined mutually agreed compensation as given under subsequent section.

4.6 LIQUIDATED DAMAGES FOR PERFORMANCE SHORTFALL IN BESS

4.6.1 LD for shortfall in efficiency of BESS

In case measured efficiency of BESS $\eta_{meas}\%$ is less than declared efficiency $\eta_{decl}\%$ during PG test, Contractor is liable to pay LD for loss in generation on account of fall in efficiency which shall be calculated as follow

$$\text{Gloss} = MWHC \times 1000 \times 365 \times BUF \left(\frac{1}{\eta_{meas}} - \frac{1}{\eta_{decl}} \right) \times 100 \text{ KWH}$$

MWHC is the MWH Capacity of the BESS system. It shall be 20 MWh for project.

BUF is the battery utilization factor and is taken as 1.

Applicable LD due to loss in efficiency $LD_{\eta Loss}$ will be

$$LD_{\eta Loss} = G_{loss} \times \text{Applicable Tariff as per PPA}$$

$LD_{\eta Loss}$ shall be for one year as the efficiency measurement shall be done each year during

operation and maintenance.

4.6.2 LD for shortfall in Equipment Availability of BESS

If yearly Plant availability factor for BESS is less than 99% during any year, then Contractor is liable for paying LD to Owner as follow

$$LD_{\text{av}} = (99 - \text{PAF}) / \text{PAF} \times \text{PPA Tariff} \times \text{Energy output from BESS during the respective year}$$

The above compensations shall be deducted from price of comprehensive O&M Contract. During the free O&M period if any, compensation shall be paid by the Contractor else it will be deducted from the Security Deposit.

Any Compensation arising out of guarantees during O&M period shall be adjusted against the O&M charges to be made to the Contractor.

5.0 Limitation of Liability: Subject to the above requirements and provisions, the Contractor's aggregate liability to pay liquidated damages for failure to attain the functional guarantees shall not exceed ten percent (10%) of the Contract price.

Use cases

1. Ramp Rate Control

Wind and solar generation is variable by nature, leading to large swings in production on the minute or even seconds scale. Whether caused by fluctuations in wind resource or passing cloud cover, significant changes in output from renewable sites can lead to fluctuations in supply on the grid as well as instability. In order to mitigate the fluctuation in grid due to intermittent nature of generation from Wind and Solar, restriction of ramp rate shall be done by BESS. The BESS shall be operated so as to maintain a Ramp Rate $\pm 10\%$ per minute on the 33 kV AC bus bar subject to the maximum capacity of the BESS System. In this use case, the Contractor shall rely on weather forecasting mechanism as well as a planned/programmed Energy Management System to operate the BESS so as to achieve the desired ramp rates.

Criteria:

2. Curtailment Mitigation

BESS shall be operated in a manner such that potential energy loss due to curtailment can be minimised up to the extent possible. In this use case, the Contractor shall rely on weather forecasting tools and co-ordination with the Utility/SLDC for operation.

3. DSM Penalty Mitigation

APERC has enforced "APERC Forecasting, Scheduling and Deviation settlement of solar and wind generation Regulation, 2017". This regulation came into force from 21st August 2017. Under this regulation forecasting, scheduling and deviation settlement has commenced from 1st January 2018 and deviation charges collection will commence from 1st July 2018.

In the event of deviation from scheduled generation more than the allowed limit under the Regulation, the BESS can be used to reduce the gap to avoid the penalty for such deviations beyond allowed limit. This shall be demonstrated at site after commissioning of the BESS facility.

Reports

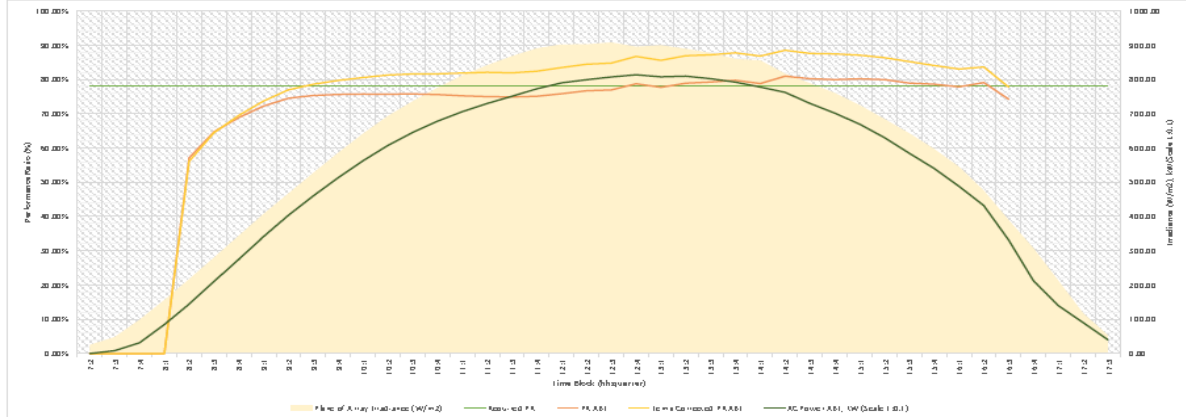
Sample Report for PR Test

PR Guarantee Test Report

Day	20-Nov-2016	Criteria	>200	Average POA Irradiance in a time block in W/m ²	
No. of Timeblocks considered	36 /42	Tot Gen	53694	kWh	Source: ABT Meter at GSS
Plant PR for the day ABT	80.66%	Average PR (temp corrected) of 15 min time blocks where POA irradiance is greater than 200W/m ² and not explicitly removed (Guaranteed PR: 78%)			

Time Block (hh:mm)	Wind Speed (m/s)	Module Temp. (°C)	Ambient Temp. (°C)	POA Radiation (kWh/m ²)	Plane of Array Irradiance (W/m ²)	GHI (W/m ²)	Humidity (%)	Wind Direction (°)	Generation ABT GSS (kWh)	AC Power ABT, kW (Scale 1:0.1)	PR ABT	Temp Corrected PR ABT	Explicit Removal
7:2	1.62	13.91	15.10	2.17	25.25	27.00	45.92	88.10	0.00	0.00	0.00%	0.00%	0
7:3	1.41	14.47	15.25	12.34	47.92	50.47	45.53	38.35	21.00	8.40	14.73%	14.10%	0
7:4	0.57	15.84	15.73	25.08	98.48	92.93	44.41	0.00	79.00	31.60	27.27%	26.24%	0
8:1	0.26	17.73	16.01	39.51	156.11	143.67	44.55	0.00	212.00	84.80	46.45%	45.07%	0
8:2	0.66	20.64	17.01	54.73	216.78	193.67	42.19	0.00	361.00	144.40	57.10%	56.08%	0
8:3	0.43	24.09	17.94	70.40	279.62	245.80	40.17	0.00	526.00	210.40	64.69%	64.45%	0
8:4	0.71	27.22	18.85	86.46	343.62	291.80	38.39	0.00	689.00	275.20	68.90%	69.52%	0
9:1	0.71	29.93	19.74	102.34	407.36	348.47	36.74	0.00	954.00	341.60	72.25%	73.71%	0
9:2	0.71	32.98	20.73	117.25	466.99	398.00	35.17	0.00	1009.00	403.60	74.53%	76.95%	0
9:3	0.80	35.60	21.52	132.29	527.14	445.27	33.94	0.00	1151.00	460.40	75.33%	78.61%	0
9:4	0.74	38.17	22.31	146.86	585.56	486.27	32.98	0.00	1283.00	513.20	75.64%	79.72%	0
10:1	0.87	40.55	23.23	160.77	641.34	516.87	31.86	0.00	1406.00	562.40	75.72%	80.54%	0
10:2	0.93	42.99	24.08	173.62	692.91	540.33	31.13	0.00	1518.00	607.20	75.70%	81.28%	0
10:3	0.99	43.78	24.78	184.38	736.02	559.67	30.67	0.00	1613.00	645.20	75.74%	81.57%	0
10:4	1.18	44.44	25.53	194.12	775.43	576.53	29.87	12.76	1695.00	678.00	75.60%	81.63%	0
11:1	1.05	46.52	26.17	203.12	811.43	593.60	28.97	0.00	1765.00	706.00	75.23%	81.87%	0
11:2	0.89	48.11	26.74	210.57	841.02	609.07	28.28	0.00	1824.00	729.60	75.00%	82.10%	0
11:3	1.51	47.95	27.61	217.05	867.66	624.60	26.97	0.00	1877.00	750.80	74.87%	81.92%	0
11:4	2.03	48.74	28.04	222.77	890.54	642.47	25.69	76.95	1932.00	772.80	75.09%	82.40%	0
12:1	1.61	49.61	28.91	225.54	902.04	656.13	24.24	0.00	1975.00	790.00	75.82%	83.47%	0
12:2	2.03	49.58	29.45	225.55	902.30	664.40	22.97	129.40	1998.00	799.20	76.69%	84.42%	0
12:3	2.34	49.79	29.73	227.09	907.75	672.60	21.62	131.02	2018.00	807.20	76.94%	84.75%	0
12:4	2.48	49.66	29.92	223.65	895.29	671.87	20.71	96.20	2034.00	813.60	78.74%	86.70%	0
13:1	2.10	49.70	30.20	224.96	899.51	670.93	18.75	0.00	2019.00	807.60	77.71%	85.57%	0
13:2	2.32	49.80	30.31	222.11	889.25	665.80	18.11	22.42	2024.00	809.60	78.90%	86.92%	0
13:3	2.59	49.39	30.42	219.07	877.23	649.13	17.75	219.19	2005.00	802.00	79.24%	87.17%	0
13:4	2.22	49.55	30.70	215.00	859.72	630.67	17.39	0.00	1980.00	792.00	79.73%	87.76%	0
14:1	1.87	49.88	30.98	213.62	855.38	620.80	16.27	0.00	1944.00	777.60	78.79%	86.83%	0
14:2	2.27	47.80	31.28	203.86	816.52	584.27	16.13	19.15	1906.00	762.40	80.95%	88.51%	0
14:3	2.30	47.34	30.99	196.95	788.89	548.20	16.46	38.30	1825.00	730.00	80.23%	87.58%	0
14:4	2.05	47.88	31.01	189.95	760.16	520.20	16.53	7.33	1754.00	701.60	79.95%	87.45%	0
15:1	1.75	45.99	31.44	180.73	724.65	484.80	15.75	0.00	1674.00	669.60	80.19%	87.10%	0
15:2	2.30	44.51	31.33	170.69	684.26	442.27	15.51	95.39	1576.00	630.40	79.94%	86.34%	0
15:3	2.10	44.35	31.19	160.33	642.47	402.40	15.57	28.93	1462.00	594.80	78.95%	85.21%	0
15:4	2.33	41.86	31.19	148.67	596.65	358.47	15.41	45.73	1350.00	540.00	78.62%	84.06%	0
16:1	1.91	41.25	31.19	135.70	544.70	311.80	15.33	90.91	1220.00	488.00	77.84%	83.02%	0
16:2	2.37	38.99	31.12	118.23	475.45	255.73	14.96	5.47	1080.00	432.00	79.09%	83.62%	0
16:3	2.57	36.66	30.95	96.68	389.67	195.27	15.01	86.82	829.00	331.60	74.24%	77.79%	0
16:4	1.60	34.83	30.62	70.86	306.83	143.86	15.44	76.91	531.00	212.40	64.88%	67.50%	0
17:1	1.56	32.61	30.19	52.45	212.88	92.47	15.59	63.97	350.00	140.00	57.76%	59.58%	0
17:2	1.75	29.57	29.68	26.61	117.56	48.14	15.94	103.66	226.00	90.40	73.53%	74.91%	0
17:3	0.84	27.22	28.80	4.19	52.66	21.40	16.82	0.00	100.00	40.00	206.71%	208.59%	0

Note: Explicit Removal (0- considered, 1- Not considered)



Remarks: [to be recorded, if any]



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EMPLOYER'S REQUIREMENT

Annexure – A

PART III

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Additional Definitions:

Commissioning – Commissioning shall mean when entire Plant Facilities (Solar PV Plant, Wind Plant, BESS & Common Infrastructure) are interconnected to the grid with charged electrical lines and has commissioning certificates issued by the Discom/Utility/Appropriate Authority for the entire plant facility.

Commissioning of Wind Plant - Commissioning of Wind Plant shall mean when all the WTGs of the Plant are interconnected to the grid with charged electrical lines and has commissioning certificates issued by the Discom/Utility/Appropriate Authority for all the WTGs.

Commissioning of Solar PV Plant - Commissioning of Solar PV Plant shall mean when entire Solar PV Power capacity of the Plant are interconnected to the grid with charged electrical lines and has commissioning certificates issued by the Discom/Utility/Appropriate Authority for complete Solar PV Plant capacity.

Commissioning of BESS - Commissioning of BESS shall mean when entire BESS capacity of the Plant are interconnected to the grid with charged electrical lines and has commissioning certificates issued by the Discom/Utility/Appropriate Authority for complete BESS capacity.

Environment & Social Mngement Plan (ESMP) – It is the plan prepared in order to manage the Environmental & Social impacts anticipated due to the project activities following an Environment & Social impact assessment, in accordance with the applicable policies of the Govt of India & World Bank and attached to this bid document as **Annexure B**

Operational Acceptance of individual Plant – Operational Acceptance of Individual Plants shall mean the preliminary acceptance by the Employer upon completion of following for the respective plant (Solar PV Plant, Wind Plant, BESS)

- Completion of erection testing and commissioning of the respective Plant
- Receiving of Commissioning Certificate for respective plant from the relevant authority
- Successful Completion of the STPT in case of Wind Plant
- Successful completion of PR test in case of Solar PV Plant
- Successful completion of Efficiency test and MWHC test in case of BESS

Operational Acceptance of Plant Facilities: Operational Acceptance of Plant facilities shall mean the preliminary acceptance by the Employer upon completion of following for the Plant Facility (Solar PV Plant, Wind Plant, BESS all together)

- Commissioning of the Plant facility
- Operational Acceptance of Individual Plant by the Employer for all the three components i.e. Solar PV Plant, Wind Plant and BESS

Final Completion / Final Acceptance of Plant Facilities: Final Acceptance of Plant Facility shall mean the Final acceptance of the Plant by the Employer upon completion of following:

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- Operational Acceptance of the Plant Facility
- Completion of Punch-list items and all other works by the Bidder in line with the scope of works
- Successful Completion of all the Performance Guarantee tests for Plant facility
- Payment of all the Liquidated Damages or compensation by the contractor to employer, if any as applicable to the contractor in accordance with the conditions given in the bidding documents for any shortfall in achieving the Performance Guarantee tests

Plant Facilities shall mean the complete & entire facility together i.e. Solar PV Plant, Wind Plant and BESS including all associated Infrastructure as required for the Plant in accordance with the Scope defined in the bidding documents.

Part I: Electrical

A Solar Photovoltaic System

1 Photovoltaic Modules

1.1 Standards and Codes

Photovoltaic Modules shall comply with the specified edition of the following standards and codes or equivalent Indian Standards, wherever applicable.

Standard	Description
IEC 61215-1 Ed. 1.0	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 1: Test requirements
IEC 61215-1-1 Ed. 1.0	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 1-1: Special requirements for testing of crystalline silicon photovoltaic (PV) modules
IEC 61215-1-2 Ed. 1.0	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 1-2: Special requirements for testing of thin-film Cadmium Telluride (CdTe) based photovoltaic (PV) modules
IEC 61730-1Ed. 2.0	Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction
IEC 61730-2 Ed.2	Photovoltaic (PV) module safety qualification - Part 2: Requirements for testing



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IEC 61701 Ed.2	Salt mist corrosion testing of photovoltaic (PV) modules (Applicable for coastal and marine environment)
IEC TS 62804-1:2015 Ed.1	Photovoltaic (PV) modules - Test methods for the detection of potential-induced degradation - Part 1: Crystalline silicon under conditions of 85°C/85% RH for minimum 192 hours.
As per the Solar Photovoltaics, Systems, Devices and Components Goods (Requirements for Compulsory Registration) Order, 2017, 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.	

1.2 Technical Requirements

Parameter	Specification
Cell type	Mono-crystalline or Multi-crystalline or Thin Film
Module Efficiency	Minimum 18% for mono-crystalline Minimum 17% for multi-crystalline Minimum 17% for Thin Film
Rated power at STC	No negative tolerance is allowed.
Temperature co-efficient of power (Pmax)	Not less than -0.40%/°C for Crystalline Si Not less than -0.32%/°C for Thin Film
Lamination (in case of Thin Film Modules)	Glass-Glass with Anodized aluminium frame
Wind speed	Suitable for site condition or As per IS:875 Part-3 whichever is higher
Application Class as per IEC 61730	Class A

1.3 Component Specifications

1.3.1 The PV Modules glass panel shall be:

- For PV Modules with backsheet, toughened low iron glass with minimum thickness of 4.0 mm for 72 cell module and 3.2 mm for 60 cell module for Multi or mono-crystalline Modules
- In case of glass-glass Modules, glass thickness on each side shall be minimum of 2 mm.
- The glass used shall have transmittance of above 90%.

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- 1.3.2 The backsheet used in the PV modules shall be of three layered structure durable for humid – hot conditions with properties of moisture barrier, elongation retention and UV resistance. The back sheet shall have the following properties.

Parameter	Value
Material thickness	≥ 300 micron
Water vapour transmission rate	< 2 g/m ² /day
Partial discharge test voltage	≥ 1000 V / 1500 V
Elongation at break	> 100%
Adhesion strength with encapsulant	> 70 N/cm
Interlayer adhesion strength	> 5 N/cm

The Employer reserves the right to conduct Pressure Cooker (PC) test/ Highly Accelerated Stress Test (HAST) to confirm the durability of the back sheet in accelerated conditions.

- 1.3.3 The encapsulant used for the PV modules should be UV stable and PID resistant in nature. No yellowing of the encapsulant with prolonged exposure shall occur. The encapsulant shall have the following properties.

Parameter	Value
Gel content	> 75%
Volume resistivity	> 1×10 ¹⁵ Ω.cm
Peeling strength with glass	> 60 N/cm

- 1.3.4 The sealant used for edge sealing of PV modules shall have excellent moisture ingress protection with good electrical insulation (Break down voltage >15 kV/mm) and with good adhesion strength. Edge tapes for sealing are not allowed.
- 1.3.5 The module frame shall be made of anodized Aluminium, which shall be electrically & chemically compatible with the structural material used for mounting the modules. It is required to have provision for earthing to connect it to the earthing grid. The anodization thickness shall not be less than 15 micron.



- 1.3.6 The material used for junction box shall be UV resistant to avoid degradation during module life. The degree of protection of the junction box shall be at least IP67. Minimum three number of bypass diodes and two number of IEC 62852/EN 50521 certified MC4 compatible connectors with appropriate length of IEC 62930/EN 50618 certified 4 sq.mm copper cable shall be provided. The cable length shall be in accordance with the PV Module wiring strategy and adequate to ensure that the cable bending radius standard is not exceeded.
- 1.3.7 Each PV Module shall be provided a bar code which is embedded inside the module lamination and must be able to withstand harsh environmental conditions. The bar code data base shall contain the following information. Bar code scanner and database of all the modules containing the following information shall also be provided.
- (i) Name of the manufacturer of PV Module
 - (ii) Name of the Manufacturer of Solar cells
 - (iii) Type of cell: Mono / Multi
 - (iv) Month and year of the manufacture (separately for solar cells and module)
 - (v) Country of origin (separately for solar cells and module)
 - (vi) I-V curve for the module
 - (vii) Peak Wattage, I_m , V_m and FF for the module
 - (viii) Unique Serial No. and Model No. of the module.
 - (ix) Date and year of obtaining IEC PV module qualification certificate
 - (x) Name of the test lab issuing IEC certificate
 - (xi) Other relevant information on traceability of solar cells and modules as per ISO 9000 series.

1.4 Warranty

- 1.4.1 PV modules must be warranted with linear degradation rate of power output except for first year (maximum 2.5% including LID) and shall guarantee minimum 80% of the initial rated power output at the end of 25 years.
- 1.4.2 The modules shall be warranted for minimum of 10 years against all material/ manufacturing defects and workmanship.
- 1.4.3 The above warranties shall be backed by third party insurance.



1.5 Approval

- 1.5.1 The Contractor shall provide commercial datasheet and Guaranteed Technical Particular datasheet.
- 1.5.2 The Contractor shall provide the Bill of Materials (BOM) of the module that is submitted for approval along with the datasheets of each component. The component datasheet shall contain all the information to substantiate the compliance for component specifications mentioned above. The Contractor shall also provide complete test reports and certifications for the proposed module type/ BOM combination. For clarity, the BOM proposed shall be the subset of Constructional Data Form (CDF)'s of all the test reports.
- 1.5.3 The Contractor shall submit a detailed QAP of the Module with list of tests performed during Production supervision, Pre-Shipment Inspection, Laboratory Tests.
- 1.5.4 The Contractor shall obtain the approval of the proposed module make & model prior to manufacturing/ inspection call.

1.6 Manufacturing and Inspection

- 1.6.1 The Contractor shall inform the module manufacturing schedule to the Employer at least 7 (seven) working days before the start of proposed schedule.
- 1.6.2 The Employer shall perform material inspection at the Manufacturer's factory before the start of proposed manufacturing schedule. Proof of procurement of components as per the approved BOM mentioning manufacturer name, manufacturing date and relevant test certificate shall be submitted during material inspection for verification.
- 1.6.3 The Manufacturing shall start only after the clearance by the Employer after the material inspection.
- 1.6.4 The cells used for module making shall be free from all defects like edge chipping, breakages, printing defects, discoloration of top surface etc. Only Class A solar cell shall be used.
- 1.6.5 The modules shall be uniformly laminated without any lamination defects.
- 1.6.6 Current binning of modules shall be employed so that current mismatch of modules in a pallet does not exceed 0.1 A. Different colour codes shall be provided on the modules as well as pallet for identification of different bins. Maximum three nos. of bins will be allowed for each Module rating.



1.6.7 Pre-dispatch inspection of modules shall be performed as per the inspection protocol attached in Annexure – A Part I.

1.7 Transportation, Handling, Storage and Installation

1.7.1 Transportation, handling, storage and installation of modules shall be in accordance with the manufacturer manual so as not to breach warranty conditions. The Standard Operating Procedure (SOP) for the same shall be shared by the Contractor prior to dispatch for approval.

1.7.2 It is required to construct a temporary platform (graded) while keeping the modules at least above the highest flood level. If the contractor scheduled/ planned to mount the modules immediately after the receipt at site, then the module shall be kept in common storage area with proper arrangement.

1.7.3 The stacked modules, in any case, shall be stacked as per the manufacturer's recommendation only and shall be covered with tarpaulin sheet.

2 String Monitoring Unit

2.1 Standards and Codes

Standard/Code	Description
IEC 60529	Enclosure Ingress Protection
IEC 62262	Enclosure Impact Protection
IEC 60269	Fuse
IEC 61643-11	Surge Protection Device
IEC 62852 or EN 50521	Solar cable connector
IEC 60695-2-11	Fire hazard testing

2.2 Construction

2.2.1 SMU Enclosure shall be made of UV resistant, fire retardant, thermoplastic material. SMU with installation of all the equipment shall have degree of protection at least IP65 and mechanical impact resistance shall be at least IK08.

2.2.2 Not more than two strings can be connected in parallel to a single input of SMU. One spare input terminal along with connector shall be provided for each SMU.

- 2.2.3 Every SMU input shall be provided with fuses on both positive and negative side. The rating of the fuses shall be selected such that it protects the modules from reverse current overload. The fuses shall be 'gPV' type conforming to IEC 60269-6.
- 2.2.4 DC disconnect switch of suitable rating shall be provided at SMU output to disconnect both positive and negative side simultaneously.
- 2.2.5 Type-II surge protective device (SPD) conforming to IEC 61643-11 shall be connected between positive/negative bus and earth.
- 2.2.6 Resistance Temperature Detector (RTD) type or semiconductor type temperature sensor shall be provided to monitor the cabinet temperature.
- 2.2.7 MC4 connector conforming to IEC 62852 or EN 50521 shall be provided at each SMU input. Cable gland (double compression Bi-metallic) of suitable size for DC cables shall be provided at the SMU output.
- 2.2.8 UV resistant printed cable ferrules for solar cables & communication cables and punched/ embossed aluminium tags for DC cables shall be provided at cable termination points for identification.
- 2.2.9 Suitable communication interface shall be provided to communicate the data to SCADA. The following parameters shall be measured/ monitored and made available at SCADA.
- (i) String current
 - (ii) Bus voltage
 - (iii) Output current
 - (iv) Cabinet temperature
 - (v) DC disconnect switch ON/OFF status
 - (vi) SPD operating status

2.3 Warranty

The SMU unit shall be warranted for minimum of 5 (five) years against all material/ manufacturing defects and workmanship.

2.4 Approval

2.4.1 Documents/Drawings

- (i) Guaranteed Technical Particular (GTP) Datasheet.
- (ii) Bill of Materials for the proposed SMU along with the datasheet of each component



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(iii) General Arrangement (GA) drawing

(iv) Quality Assurance Plan (QAP)

2.4.2 Test Certificates/Reports

(i) Test certificates of fuse, SPD and solar cable connector

(ii) SMU with installation of all the equipment ingress protection and impact protection test certificates

(iii) Temperature rise test on the completely assembled unit

2.5 Tests

Routine tests and acceptance tests for the assembled unit shall be as per the Quality Assurance Plan (QAP) approved by the Employer.

3 Solar and DC Cables

3.1 Standards and Codes

Cable	From	To	Conductor/ Insulation	Voltage Rating	Applicable Standard
Solar Cable*	Module	SMU	Tinned Copper/ XLPO	1.1 kV DC/ 1.5 kV DC	IEC 62930/ EN 50618
DC Cable	SMU	PCU	Copper or Aluminium/ XLPE	1.1 kV DC/ 1.5 kV DC	IS 7098 Part I

* Cable used for module interconnection shall also be referred as solar cable.

3.2 Solar cable outer sheath shall be flame retardant, UV resistant and black in colour. Solar cable with positive polarity should have marking of red line on black outer sheath.

3.3 DC cables shall be single core, armoured, Flame Retardant Low smoke (FRLS), PVC outer sheath conforming to IS 7098-I. DC cable with positive polarity should have marking of red line on black outer sheath.

3.4 In addition to manufacturer's identification on cables as per relevant standard, following marking shall also be provided over outer sheath.

(i) Cable size and voltage grade

(ii) Word 'FRNC/ FRLS' (as applicable) at every metre

(iii) Sequential marking of length of the cable in metres at every metre

3.5 Cables shall be sized based on the following considerations:

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- (i) Rated current of module
- (ii) The average voltage drop in the cables (Modules to Inverter) shall be limited to 1.5 % of the rated voltage. Contractor shall provide voltage drop calculations in excel sheet.
- (iii) Short circuit withstand capability
- (iv) De-rating factors as applicable

3.6 Warranty

The cables (Solar and DC) shall be warranted for minimum of 1 (one) year against all material/ manufacturing defects and workmanship.

3.7 Approval

3.7.1 Documents/Drawings

- (i) Guaranteed Technical Particular (GTP) Datasheet.
- (ii) Solar and DC Cable sizing calculation
- (iii) Quality Assurance Plan (QAP)

3.7.2 Test Certificates/Reports

- (i) Solar cable type test certificate as per IEC 62930/ EN 50618
- (ii) DC cable type test certificate as per IS 7098-1

3.8 Tests

Routine test and acceptance tests requirements shall be as per IEC 62930/EN 50618 for solar cables and IS 7098-1 for DC cables.

3.9 Installation

3.9.1 Cable installation shall be as per IS 1255.

3.9.2 Only terminal cable joints shall be accepted. No cable joint to join two cable ends shall be accepted.

3.9.3 Solar cables shall be provided with UV resistant printed ferrules and DC cables shall be provided with punched/ embossed aluminium tags. The marking shall be done with good quality letter and numbers of proper size so that the cables can be identified easily.



- 3.9.4 Cable terminations shall be made with properly crimped lugs and passed through cable glands at the entry & exit point of the cubicles. Bimetallic lugs shall be used for connecting Cu bus bar and Al cables or vice-versa.
- 3.9.5 Solar cables, wherever exposed to direct sunlight and buried underground, shall be laid through Double Wall Corrugated (DWC) HDPE conduits. The size of the conduit or pipe shall be selected on the basis of 40% fill criteria.
- 3.9.6 Solar cables shall be aesthetically tied to Module Mounting Structure using UV resistant cable-ties suitable for outdoor application.
- 3.9.7 A.C and D.C cables shall be kept in separate trenches. The horizontal and vertical clearances between power and communication cable shall not be less than 300mm.
- 3.9.8 None of the cable in the plant shall be kept in hanging position without support.
- 3.9.9 For the road crossing NP3 type Hume pipe as per IS 458 shall be used.

4 Power Conditioning Unit

4.1 Standards and Codes

Power Conditioning Unit (PCU) shall comply with the specified edition of the following standards and codes or their equivalent Indian Standards, wherever applicable.

Standard	Description
IEC 61683 Ed. 1	Photovoltaic systems - Power conditioners - Procedure for measuring efficiency
IEC 62109-1 Ed. 1	Safety of power converters for use in photovoltaic power systems - Part 1: General requirements
IEC 62109-2 Ed. 1	Safety of power converters for use in photovoltaic power systems - Part 2: Particular requirements for inverters
IEC 61000-6-2 Ed. 2	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments
IEC 61000-6-4 Ed. 2.1	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
IEC 62116 Ed. 2	Utility-interconnected photovoltaic inverters - Test procedure of islanding prevention measures



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IEC 61727:2004 Ed. 2	Photovoltaic (PV) systems - Characteristics of the utility interface
IEC 60068-2-1:2007	Environmental testing - Part 2-1: Tests - Test A: Cold
IEC 60068-2-2:2007	Environmental testing - Part 2-2: Tests - Test B: Dry heat
IEC 60068-2-14:2009	Environmental testing - Part 2-14: Tests - Test N: Change of temperature
IEC 60068-2-30:2005	Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)
CEA Technical Standards for Connectivity to the Grid Regulations 2007 with 2013 Amendment and further notifications in due course.	
As per the Solar Photovoltaics, Systems, Devices and Components Goods (Requirements for Compulsory Registration) Order, 2017, Inverters 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.	

4.2 Technical Requirements

Parameter	Specification
Rated AC power	As per design
Maximum input voltage	1000 V / 1500 V
Rated AC output voltage	As per design
Tolerance on rated AC output voltage	+/-10%
Rated frequency	50 Hz
Operating frequency range	47.5 Hz to 52 Hz
Power factor control range	0.9 lag to 0.9 lead
European efficiency	Minimum 98%
Maximum loss in Sleep Mode	0.05% of rated AC power
Total Harmonic Distortion	Less than 3% at 100% load
Degree of protection	IP 20 (Indoor)/IP 54 (Outdoor)

4.2.1 The rated/ name plate AC capacity of the PCU shall be AC power output of the PCU at 50°C.

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4.2.2 Maximum power point tracker (MPPT) shall be integrated in the PCU to maximize energy drawn from the Solar PV array. The MPPT voltage window shall be sufficient enough to accommodate the output voltage of the PV array at extreme temperatures prevailing at site.

4.2.3 The PCU output shall always follow the grid in terms of voltage and frequency. The operating voltage and frequency range of the PCU shall be sufficient enough to accommodate the allowable grid voltage and frequency variations.

4.3 Construction

4.3.1 Power Conditioning Unit (PCU) shall consist of an electronic three phase inverter along with associated control, protection, filtering, measurement and data logging devices.

4.3.2 Every DC input terminal of PCU shall be provided with fuse of appropriate rating. The combined DC feeder shall have suitably rated isolators for safe start up and shut down of the system.

4.3.3 Type-II surge protective device (SPD) conforming to IEC 61643-11 shall be connected between positive/ negative bus and earth.

4.3.4 In case external auxiliary power supply is required, UPS shall be used to meet auxiliary power requirement of PCU. It shall have a backup storage capacity of 2 hours.

4.3.5 Circuit Breaker of appropriate voltage and current rating shall be provided at the output to isolate the PCU from grid in case of faults.

4.3.6 The PCU shall be tropicalized and the design shall be compatible with conditions prevailing at site. Suitable number of exhaust fan with proper ducting shall be provided for cooling keeping in mind the extreme climatic condition of the site as per the recommendations of OEM to achieve desired performance and life expectancy.

4.3.7 All the conducting parts of the PCU that are not intended to carry current shall be bonded together and connected to dedicated earth pits through protective conductor of appropriate size. DC negative terminal shall be grounded through ground fault detection interrupter device.

4.3.8 Dedicated communication interface shall be provided to monitor the PCU from SCADA.



4.3.9 PCU front panel shall be provided with LCD/ LED to display all the relevant parameters related to PCU operation and fault conditions. It shall include, but not limited to, the following parameters.

- (i) DC input power
- (ii) DC input voltage
- (iii) DC input current
- (iv) AC output power
- (v) AC output voltage (all the 3 phases and line)
- (vi) AC output current (all the 3 phases and line)
- (vii) Frequency
- (viii) Power Factor

4.4 Operating Modes

Operating modes of PCU shall include, but not limited to, the following modes. These operating modes and conditions for transition are indicative only. The Contractor shall provide the detailed flow chart indicating the various operating modes and conditions for transition during detailed engineering.

4.4.1 Standby Mode

The PCU shall continuously monitor the input DC voltage and remain on Standby Mode until it reaches the pre-set value.

4.4.2 MPPT Mode

When the input DC voltage is above the pre-set value and AC grid connection conditions are fulfilled, the PCU shall enter into MPPT mode.

4.4.3 Sleep Mode

When the AC output power/DC input voltage decreases below the pre-set value for pre-set time delay, the PCU shall switch into Sleep Mode.

4.5 Protection Features

The PCU shall include appropriate self-protective and self-diagnostic feature to protect itself and the PV array from damage in the event of PCU component failure or from parameters beyond the PCU's safe operating range due to internal or external causes.

The self-protective features shall not allow signals from the PCU front panel to cause the



PCU to be operated in a manner which may be unsafe or damaging. Faults due to malfunctioning within the PCU, including commutation failure, shall be cleared by the PCU protective devices.

The PCU shall provide protection against the following type of faults, among others.

- (i) DC/AC over current
- (ii) DC/AC over voltage
- (iii) DC reverse polarity
- (iv) DC earth fault
- (v) AC under voltage
- (vi) AC under frequency/over frequency
- (vii) Islanding
- (viii) Over temperature
- (ix) Lightning surges
- (x) Synchronisation Loss

4.6 Over HeatingGrid Support Functions

4.6.1 Active power regulation

The PCU shall be able to limit the active power exported to the grid based on the set point provided through PCU front control panel. The PCU shall also be able to automatically the limit the active power after an increase in grid frequency above a pre-set value. The ramp rate shall be adjustable during operation and start-up after fault. The applicability of the requirement shall be as per CEA regulation and compliance.

4.6.2 Reactive power control

The PCU shall be able to inject /absorb reactive power to/ from the grid based on the set point provided through PCU front control panel. The same shall be performed automatically with adjustable ramp rate based on dynamic changes in grid voltage or reactive power reference.

4.6.3 Voltage Ride Through

The PCU shall remain connected to the grid during temporary dip or rise in grid voltage as per the LVRT and HVRT requirements of CEA Technical Standards for Connectivity to the Grid Regulations. The PCU shall also be able to inject reactive power during the



period of voltage dip.

4.6.4

4.7 Warranty

The complete Power Conditioning Unit shall be warranted for minimum of 5 (five) years against all material/ manufacturing defects and workmanship.

4.8 Approval

4.8.1 Documents/Drawings

- (i) Guaranteed Technical Particular (GTP) Datasheet.
- (ii) General Arrangement (GA) drawing and Foundation details
- (iii) Single Line Diagram and Bill of Materials
- (iv) Transformer Requirements
- (v) Quality Assurance Plan (QAP)
- (vi) CFD Analysis for the Ventilation requirement

4.8.2 Test Certificates/Reports

All the test certificates as per the standards mentioned above shall be submitted for approval. The tests should have been conducted at a test laboratory compliant with ISO 17025 for testing and calibration and accredited by an ILAC/IECEE member signatory. Laboratory accreditation certificate or weblink along with scope of accreditation shall also be submitted. It is the responsibility of the Contractor to substantiate the compliance for CEA Regulations using test reports.

4.9 Tests

Routine tests and acceptance tests shall be as per the Quality Assurance Plan (QAP) approved by the Employer.

5 **Inverter Transformer and Auxiliary Transformer**

5.1 Standards and Codes

Inverter transformer and auxiliary transformer, wherever applicable, shall comply with the latest edition of the following standards and codes including amendments.

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Standard	Description
IS:2026, IEC:60076	Specification of Power Transformers
IS:2099, IEC:60137	Bushings for alternate voltage above 1000 V
IS: 335, IEC 60296	Insulating oil
IS: 3639	Fittings and Accessories for Power Transformers

5.2 Technical Requirements

Parameters	Inverter Transformer	Auxiliary Transformer
VA Rating	As per system requirement and SLD	
Voltage Ratio	33 kV/ Inverter output voltage	As per system design
Duty, Service & Application	Continuous Solar Inverter application and converter Duty (Outdoor)	Continuous application (Outdoor/Indoor)
Winding	As per system design requirement	2
Frequency	50 Hz	50Hz
Nos. of Phase	3	3
Vector Group & Neutral earthing	As per system/inverter manufacturer requirement and SLD	Dyn11
Cooling	ONAN	ONAN/ AN
Tap Changer	OCTC, No. of steps shall be as per the SLD and system requirement	
Impedance at 75°C	As per Inverter Manufacturer requirement and SLD	As per system requirement and SLD
Permissible Temperature rise over an ambient of 50°C (irrespective of tap)		
Top Oil	50°C	50°C
Winding	55°C	55°C
SC withstand time (thermal)	2 second	2 second
Short Circuit Apparent power	As per system requirement	



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Termination	As per system requirement and SLD
Bushing rating, Insulation class (Winding & bushing)	HV side - 36 kV porcelain bushings LV side – 1.1 kV epoxy bushings
Noise level	As per NEMA TR-1
Loading Capability	Continuous operation at rated MVA on any tap with voltage variation of +/-3%, also transformer shall be capable of being loaded in accordance with IEC 60076-7
Flux density	Not to exceed 1.9 Wb/sq.m. at any tap position with combined frequency and voltage variation from rated V/f ratio by 10% corresponding to the tap. Transformer shall also withstand following over fluxing conditions due to combined voltage and frequency fluctuations: a) 110% for continuous rating b) 125% for at least one minute c) 140% for at least five seconds. Bidder shall furnish over fluxing characteristic up to 150%
Air Clearance	As per CBIP
* Single Line Diagram (SLD) will be finalized during detailed engineering.	

5.3 Construction

- 5.3.1 The transformer shall be provided with conventional single compartment conservator with prismatic toughened glass oil gauge. The top of the conservator shall be connected to the atmosphere through indicating type cobalt free silica gel breather with transparent enclosure. Silica gel shall be isolated from atmosphere by an oil seal. Inverter transformers shall be provided with Magnetic Oil Gauge (MOG) with low oil level alarm contact.
- 5.3.2 It is the responsibility of the Contractor to ensure that the inverter transformer comply with all the requirements of inverter provided by the inverter manufacturer. Letter of compliance shall be provided by the Contractor during detailed engineering stage before manufacturing.



- 5.3.3 Inverter Transformer shall be designed for at least 5% total harmonic distortion (THD) to withstand distortion generated by the inverter as well as possible outside harmonics from the network.
- 5.3.4 The transformer shall be suitable for continuous operation with a frequency variation of $\pm 2.5\%$ from nominal frequency of 50 Hz without exceeding the specified temperature rise.
- 5.3.5 Inverter Transformer shall have shield winding between LV & HV windings. Each LV winding must be galvanically isolated from each other and capable of handling non-sinusoidal voltage with voltage gradient as specified by the inverter manufacturer. Also, shield winding shall be taken out from tank through shield bushing and the same shall be brought down to the bottom of the tank using copper flat and support insulator for independent grounding.
- 5.3.6 Neutral bushing of Inverter duty transformer shall be brought outside the tank for the testing purpose. It shall be covered with MS sheet and a sticker "For testing purpose only. Do not earth". Neutral bushing of auxiliary transformer shall be brought outside the tank for earthing.
- 5.3.7 Transformer shall have 150 mm dial type Oil Temperature Indicator (OTI) and Winding Temperature Indicator (WTI) with alarm and trip contacts. All indicators shall have accuracy of 1.5%. For inverter transformers, WTI shall be provided for all the windings.
- 5.3.8 The radiators shall be detachable type, mounted on the tank with shut off valve at each point of connection to the tank, lifts, along with drain plug/ valve at the bottom and air release plug at the top.
- 5.3.9 Marshalling Box shall be of sheet steel, dust and vermin proof provided with proper lighting and thermostatically controlled space heaters. The degree of protection shall be IP 55. Marshalling Box of all transformers shall be preferably Tank Mounted. One dummy terminal block in between each trip wire terminal shall be provided. At least 10% spare terminals shall be provided on each panel. The gasket used shall be of neoprene rubber. Wiring scheme (TB details) shall be engraved in a stainless-steel plate with viewable font size and the same shall be fixed inside the Marshalling Box door.
- 5.3.10 Buchholz relay, double float type with alarm and trip contacts, along with suitable gas collecting arrangement shall be provided.

- 5.3.11 Inverter transformer shall be provided with spring operated Pressure Relief Device (with trip contacts) with suitable discharge arrangement for oil. For Auxiliary transformers, diaphragm type explosion vent shall be provided.
- 5.3.12 Filter valve at top the tank and drain cum sampling valve at bottom of the tank shall be provided.
- 5.3.13 All external surface of the transformer shall be painted with two coats of epoxy-based paint of colour shade RAL 7032. Internal surface of cable boxes and marshalling box shall be painted with epoxy enamel white paint. The minimum dry film thickness (DFT) shall be 100 microns.
- 5.3.14 LV and HV cable box shall be provided with disconnecting chamber to facilitate the movement of transformer without disturbing cable box and termination.
- 5.3.15 Air release plug, bi-directional wheel/skids, cover lifting eyes, transformer lifting lugs, jacking pads, towing holes, core and winding lifting lugs, inspection cover, rating plate, valve schedule plate, accessories and terminal marking plates, two nos. of earthing terminals shall be provided.
- 5.3.16 Rain hoods to be provided on Buchholz, MOG & PRD. Entry points of wires shall be suitably sealed.
- 5.3.17 The accessories listed above are indicative only. Accessories which are not mentioned above but required for satisfactory operation of the transformers are deemed to be included in the contract without extra charges.

5.4 Warranty

The transformer shall be warranted for minimum of 5 (five) years against all material/manufacturing defects and workmanship.

5.5 Approval

5.5.1 Documents/Drawings

- (i) Guaranteed Technical Particular (GTP) Datasheet.
- (ii) General Arrangement (GA) Drawing of complete transformer, cable boxes, marshalling box
- (iii) Foundation details
- (iv) Rating plate and Valve schedule plate
- (v) Marshalling box wiring diagram



(vi) Manufacturer acceptance for inverter requirements

(vii) Quality Assurance Plan (QAP)

5.5.2 Test Certificates/Reports

All the Type test and Special test reports as per IS:2026 and IEC:60076 as mentioned in the following clause shall be submitted for approval.

5.6 Testing and Inspection

5.6.1 Type Tests and Special Tests

The following type test and special test reports shall be submitted during detailed engineering. The tests should have been conducted on the similar transformer by NABL accredited laboratory.

1.1.1.1 Type Tests

- (i) Lightning impulse (Full & Chopped Wave) test on windings as per IEC 60076-3
- (ii) Temperature Rise test at a tap corresponding to maximum losses as per IEC 60076-2

1.1.1.2 Special Tests

- (i) Measurement of zero-sequence impedance as per IEC 60076-1
- (ii) Measurement of harmonics of no-load current as per IEC 60076-1
- (iii) Measurement of acoustic noise level as per NEMA TR-1
- (iv) Short Circuit withstand test as per IEC 60076-5

In case the contractor is not able to submit the test reports during detailed engineering, then the contractor shall conduct the type/special tests at NABL accredited laboratory in the presence of Employer or Employer's Engineer and submit the reports of type/special tests before the starting the manufacturing.

5.6.2 Routine Tests

Each completed transformer shall be subjected to following routine tests as per the latest edition of IEC 60076 unless specified otherwise.

- (i) Measurement of winding resistance at each tap



- (ii) Measurement of voltage ratio between HV and LV windings at each tap
- (iii) Check of vector group
- (iv) Measurement of no-load loss and no-load current
- (v) Measurement of short-circuit impedance and load loss
- (vi) Magnetic balance test as per CBIP manual publication no. 295
- (vii) Separate source voltage withstand test
- (viii) Induced over voltage withstand test
- (ix) Measurement of insulation resistance
- (x) Marshalling box functional test
- (xi) IR Measurement on wiring of marshalling box
- (xii) Breakdown voltage test on transformer oil as per IS 335
- (xiii) Oil leakage test on completely assembled transformer along with radiators

5.6.3 Tests at Site

After erection at site all transformer(s) shall be subjected to the following tests.

- (i) Measurement of voltage ratio
- (ii) Check of vector group
- (iii) Magnetic balance test
- (iv) Measurement of insulation resistance
- (v) Breakdown voltage test on transformer oil

In case the equipment is not found as per the requirements of the Technical Specifications of NIT, all expenses incurred during site testing will be to the Contractor's account and the equipment shall be replaced by him at free of cost.

6 HT Switchgear

6.1 Standards and Codes

All equipment provided under HT switchgear shall comply with latest editions and amendments of the relevant IEC standards and IS codes. In particular, the switchgear shall comply with the following standards and codes.

Standard/Code	Description

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IS/IEC 62271-1	High Voltage Switchgear and Control gear - Part 1: Common Specifications
IS/IEC 62271-100	High Voltage Switchgear and Control gear - Part 100: AC Circuit Breakers
IS/IEC 62271-102	High Voltage Switchgear and Control gear - Part 102: AC Disconnectors and Earthing Switches
IS/IEC 62271-200	High Voltage Switchgear and Control gear - Part 200: AC Metal Enclosed Switchgear and Control gear for Rated Voltages Above 1 kV and Up to and Including 52 kV
IEC 61869	Instrument Transformers
IS 3231	Electrical relays for power systems protection
IEC 60255	Measuring relays and protection equipment
IEC 61850	Communication networks and systems for power utility automation
IEC 61131-3	Programmable controllers - Part 3: Programming languages
IS 9385	High voltage fuses
IS 9431	Indoor post insulators of organic material for systems with nominal voltages greater than 1000 V up to and including 300 kV
IEC 60099-4	Surge arresters - Part 4: Metal-oxide surge arresters without gaps for A.C. systems
IS 3070-3	Lightning Arresters for Alternating Current Systems - Part 3: Metal Oxide Lightning Arresters Without Gaps
IEC 62052-11	Electricity metering equipment (A.C.) - General requirements, tests and test conditions - Part 11: Metering equipment
IEC 62053	Electricity metering equipment (A.C.) - Particular requirements
IS 14697	AC Static Transformer Operated Watthour and Var-hour Meters, Class 0.2S and 0.5S

6.2 Technical Parameters

Parameter	Specification
System Parameters	
Highest system voltage	36 kV
Rated system voltage	33 kV
Rated frequency	50 Hz

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Number of phases	3
Power frequency withstand voltage	70 kV (r.m.s.)
Lightning impulse withstand voltage	170 kV (peak)
System fault current	25 kA for 3s
Circuit Breaker	
Type	Vacuum type
Operating duty cycle	O – 0.3sec – CO – 3min – CO
Short circuit breaking current	25 kA
Short circuit making current	63 kA
Re-strike performance class	C2
Mechanical endurance class	M1
Current Transformer	
Accuracy class	0.2 for metering (0.2s for metering at outgoing feeder), 5P20 for protection
Rated VA burden	As per requirement
Insulation class	Class E
Voltage Transformer	
Accuracy class	0.2 for metering, 3P for protection
Rated VA burden	As per requirement
Insulation class	Class E

6.3 Switchgear Panel

- 6.3.1 The switchgear panel shall be free standing, floor mounted, single front, single tier fully compartmentalized, metal enclosed construction. Each panel shall have separate compartments for circuit breaker, bus bars, cable termination and auxiliary circuit.
- 6.3.2 The circuit breakers shall be mounted on horizontally withdrawable trucks with locking facility in SERVICE and TEST positions.
- 6.3.3 The panel enclosure shall be constructed with CRCA steel/Aluzinc sheet. The thickness of load bearing members shall be minimum 3 mm and that of non-load bearing members shall be minimum 2 mm.



- 6.3.4 All surfaces shall be painted with two coats of epoxy-based paint of colour shade RAL 7032.. The minimum dry film thickness (DFT) shall be 100 micron. The painting shall be done with at least 7 Tank process.
- 6.3.5 The circuit breaker and auxiliary circuit compartments provided on the front side shall have separate concealed hinged doors. Cable and bus bar compartments provided on the rear side shall have separate bolted covers. All doors and covers shall be provided with neoprene/synthetic rubber gaskets to prevent entry of vermin and dust.
- 6.3.6 Pressure relief device shall be provided in each high voltage compartment of a panel to safely vent the gases in the event of internal arc. Seal-off bushing arrangement shall be provided between the breaker compartment and bus bar/cable compartments to prevent transfer of arc from one compartment to other.
- 6.3.7 Automatic safety shutters shall be provided to cover up the fixed high voltage contacts on bus bar and cable sides when the truck is moved to TEST position.
- 6.3.8 Degree of protection shall not be less than IP 5X for auxiliary circuit compartment. However, for remaining compartments it shall not be less than IP 4X.
- 6.3.9 Mechanical /Electrical interlocks shall be provided to prevent mal-operation and in particular to ensure the following.
- (i) The breaker shall be operated only if it is in SERVICE or TEST position.
 - (ii) Movement of the breaker truck between SERVICE and TEST positions shall be possible only if the breaker is OFF.
 - (iii) It shall be possible to open the door only when the breaker is in TEST position.
- 6.3.10 Each switchgear panel shall be provided with thermostatically controlled space heaters, separately for breaker, cable and bus bar compartments, to prevent condensation within the compartment. The space heater shall be connected to 240 V, 50 Hz, single phase AC supply through suitable switch and fuse.
- 6.3.11 240 V, 5 A, SPN industrial socket-outlet with ON/OFF switch shall be provided in each panel.
- 6.3.12 Each panel shall be provided with LED lamp rated for 240 V, 50 Hz, single phase AC supply for interior illumination controlled by door switch.
- 6.3.13 Gapless, metal-oxide surge arrestors shall be provided between line and earth in cable compartment of the switchgear panel.
- 6.3.14 Suitable lifting hooks shall be provided for each panel.



6.4 Circuit Breakers

- 6.4.1 Circuit breakers shall be of vacuum type. It shall comprise of three separate identical single pole units operated through the common shaft and shall be fully interchangeable both electrically and mechanically.
- 6.4.2 The circuit breaker operating mechanism shall be based on motor operated spring charging and it shall be re-strike free, trip free both electrically and mechanically, with anti-pumping feature.
- 6.4.3 The rated control voltage of the spring charging motor shall be 110 VDC/230 VAC. Closing coil shall operate at all values of voltages between 85% and 110% of rated voltage. Opening coil shall operate correctly under all operating conditions of the circuit breaker up to the rated breaking capacity and at all values of supply voltage between 70% and 110% of rated voltage.
- 6.4.4 The spring charging motor shall have adequate thermal rating such that continuous sequence of the closing and opening operations is possible as long as power supply is available to the motor. It shall also be possible to charge the spring manually and close the breaker in the event of failure of motor / control supply to motor. Operating handle shall be provided for charging the operating mechanism. After failure of control supply to the motor, one open-close-open operation shall be possible with the energy contained in the operating mechanism.
- 6.4.5 The motor rating shall be such that it requires not more than 30 seconds for full charging of the closing spring. Closing action of the circuit breaker shall compress the opening spring ready for tripping. When closing springs are discharged after closing the breaker, they shall be automatically charged for the next operation.
- 6.4.6 Mechanical indicators shall be provided to indicate OPEN/CLOSED positions of the circuit breaker and CHARGED/ DISCHARGED positions of the closing spring. An operation counter shall also be provided. These indicators and counter shall be visible from the panel front door without opening it.

6.5 Relays

- 6.5.1 All relays shall be microprocessor based numerical type. However, auxiliary relays can be static or electromechanical type. The relays shall be flush mounted on panel front with connections from the inside.

- 6.5.2 Auxiliary voltage of the relays shall be 110 VDC and the relays shall be capable of operating continuously between 80 – 120% of auxiliary voltage.
- 6.5.3 All numerical relays shall have adequate number of freely configurable, optically isolated, Binary Inputs (BI) and potential free Binary Outputs (BO).
- 6.5.4 All numerical relays shall have minimum four no. of current inputs, three for phase current and one for earth current, suitable for CT secondary current of 1A. The current inputs shall be compatible with both residual connected CT and Core Balance CT (CBCT). In addition, numerical relay in main outgoing feeder shall have three no. of voltage inputs for Under Voltage/Over Voltage protection.
- 6.5.5 All I/O's shall have galvanic isolation. Analog inputs shall be protected against switching surges and harmonics.
- 6.5.6 Making, breaking and continuous capacity of the relay contacts shall be adequate enough for the circuits in which they are used.
- 6.5.7 The numerical relay shall have the following protection functions with at least two independent protection setting groups. The protection functions shall be selectable from any of the IEC characteristic curves.
- (i) Definite time (DT) phase over current protection
 - (ii) Inverse Definite Minimum Time (IDMT) phase over current protection
 - (iii) Definite time (DT) earth fault current protection
 - (iv) Inverse Definite Minimum Time (IDMT) earth fault current protection
 - (v) Under Voltage protection
 - (vi) Over Voltage protection
- 6.5.8 Transformer feeder protection relay shall have provision for the following protection functions.
- (i) Buchholz alarm & trip
 - (ii) Oil Temperature Indicator (OTI) alarm & trip
 - (iii) Winding Temperature Indicator (WTI) alarm & trip
 - (iv) Pressure Relief Valve (PRV) trip
 - (v) Magnetic Oil Gauge (MOG) alarm
- 6.5.9 All numerical relays shall have provision for measurement and storage of electrical parameters such as voltage, current, frequency, active power, reactive power etc.

6.5.10 The numerical relay shall be able to record faults and events in non-volatile memory.

- (i) Fault record – At least 5 recent faults including the protection function operated, operating phase(s), voltages and currents along with date and time stamp.
- (ii) Event record – At least 200 events with date and time stamp.

6.5.11 The numerical relay shall have trip circuit supervision facility to monitor the circuit breaker trip circuit both in pre-trip and post-trip conditions. The relay shall also be able to provide circuit breaker monitoring, CT and VT supervision.

6.5.12 The numerical relay shall have self-diagnostic feature with separate output contact for indication of any internal relay failure.

6.5.13 The numerical relay shall have RS-232/RS-485/RJ-45/USB ports on front side for local communication with PC and on rear side for remote communication to SCADA system.

6.5.14 The numerical relay shall have feature for time synchronization through the SCADA System / networking.

6.5.15 The numerical relay shall be provided with backlit alphanumeric LCD to access protection settings, measurement parameters, fault and event records. Read and write access to protection settings shall be password protected.

6.6 Instrument Transformers

6.6.1 Instrument transformers shall be completely encapsulated cast resin type, suitable for continuous operation at the ambient temperature prevailing inside the switchgear enclosure, when the switchgear is operating at its rated load and the outside ambient temperature is 50°C.

6.6.2 Polarity marks shall indelibly be marked on each instrument transformer and at the lead terminals at the associated terminal block.

6.6.3 Voltage transformers shall be single phase units. Bus voltage transformers shall be housed in a separate panel on withdrawable truck.

6.6.4 HRC fuses of suitable rating shall be provided on primary side of voltage transformers. For secondary side, four pole Miniature Circuit Breakers (MCB) shall be provided.

6.7 Earthing



- 6.7.1 An earth bus made of copper or aluminium shall be provided throughout the length of the panel. It shall be bolted to the framework of each panel and brazed to each breaker earthing contact bar.
- 6.7.2 The earth bus shall have sufficient cross section to carry maximum fault current without exceeding the allowable temperature rise.
- 6.7.3 All non-current carrying conductors of the panel shall be connected to the earth bus. All joints to the earth bus shall be made through at least two bolts. Hinged doors shall be earthed through flexible earthing braid of adequate cross section. Suitable provision shall be provided at each end of the earth bus for connection with Owner's Earth conductor.
- 6.7.4 Positive earthing of the breaker truck and frame shall be maintained when it is in the connected position and in all other positions whilst the auxiliary circuits are not totally disconnected.
- 6.7.5 All metallic cases of relays, instruments and other panel mounted equipment shall be connected to earth bus by independent copper wires of size not less than 2.5 sq. mm with green colour insulation.
- 6.7.6 Instrument transformer secondary neutral point shall be earthed at one place only on the terminal block. Such earthing shall be made through links so that earthing of one circuit may be removed without disturbing the earthing of other circuits.
- 6.7.7 Separate earthing trucks shall be provided for earthing of busbars and incoming/outgoing feeders. The trucks shall have voltage transformer to indicate presence of voltage prior to earthing. An audible alarm shall also be provided in case of voltage on the earthing terminal. Integral earth switches may also be considered instead of earthing trucks. The earthing truck/switch shall have short circuit withstand capability equal to that of the associated switchgear panel.
- 6.7.8 The interlocks shall be provided to ensure the following.
- (i) It is not possible to rack-in the earthing truck/close the earthing switch when the breaker truck is in SERVICE position.
 - (ii) It is not possible to rack-in the breaker truck into SERVICE position when earthing truck is connected/earthing switch is in closed position.

6.8 Bus bar

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- 6.8.1 Bus bar shall be made of copper or aluminium with uniform cross section throughout their length. They shall be adequately supported on insulators to withstand electrical and mechanical stresses due to specified short circuit current.
- 6.8.2 All bus bars joints shall be thoroughly cleaned and anti-oxide grease shall be applied. Plain and spring washers shall be provided to ensure good contacts at the joints and taps. Wherever aluminium to copper connections are required, suitable bimetallic connectors or clamps shall be used.
- 6.8.3 Bus bars shall be provided with heat shrinkable sleeves of suitable insulation class throughout their length with proper colour coding. All bus bar joints and taps shall be shrouded.
- 6.8.4 Bus bar support insulators shall be made of non-hygroscopic, arc and track resistant, high strength material suitable to withstand stresses due to over voltage and short circuit current.
- 6.8.5 The Contractor shall submit busbar sizing calculation for specified continuous and short time current ratings during detailed engineering.

6.9 Measuring Instruments

- 6.9.1 All the measuring instruments shall be digital, flush mounting type with communication facility.
- 6.9.2 All feeders except main outgoing feeder shall be provided with digital Multi-Function Meter (MFM). Tri Vector Meter (TVM) shall be provided for the outgoing feeder (in the HT Panel). Accuracy class of MFM shall be 0.2 and that of TVM shall be 0.2S.
- 6.9.3 Measuring instruments shall have provision to display the following parameters.
- (i) Line and phase voltages
 - (ii) Line and phase currents
 - (iii) Active power, Reactive power, Apparent power
 - (iv) Frequency
 - (v) Power factor
 - (vi) Total Harmonic Distortion (THD)

6.10 Wiring and Terminal blocks

- 6.10.1 All internal wiring shall be done with 650 V grade, 1.5 sq.mm. PVC insulated stranded flexible copper wire. For CT secondary circuits, 2.5 sq.mm copper wire shall be used.



6.10.2 Wire terminations shall be made with solderless crimping type tinned copper lugs, which shall firmly grip the conductor. Insulation sleeves shall be provided at all the wire terminations.

6.10.3 Printed identification ferrules, marked to correspond with panel wiring diagram shall be provided at both ends of each wire. The ferrules shall be firmly located on each wire so that they cannot move or turn freely on the wire. Wire identification shall be done in accordance with IS 11353.

6.10.4 The Contractor shall be solely responsible for the completeness and correctness of the internal wiring and for the proper functioning of the connected equipment.

6.10.5 All internal wiring to be connected to the external equipment shall terminate on terminal blocks. Terminal blocks shall be rated for 650 V, 10 A and made of non-inflammable material.

6.10.6 CT and VT secondary circuits shall be terminated on stud type, non-disconnecting terminal blocks.

6.10.7 At least 10% spare terminals shall be provided on each panel and these spare terminals shall be distributed on all terminal blocks.

6.11 Warranty

The HT panel unit shall be warranted for minimum of 5 (five) years against all material/ manufacturing defects and workmanship.

6.12 Approval

6.12.1 Documents/Drawings

- (i) Guaranteed Technical Particular (GTP) Datasheet
- (ii) General Arrangement (GA) Drawing and Foundation details
- (iii) Schematic diagram
- (iv) Bus bar sizing calculation
- (v) Bill of Materials
- (vi) Quality Assurance Plan (QAP)

6.12.2 Test Certificates/ Reports

Type test reports as mentioned in the following clause shall be submitted for approval.

6.13 Testing and Inspection

6.13.1 Type Tests

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The switchgear panel shall be of type tested design. The following type test reports shall be submitted during detailed engineering. The tests should have been conducted on the similar equipment by NABL accredited laboratory.

Test	Standard	Relevant IEC Clause
Switchgear Panel		
Dielectric tests		
Power frequency voltage test	IEC 62271-200	6.2.6.1
Lightning impulse voltage test	IEC 62271-200	6.2.6.2
Dielectric tests on auxiliary and control circuits	IEC 62271-200	6.2.10
Measurement of the resistance of the main circuit	IEC 62271-200	6.4.1
Temperature-rise tests	IEC 62271-200	6.5
Short-time withstand current and peak withstand current tests	IEC 62271-200	6.6
Verification of the IP coding	IEC 62271-200	6.7.1
Verification of making and breaking capacities	IEC 62271-200	6.101
Mechanical operation test	IEC 62271-200	6.102
Internal arc test	IEC 62271-200	6.106
Circuit Breaker		
Mechanical operation test at ambient air temperature (M2 Class)	IEC 62271-100	6.101.2
Basic short-circuit test-duties	IEC 62271-100	6.106
Relays		
Vibration tests	IEC 60255-21-1	
Shock and bump tests	IEC 60255-21-2	
Seismic tests	IEC 60255-21-3	
Electromagnetic compatibility requirements	IEC 60255-26	
Product safety requirements	IEC 60255-27	
Common requirements	IEC 60255-1	



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Functional requirements	Relevant parts of IEC 60255-100 series	
Communication requirements	IEC 61850	
Current Transformers		
Temperature-rise test	IEC 61869-2	7.2.2
Impulse voltage withstand test on primary terminals	IEC 61869-2	7.2.3
Tests for accuracy	IEC 61869-2	7.2.6
Short-time current tests	IEC 61869-2	7.2.201
Voltage Transformer		
Temperature-rise test	IEC 61869-3	7.2.2
Impulse voltage withstand test on primary terminals	IEC 61869-3	7.2.3
Electromagnetic Compatibility tests	IEC 61869-3	7.2.5
Test for accuracy	IEC 61869-3	7.2.6
Short-circuit withstand capability test	IEC 61869-3	7.2.301

In case the contractor is not able to submit the test reports during detailed engineering, the contractor shall submit the reports of type/special tests either conducted by NABL accredited laboratory or witnessed by Employer.

6.13.2 Routine Tests

Routine tests and acceptance tests shall be as per the Quality Assurance Plan (QAP) approved by the Employer.

7 AC Cables

7.1 Standards and Codes

All AC Cables shall conform to the following standards and codes.

IS 7098	Crosslinked polyethylene insulated PVC sheathed cables, Part 1: For working voltage up to and including 1100 V
IS 7098	Crosslinked Polyethylene Insulated Thermoplastics Sheathed Cables Part 2: for Working Voltages from 3.3 kV up to and Including 33 kV

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7.2 All AC cables shall be flame retardant, low smoke (FRLS) type designed to withstand all mechanical, electrical and thermal stresses develop under steady state and transient operating conditions.

7.3 Only terminal cable joints shall be accepted. No cable joint to join two cable ends shall be accepted. However, cable joints may be allowed if the route length is more than maximum available drum length subject to Employer's approval.

7.4 In addition to manufacturer's identification on cables as per relevant standard, following marking shall also be provided over outer sheath.

- (i) Cable size and voltage grade
- (ii) Word 'FRLS' at every metre
- (iii) Sequential marking of length of the cable in metres at every metre

7.5 Cables shall be sized based on the following considerations:

- (i) Rated current the equipment
- (ii) Maximum voltage drop in LT cable (from inverter to inverter transformer) shall be limited to 0.5% of the rated voltage. For HT cables (from inverter transformer to interconnection point), maximum voltage drop shall be limited to 0.5 % of the rated voltage. Successful Bidder shall provide voltage drop calculations in excel sheet.
- (iii) Short circuit withstand capability as per design for 1s.
- (iv) De-rating factors according to laying pattern

7.6 Warranty

All cables shall be warranted for minimum of 1 (one) year against all material/ manufacturing defects and workmanship.

7.7 Approval

7.7.1 Documents/Drawings

- (i) Guaranteed Technical Particular (GTP) Datasheet
- (ii) Cable sizing calculation
- (iii) Quality Assurance Plan (QAP)

7.7.2 Test Certificates/ Reports

Type test certificates as per the standards mentioned above shall be submitted for approval.



7.8 Testing

Routine test and acceptance tests requirements shall be as per relevant standards for all cable sizes.

7.9 Installation

7.9.1 Cable installation shall be as per IS 1255.

7.9.2 LT cable (from inverter to inverter transformer) shall laid through RCC cable trench with supports.

7.9.3 Cable terminations shall be made with properly crimped lugs and passed through cable glands at the entry & exit point of the cubicles. Bimetallic lugs shall be used for connecting Cu bus bar and Al cables or vice-versa.

7.9.4 All AC cables shall be provided with punched/embossed aluminium tags. The marking shall be done with good quality letter and numbers of proper size so that the cables can be identified easily.

8 **Auxiliary Supply System**

8.1 Scheme for Auxiliary supply system shall be submitted by contractor during detailed engineering for the approval by Employer.

8.2 It shall mainly comprise of auxiliary transformer, AC distribution board(s) (ACDB), Battery & battery charger system, emergency lighting network, Uninterrupted power supply (UPS), distribution cables and metering & protective devices.

8.3 Following consideration shall be taken into account while sizing the auxiliary transformer:

- (i) 20% future load margin
- (ii) 20% design margin
- (iii) Total connected load at 0.8 power factor

9 **Distribution Switchgear**

9.1 Standards and Codes

All equipment provided under distribution switchgear shall comply with latest revisions and amendments of the relevant IEC standards and IS codes. In particular, the switchgear shall comply with the following standards and codes.



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Standard/Code	Description
IEC 61439-1	Low-voltage switchgear and control gear assemblies - Part 1: General rules
IEC 61439-2	Low-voltage switchgear and control gear assemblies - Part 2: Power switchgear and control gear assemblies
IEC 60947-1	Low-voltage switchgear and control gear - Part 1: General rules
IEC 60947-2	Low-Voltage Switchgear and Control gear: Circuit Breakers
IEC 60947-3	Low voltage switchgear and control gear: Part 3 Switches, disconnectors, switch-disconnectors and fuse combination units
IEC 60947-4-1	Low-voltage switchgear and control gear - Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters
IEC 60947-5-1	Low-voltage switchgear and control gear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices
IEC 62052-11	Electricity metering equipment (a.c.) - General requirements, tests and test conditions - Part 11: Metering equipment
IS 694	Polyvinyl chloride insulated unsheathed-and sheathed cables/ cords with rigid and flexible conductor for rated voltages - up to and including 450/750V
IEC 61869	Instrument Transformers
IS 3043	Code of practice for earthing
IEC 60255	Measuring relays and protection equipment - Part 1: Common requirements

9.2 Technical Parameters

System Details	
Rated system voltage	415 V + 10%, 3 Phase, 50Hz, 4 wire, Neutral Solidly Earthed
Digital Multifunctional Meter (MFM)	
Accuracy class	0.5 class for main distribution board at main control room and 0.5 class for DB at inverter room(s)
Communication with SCADA	RS485 communication with Modbus RTU
Current transformer (CT)	
Type	Cast Resin Bar Primary

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Voltage class and frequency	650V, 50Hz
CT Secondary Current	1 A
Class of insulation	E or better
Accuracy class & burden	
a) For Protection	5P20, 5VA PS Class for REF and core balance CT (CBCT)
b) For Metering	Class 0.5, 5VA (min)
Minimum primary earth fault current to be detected by CBCT	1 A
Instrument Security Factor for metering CT	5
Voltage transformer (VT)	
Type	Cast Resin
Accuracy class	0.5
Rated Voltage factor	1.1 continuous, 1.5 for 30 seconds
Class of insulation	E or better
Moulded case circuit breaker (MCCB)	
Rated voltage	415V
Release	Thermal-Magnetic/Microprocessor
Rated current	As per system requirement
Poles	4 poles
Rated insulation level	690V
Rated ultimate and service short circuit breaking Capacity	As per system requirement
Rated Making capacity (as per system requirement)	2.1 X Short circuit breaking Capacity
Utilization category	A

9.3 Constructional Details

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- 9.3.1 The panel shall be metal enclosed, free standing, floor mounted, modular type with compartmentalized construction having degree of protection of IP 2X (Indoor) as per IS/IEC 60529. All doors and covers shall be provided with neoprene gaskets to prevent entry of vermin and dust.
- 9.3.2 All switches, push buttons etc. shall be operated front and shall be flush/semi-flush mounted.
- 9.3.3 The panel shall be fabricated from 2 mm CRCA sheet steel for frame & load bearing surfaces. Partitions may be fabricated from 1.6 mm CRCA if no components are mounted on them.
- 9.3.4 Cable entries shall be from bottom. The opening of cable entry shall be covered by 3mm thick gland plates with proper sealing to avoid water and rodent entry.
- 9.3.5 Earthing bus bar of suitable cross section shall be provided throughout the length of panel.
- 9.3.6 The panel shall be duly wired with suitable size of 1.1kV, PVC insulated cable and terminals shall be brought out for cable connections. 10% spare terminals subjected to minimum one of each rating shall be provided on each distribution switchgear. All wire shall have ferrules as per wiring diagram.
- 9.3.7 The panel shall be painted with 2 coats of primer after pre-treatment and 2 coats of Polyurethane / epoxy paint with shade as decided by the Owner.
- 9.3.8 The panel shall be of dead front construction suitable for front operated and back maintained functioning.
- 9.3.9 240 V, 15 A, 3 pin industrial socket-outlet with ON/OFF switch shall be provided in each panel.
- 9.3.10 Each panel shall be provided with LED lamp rated for 240 V, 50 Hz, single phase AC supply for interior illumination controlled by door switch.
- 9.3.11 Suitable lifting hooks shall be provided for each panel.
- 9.3.12 Each switchgear panel shall be provided with thermostatically controlled space heaters to prevent condensation within the enclosure. The space heater shall be connected to 240 V, 50 Hz, single phase AC supply through suitable switch and fuse.



9.3.13 Earth leakage relay with Core balance CTs (CBCT) shall be provided on main incoming feeders having phase CT ratio more than 50/1A. CBCT's shall be circular window type with window size based on the overall diameter of the cables, to be finalized during detailed engineering.

The Distribution board shall have redundant power supply.

9.4 Warranty

Distribution panels (ACDB and DCDB) shall be warranted for minimum of 1 (one) year against all material/ manufacturing defects and workmanship

9.5 Approval

Schematic diagram and General Arrangement (GA) drawing shall be submitted for approval.

9.6 Testing

Routine test and acceptance tests requirements shall be as per relevant standards for all cable sizes.

10 **Uninterrupted Power Supply**

10.1 Standards and Codes

Standard/Code	Description
IEC 62040-1	Uninterruptible power systems (UPS) - Part 1: General and safety requirements for UPS
IEC 62040-2	Uninterruptible power systems (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements
IEC 62040-3	Uninterruptible power systems (UPS) - Part 3: Method of specifying the performance and test requirements

10.2 General Requirements

10.2.1 The Uninterrupted Power Supply (UPS) system shall be designed to supply power to following loads (but not limited to).

- (i) Data logger / SCADA
- (ii) Fire Detection/ Alarm Panel
- (iii) HMI of SCADA
- (iv) Emergency Lighting



(v) Inverter's Auxiliary supply (if applicable)

(vi) HT panel auxiliary

(vii) CCTV

10.2.2 Sizing of UPS shall be done considering the above-mentioned load at power factor of 0.8 lagging inclusive of 10% design margin at 50 °C.

10.3 System Description

10.3.1 The UPS shall automatically provide continuous, regulated AC power to critical loads under normal and abnormal conditions, including loss of input AC power. The UPS system shall consist of the following major equipment.

(i) UPS Module

(a) Insulated Gate Bipolar Transistor (IGBT) Converter

(b) Insulated Gate Bipolar Transistor (IGBT) Inverter

(c) Digital Signal Processor (DSP) using Pulse Width Modulation (PWM) for Direct Digital Control (DDC) of all UPS control and monitoring functions

(d) Static bypass switch

(ii) Battery system for 2 hours

(iii) Battery protective and disconnect device

(iv) Maintenance bypass switch

(v) LCD display panel and LED indications

(vi) Integrated UPS Communications Protocols capable of communicating with SCADA system

10.3.2 The UPS shall meet the following minimum specifications.

Parameter	Specification
Topology	Online double conversion UPS
Input	
Voltage	415 V $\pm$ 10% AC
Frequency	50 $\pm$ 5 Hz
Power factor	0.95
Output	
Voltage	230V $\pm$ 1% AC



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Frequency	50 Hz
Power factor	0.8
Battery	
Type	Sealed, Maintenance-Free (AGM) battery
Capacity	100% UPS load for 2 hours
Monitoring and communication	
LED Indicators	Load on Inverter, Battery operation, Load on Bypass, Overload, LCD Fault, UPS Fault
Electrical contacts	Closing contacts for each of the following conditions: 1. Unit on Battery 2. Low Battery 3. Summary Alarm 4. UPS On 5. Input Fail
Local Display	LCD/ LED
SCADA communications	RS-232 & RS-485 Interface Port
Overall efficiency	>90%
Electrical Protection	Input/ output under voltage, over temperature, overload, Short circuit, battery low trip

10.3.3 The UPS shall be forced air cooled by internally mounted fans. The fans shall be redundant in nature to ensure maximum reliability. The fans shall be easily replaceable without the use of special tools.

10.3.4 Contractor shall provide the Operation & Maintenance Manual and mandatory spare parts list along with the equipment.

10.4 Warranty

UPS shall be warranted for minimum of 5 (five) years and batteries shall be warranted for a minimum of 2 (two) years against all material/ manufacturing defects and workmanship

10.5 Approval

10.5.1 Documents/Drawings

- (i) Technical Datasheet
- (ii) UPS sizing calculation

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- (iii) Single line diagram
- (iv) General Arrangement (GA) drawing
- (v) Quality Assurance Plan

10.5.2 Test Certificates/Reports

Type test certificates as per the standards mentioned above shall be submitted for approval.

10.6 Tests

10.6.1 Routine tests and acceptance tests on final product shall be done as per QAP approved by the Employer.

10.6.2 On completion of installation and commissioning of the equipment on site tests shall be carried out with the max. available load, which does not exceed the rated continuous load. An on-site test procedure shall be submitted by contractor include a check of controls and indicators after installation of the equipment.

11 Earthing

11.1 Standards and Codes

Earthing system shall comply with latest revisions and amendments of the relevant IEC standards and IS codes. In particular, earthing system shall comply with the following standards and codes.

Standard/Code	Description
IS 3043	Code of Practice for Earthing
IEEE 80	IEEE Guide for Safety in AC Substation Grounding
IEEE 142	IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems
Indian Electricity Rules	

11.2 General Requirements

11.2.1 Earthing system shall be designed based on system fault current and soil resistivity value obtained from geo-technical investigation report. Earth grid shall be formed consisting of number of earth electrodes sufficient enough to dissipate the system fault current interconnected by earthing conductors.



- 11.2.2 The earth electrode shall be made of high tensile low carbon steel rod, molecularly bonded by high conductivity copper on outer surface with coating thickness not less than 250 micron as per relevant standards. Suitable earth enhancing material shall be filled around the electrode to lower the resistance to earth. Inspection chamber and lid shall be provided as per IS 3043.
- 11.2.3 Earth conductors shall be made of copper bonded steel or galvanized steel of sufficient cross section to carry the fault current and withstand corrosion.
- 11.2.4 Earth conductors buried in ground shall be laid minimum 600 mm below ground level unless otherwise indicated in the drawing. Back filling material to be placed over buried conductors shall be free from stones and harmful mixtures. Earthing conductor shall be buried at least 2000 mm outside the fence of electrical installations.
- 11.2.5 Earth electrodes shall not be situated within 1.5m from any building whose installation system is being earthed. Minimum distance between earth electrodes shall be the driven depth of the electrode.
- 11.2.6 Every alternate post of the transformer yard and switchyard fence shall be connected to the earth grid by one GS flat and gates by flexible lead to the earthed post.
- 11.2.7 All welded connections shall be made by electric arc welding. For rust protection the welds should be treated with red lead compound and afterwards thickly coated with bitumen compound.

11.3 Earthing of PV array field

- 11.3.1 All PV Modules, Module Mounting Structures (MMS) and String Monitoring Unit (SMU) structures in the PV array field shall be bonded to the earthing system by two distinct connections or path.
- 11.3.2 Each PV Module frame shall be earthed using copper wire of sufficient cross section. The copper wire shall be connected to the earth hole provided in the module frame using suitable arrangement in line with the manufacturer recommendation. The earthing arrangement shall use stainless washers to prevent galvanic corrosion between aluminium frame and copper wire. In order to achieve effective earthing, serrated washers shall be employed to penetrate the anodization layer of the module frame.



- 11.3.3 Continuous copper earthing wire shall be run to connect a group of modules and both ends of the loop shall be bolted to the DC earth grid using bimetallic lugs and stainless-steel fasteners. The copper earthing wire shall be routed in such a way to avoid physical contact with the module aluminium frame.
- 11.3.4 The connection between MMS and DC earth grid shall be welded. Portion of the MMS which undergoes welding at site shall be coated with two coats of cold galvanising and anti-corrosion paint afterwards.
- 11.3.5 Earth electrodes of the DC earth grid shall be uniformly distributed throughout the PV array field so that optimum earth resistance is offered to leakage current flowing from any module frame or MMS.
- 11.3.6 SMU equipment earthing point shall be connected to the DC earth grid using flexible copper cable of sufficient cross section as recommended by the manufacturer. The connection with the DC earth grid shall be done using suitable bimetallic lugs and stainless-steel fasteners.

11.4 PCU Earthing

DC negative bus bar of the PCU shall be earthed to avoid Potential Induced Degradation (PID). DC negative bus bar and PCU equipment earth shall be bonded to the PCU earth bus and connected to earth electrodes through flexible copper cable of sufficient cross section as mentioned by the manufacturer. The interconnection of PCU earth electrodes with DC earth grid shall be as per PCU manufacturer recommendation.

11.5 Transformer Earthing

- 11.5.1 Inverter transformer neutral shall be floating, not to be earthed. Transformer tank, cable box, marshalling box and all other body earth points shall be earthed.
- 11.5.2 Inverter transformer shield shall be earthed separately using minimum two no. of earth electrodes. Earthing conductor between shield bushing and earth electrodes shall be copper flat of suitable size not less than 25 x 6 mm.
- 11.5.3 Neutral and body of the auxiliary transformer shall be earthed.

11.6 Inverter Room and Main Control Room Earthing

- 11.6.1 Metallic enclosure of all electrical equipment inside the inverter room and main control room shall be connected to the earth grid by two separate and distinct connections.



11.6.2 Cable racks and trays shall be connected to the earth grid at minimum two places using galvanized steel flat.

11.6.3 SCADA and other related electronic devices shall be earthed separately using minimum two no. of earth electrodes.

11.7 Approval

11.7.1 Documents/ drawings

- (i) Technical datasheet
- (ii) Earthing Design calculation

11.8 Tests

On completion of installation, continuity of earth conductors and efficiency of all bonds and joints shall be checked. Earth resistance at earth terminations shall be measured and recorded.

The earth plate shall be provided to facilitate its identification and for carrying out periodical inspection.

12 **Lightning Protection System**

12.1 Lightning Protection System for entire plant against direct lighting strokes shall be provided with Early Streamer Emission (ESE) Air Terminal as per NFC 17-102:2011.

12.2 Protection Level for the entire plant shall be level – I.

12.3 Each ESE air terminal shall be provided with following accessories.

- (i) Highly insulated poly-plastic adaptor to fix the ESE air terminal with the FRP mast
- (ii) Fiberglass Reinforced Plastic (FRP) mast
- (iii) Coupler to connect FRP mast with GI mast
- (iv) Galvanized Iron mast with base plate and guy wire kit
- (v) Down-conductor: PVC insulated flexible copper cable of suitable size complying with EN 50164-2 or equivalent standard. It shall be routed along the mast with suitable fixings and connectors
- (vi) Test joint with each down conductor
- (vii) Lightning event counter complying with EN 50164-6 or equivalent standard. It shall be fixed at suitable height in series with the down conductor.
- (viii) Earth termination system in accordance with NFC 17-102. Earth electrodes shall



comply with the EN 50164-2 or equivalent standard. Earth enhancing compounds complying with EN 50164-7 or equivalent standard, may be used where soil resistivity is higher and making it impossible to achieve system resistance within specified limit.

(ix) Guy wire for the support during high wind conditions

12.4 Accessories listed above are indicative only and any other fittings or accessories, which are usual or necessary for satisfactory operation of the lightning protection shall be provided by the Contractor without extra charges.

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

12.6 The product shall be warranted for minimum of 2 (two) years against all material/ manufacturing defects and workmanship.

12.7 Type test reports as per NFC 17-102:2011 shall be submitted during detailed engineering for approval.

13 Communication Cables

13.1 Optical Fibre Cables

13.1.1 Optic Fibre cable shall be 4/8/12 core, galvanized corrugated steel taped armoured, fully water blocked with dielectric central member for outdoor/ indoor application so as to prevent any physical damage.

13.1.2 The cable shall have multiple single-mode or multimode fibres on as required basis so as to avoid the usage of any repeaters.

13.1.3 The outer sheath shall have Flame Retardant, UV resistant properties and are to be identified with the manufacturer's name, year of manufacturing, progressive automatic sequential on-line marking of length in meters at every meter on outer sheath.

13.1.4 The cable core shall have suitable characteristics and strengthening for prevention of damage during pulling.

13.1.5 All testing of the optic fibre cable being supplied shall be as per the relevant IEC, EIA and other international standards.

13.1.6 The Contractor shall ensure that minimum 100% cores are kept as spare in all types of optical fibre cables.



13.1.7 Cables shall be suitable for laying in conduits, ducts, trenches, racks and underground buried installation.

13.1.8 Spliced/ Repaired cables are not acceptable. Penetration of water resistance and impact resistance shall be as per IEC standard.

13.2 Communication Cable (Modbus)

13.2.1 Data (Modbus) Cable to be used shall be shielded type with stranded copper conductor. Cable shall have minimum 2 pair each with conductor size of 0.5 Sq.mm. Cable shall be flame retardant according to IEC 60332-1-2.

13.2.2 Cable shall be tested for Peak working voltage of not less than 300 V and shall be suitable for serial interfaces (RS 422 and RS 485).

13.2.3 Communication cable shall be laid through underground with suitable HDPE ducts.

14 Illumination

14.1 Standards and Codes

LED luminaires shall be tested at independent laboratory as per the following test standards.

Standard/Code	Description
LM79-08	Electrical and Photometric Measurements of Solid-State Lighting Products
LM 80-15:	Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules

15 General specification

15.1 This specification covers design, supply and installation of uniformly Illumination system along the peripheral & internal roads, main control room & inverter rooms, switchyard and other facilities including entry points/gate(s) inside the plant area.

15.2 The contractor shall furnish Guaranteed Technical Particulars of the LED luminaires, from renowned brands available in the market for approval of Employer.

15.3 Lighting system shall work on the auxiliary supply and same shall be incorporated in auxiliary loads. Contractor shall provide minimum 20% of total lighting points as emergency lighting points, fed from UPS DB or DCDB as per scheme adopted by the Contractor. Indoor and outdoor emergency lights shall be provided at each inverter



room, main control room, security room and main gate.

16 Lighting Levels

16.1 The average LUX level of 10 lm is to be maintained in switchyard. However, a lux level of 20 lm ((10+10) additional switchable on requirement only) is to be maintained in switchyard on transformer.

16.2 The lighting system for outdoor and indoor areas of solar power plant shall be designed in such a way that uniform illumination is achieved. Average LUX level to be maintained in different areas shall be as under:

Area	LUX
Control Room and equipment rooms	300
Office	300
Battery & other rooms	150
Internal/Periphery Roads	4
Transformer yard/Switch Yard	20
H – pole and metering point	10

16.3 The lighting level shall take into account appropriate light output ratio of luminaires, coefficient of utilization maintenance factor (of 0.7 or less) to take into account deterioration with time and dust deposition.

16.4 LED luminaires for Outdoor Applications

16.4.1 General Requirements:

Parameter	Specified Value
Input voltage	170-260 V
Input Frequency	50 HZ +/-1 HZ
Power Factor	0.90 (Minimum)
Luminous efficacy	>90 lumens per watt
Beam Angle	Minimum 120°
Total Harmonic Distortion	< 10 %



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Working Humidity	10% - 90% RH (Preferably Hermetically sealed unit)
Degree of Protection	Minimum IP 65 (for Outdoor fixtures)
Luminaire Casing	Powder coated metal / Aluminium.
Color Temperature	5700 K (cool day light)
Color Rendering Index	>65
Moisture protection in case of casing damage	IP 65 (driver unit shall preferably be totally encapsulated)

16.4.2 The LED luminaire (outdoor) housing, heat sink, pole mounting bracket, individual LED reflectors and front heat resistant tempered glass should be provided.

16.4.3 The LED luminaire (outdoor) housing should be made of non-corrosive high pressure die cast aluminium and the housing should be power coated grey, so as to ensure good weatherability. Each individual LED source should be provided with an asymmetrical distribution high reflectance aluminized reflector, which should ensure that the light distribution of the luminaire is suitable for road lighting applications (wide beam distribution) and should ensure high pole to pole spacing.

16.4.4 The luminaire should be provided with in built power unit and electronic driver.

16.4.5 The luminaire should be suitable for standard street light poles and should be suitable for side entry and bottom entry (post top).

16.4.6 GI Lighting pole of suitable diameter capable of withstanding system and wind load, shall be provided with average Zn coating thickness of 80micron. The street light poles shall have loop in loop out arrangement for cable entry and light fixture / wiring protected with suitably rated MCB.

16.4.7 All outdoor lighting system shall be automatically controlled by synchronous timer or photocell. Provision to bypass the timer or photocell shall be provided in the panel.

16.4.8 Lighting panels shall be earthed by two separate and distinct connections with earthing system. Switch boxes, junction boxes, lighting fixtures, etc. shall be earthed by means of separate earth continuity conductor. Cable armour shall be connected to earthing system at both the ends. Proper earthing of street light poles shall be ensured.

16.4.9 Junction box for lighting shall be made of fire retardant material. The degree of protection shall be IP55 for outdoor JB.



16.4.10 Lighting cables, wherever exposed to direct sunlight, shall be laid through Double Wall Corrugated (DWC) HDPE conduits.

16.5 LED luminaire/lamps for Indoor Applications

16.5.1 LED luminaire/lamps shall have minimum 3 star BEE rating.

16.5.2 All indoor LED luminaire/lamps shall be supplied with proper diffuser to avoid direct visibility of LED and suitable heat sink for longer life.

16.6 Warranty

All luminaires shall be warranted for minimum of 2 (two) years against all material/manufacturing defects and workmanship.

16.7 Approval

16.8 Documents/ drawings

- (i) Lux level calculations
- (ii) Building and street lighting layout
- (iii) Luminaire data sheet
- (iv) Test certificates

17 Weather Monitoring System

As a part of weather monitoring system, the Contractor shall provide the following measuring instruments with all necessary software and hardware required to integrate with SCADA.

17.1 Pyranometer

17.1.1 The Contractor shall provide minimum 8 (eight) number of secondary standard pyranometers (ISO 9060 classification) along with necessary accessories for measuring the incidental solar radiation at horizontal and inclined plane of array. The location(s) shall be decided as per the Owner.

17.1.2 Specification of the pyranometer shall be as follows.

Parameter	Specification
Spectral Response	0.31 to 2.8 micron

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

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

17.2 Temperature Sensor

The Contractor shall provide minimum 6 (six) temperature sensors (1 (one) for ambient temperature measurement with shielding case and 5 (five) for module temperature measurement). The temperature sensor shall be Resistance Temperature Detector (RTD)/ Semiconductor type with measurement range of 0°C to 80°C. The instrument shall have valid calibration certificate.

17.3 Anemometer

Contractor shall provide minimum one no. ultrasonic wind sensor (no moving parts) for wind speed and direction monitoring.

Parameter	Specification
Velocity range with accuracy limit	0-60m/s with +/-2% accuracy @12 m/s; Resolution: 0.01m/s
Wind direction range with accuracy limit	0 to 360° (No dead band) with +/-2° accuracy @12 m/s; Resolution: 1°



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Mounting Bracket	Anodized Aluminium bracket to reduce corrosion, all mounting bolts of SS
Protection Class	IP66
Output	RS232 and RS485

17.4 Data logger and Data Acquisition System

Data logger for the weather monitoring station should have the following features:

17.4.1 Provision for analog, digital and counter type inputs for interfacing with various type of sensors

(i) Analog Input

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

(ii) Digital Inputs

- Adequate no. of Digital inputs and outputs for the application

(iii) Provision for RS232 and RS485 serial outputs

(iv) Built-in battery backup

(v) Connectivity and Data transmission:

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



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

18 CCTV Camera

18.1 CCTV Cameras along with monitoring stations (sufficient numbers) and all other accessories required for its proper operation must be installed to have complete coverage of following areas.

- (i) Main entry: Covering all the entry/exit 24 hours
- (ii) Along the Plant Perimeter: Covering complete perimeter of Plant Area to capture all possible intrusion
- (iii) Control Rooms: Covering Entry/Exit and activities within Control Rooms
- (iv) The Contractor has to propose the locations and number of cameras required for the Plant during bidding, however Employer's decision on number of cameras shall be final.

18.2 Monitoring stations of the CCTV Network shall be installed in Main Control Room.

18.3 The CCTV system shall be designed as a standalone IP based network architecture. System shall use video signals from different cameras at defined locations, process the video signals for viewing on monitors at control room and simultaneously record all video streams using latest compression techniques.

18.4 Camera shall be colour, suitable for day and night surveillance (even under complete darkness) and network compatible.

18.5 It shall be possible to control all cameras i.e., PTZ auto/ manual focus, selection of pre-sets, video tour selection etc. The software shall support flexible 1/2/4 windows split screen display mode or scroll mode on the display monitor for live video.

18.6 The system shall support video analytics in respect of the following:

- (i) Video motion detection
- (ii) Object tracking



- (iii) Object classification
- (iv) Camera server shall be provided with sufficient storage space to storage recordings of all cameras at HD mode for a period of 15 days. All recordings shall have camera ID, location, date and time of recording.

19 Fire Alarm System

19.1 Standards and Codes

Standard/Code	Description
IS 2189	Selection, Installation and Maintenance of Automatic Fire Detection and Alarm System Code of Practice
IS 2171	Portable Fire Extinguishers, Dry Powder (Cartridge Type)
IS 8149	Functional requirements for twin CO ₂ fire extinguishers (trolley mounted)
IS 2546	Galvanized mild steel fire bucket
National Building code 2005	

19.2 Contractor shall ensure the compliance of fire detection and addressable type alarm system as per relevant standards and regulations. The installation shall meet all applicable statutory requirements and safety regulations of state/central fire department/body or any other competent authority in terms of fire protection.

19.3 Firefighting system for the proposed power plant for fire protection shall be consisting of but not limited to:

- (i) Sand buckets
- (ii) Portable fire extinguishers (CO₂ and dry powder type)
- (iii) Microprocessor based fire alarm panel
- (iv) Multi sensor smoke detectors
- (v) Hooter cum strobe
- (vi) Manual call points
- (vii) Cables from sensor to fire Panel.

19.4 Minimum two numbers of fire extinguishers (CO₂ and Foam type each, of capacity 10 kg having BIS certification marking as per IS: 2171) shall be provided at every building/container, transformer yard and switchyard. However, contractor must comply with existing building code for fire protection and relevant IS codes.

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19.5 Four numbers of stand with four sand buckets on each stand shall be provided in the Transformer Yard. Sand buckets inside the building shall be provided at strategic locations as decided during detailed engineering.

19.6 Digital output from the fire detection system shall be integrated with SCADA

19.7 Contractor shall submit the plan for fire and smoke detection system for the Employer's approval.

20 Testing Instruments

The Contractor shall provide the following set of instruments for on-site testing.

20.1 Earth resistance tester

Parameter	Specification
Display	Backlit LCD or LED display
Range	Earth Resistance: up to 2000 Ω Earth Voltage: 200 V
Accuracy	$\pm (2\% + 5)$
Safety Ratings	IP 56
Programmable Limits setting	Enabled
Accessories	
Earth Ground Stakes (4 Nos)	
Three cable reels with cable length up to 20 m	
Carry Case-1 (capable of handling tester along with accessories)	
1 set of spare battery	

20.2 Array tester

Parameter	Specification
Display	Backlit LCD or LED display
Functionality	All electrical tests required by IEC 62446-1:2016
Memory	Up to 200 records & USB downloadable to Computer
Accessories	
A set of two, 4mm fused leads for extra protection during installation tests.	



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Leads which enable the array tester to connect directly to PV arrays

1 set of spare battery

20.3 Insulation tester

Parameter	Specification
Display	Backlit LCD or LED display
Insulation Test Range	0.1 MΩ to 10 GΩ
Test Voltage	250V, 500V, 1000V, 5000V
Test Voltage accuracy	+20% on positive side only no negative variation is allowed
Insulation Test Current	1 mA nominal
Auto Discharge	Discharge time < 0.5 Second for C = 1
Open Circuit test Voltage	>4 V, <8 V
Accessories	
Heavy duty Test Lead Set – 4 Nos.	
Carry Case with sufficient space for accommodating accessories.	

20.4 Digital Multimeter

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



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Carry Case with sufficient space for accommodating accessories.

20.5 Clamp meter

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

20.6 Infra-red thermal imaging camera

Parameter	Specification
Spectral response	8 μm to 14 μm (LW)
Temperature-sensitivity and calibration range	-20 $^{\circ}\text{C}$ to +120 $^{\circ}\text{C}$
Atmospheric air temperature	-10 $^{\circ}\text{C}$ to +40 $^{\circ}\text{C}$
Thermal sensitivity	NETD $\leq$ 0.1 K at 30 $^{\circ}\text{C}$
Geometric resolution	640 x 480 pixels
Photo camera resolution	Approx. 30 times of IR camera resolution
Absolute error of measurement	$< \pm 2$ K
Adjustable parameters	Emissivity, ambient temperature
Adjustable functions	Focus, temperature level and span



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Measurement functions	Measuring spot, measuring area with average and maximum temperature
Calibration	The measuring system (Camera, lens, aperture and filter): The camera has to be traceably calibrated at least every two years. The calibration has to be documented. If the camera is not compliant, it has to be readjusted by the manufacturer.
Documentation	Storing of the infrared picture with the radiometric data

20.7 Digital lux meter

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

20.8 All testing equipment shall possess valid calibration certificate issued from approved NABL labs.

20.9 Instruments of superior rating is allowed after seeking consent of the Employer.

20.10 Maintenance, calibration, up keeping, repair & replacement of these tools will be in the scope of the Contractor during 10 years of O&M.

20.11 It is Contractor's responsibility to arrange for tools, tackles, logistics, test kits, manpower, experts etc. required for trouble free operation of Plant.



B Wind Power System

21 Supply

The Scope of Supply covered under this specification shall be but not limited to the following:

21.1 Design, engineering, manufacture, in house testing and supply at site of suitable low voltage, 50 Hz, upwind / downwind, horizontal axis Wind Turbine Generators (WTGs) with minimum rating of 2MW and total capacity 40 MW (may be up to 50 MW but not less than 40 MW in any case) complete with accessories as may be required for erection, commissioning and successful continuous operation. The WTGs shall be equipped with current limiting devices and capacitors (in case of induction generators) so as to maintain power factor conforming to the requirement of State grid. WTGs shall have the LVRT and HVRT capability including all other functional capabilities as per the requirement under the CEA Regulations for Grid connectivity.

Only the makes and models approved under Revised List of Models and Manufacturers (RLMM list) of MNRE as on the date of bid submission should be offered.

21.2 Design, engineering, manufacture and supply at site of Towers, Blades, Hub, Nacelle, Foundation Base and other major components suitable for offered WTGs.

21.3 Design, engineering, manufacture and supply at site of wind farm internal electrical system including the Equipment at Unit Substation of each WTG, materials for 33 kV Overhead Transmission lines.

21.4 Design, engineering, manufacture and supply at site of Grid interfacing equipment including transformers, HT lines, panels, kiosks, protection equipment, metering equipment for evacuation of power from the wind power plant to the grid sub-station.

21.5 Design, engineering, manufacture and supply of tri-vector type energy meter(s) for recording data regarding export and import of power to/from grid on real time basis.

21.6 Design, engineering, manufacture and supply of VAR drawl compensation system, if required.

21.7 Design, engineering, manufacture and supply of all control system to give command to WTGs, receive data, processing and getting required report on energy generation, wind speed etc.



21.8 Design, engineering, manufacture and supply Centralized Monitoring and Control System for the Wind Plant.

21.9 Design, engineering, manufacture and supply of any item not specified but essential for the wind plant.

21.10 Stocking of adequate spares at site for operation & maintenance of wind energy project.

21.11 Supply and stocking of all the necessary tools and tackles for carrying out all the maintenance work.

List of such spares to be provided.

21.12 Wind Monitoring Mast: The bid should include supply, installation and maintenance of one wind monitoring mast at offered site till the power curve testing is carried out. The height of the wind mast should be close to the hub height of the WTGs installed therein. Numbers and specifications of the equipments and sensors (anemometers, wind vanes, temperature and pressure sensors and dataloggers etc. shall be as per the requirement set under the IEC-61400-12-1:2017 edition that defines the standard for power performance measurement of electricity producing wind turbines. In any case the numbers of anemometers shall not be less than two. The Wind Mast may be dismantled and taken back by bidder after successful Power Curve test.

21.12.1 This shall include all required data loggers, sensors etc. capable of recording data for a minimum of 10-minute average intervals to ensure correct and reliable data collection and its computation for analysis, for verification of generation with reference to the actual wind conditions at Hub height.

N.B.: The bidder must quote this item separately in the price bid.

21.13 Documents & Drawings

21.13.1 Contractor shall utilise, only the WTG co-ordinates specified in **Annexure ____**.

Following documents in two copies each along with the soft copies shall be submitted to Employer/Employer's representative for review and approval:

1. Detail Technical Specifications of the WTGs and associated Equipment for the wind farm.
2. Power Curve and Thrust Curve of the offered WTG model
3. General Arrangement Drawings.



4. Contour plan for the land area.
 5. Micrositing plan & wind farm layout with consideration to shadow effect on Solar PV arrays also to be specified.
 6. Schematic diagram for entire evacuation system and transmission loss calculations.
 7. G. A. drawings for overhead lines along with all types of structures, 33kV switchyard & Interfacing.
 8. Quality Assurance Plans.
 9. Copies of WTG type test certificates and certified Power Curve Test certificates,
 10. WTG Design assessment certificates with all annexures, along with test reports
 11. Routine and acceptance tests for major components.
 12. Site Suitability assessment report: Bidder shall carry out the Site Suitability Assessment study including the Mechanical Load Assessment for the offered WTG w.r.t. the WTG micrositing as given in **Annexure -----**. Bidder shall submit the detailed Site Suitability assessment report for the offered WTG along with the bid document. All the assessment under the site suitability assessment study shall genuinely assess the WTG suitability for the given micrositing, and the Bidder shall not offer any of the WTG model which are not found suitable for the given micrositing and are having any of the site suitability issue which may impact its design life and performance etc.
- 21.13.2 The Bidders shall restrict themselves to the already given micrositing only and there shall not be any modification in the micrositing. Any such concern related to non-ability to provide any functional or technical guarantee for the offered WTG due to any limitation of the given micrositing, shall be communicated to Employer during the Pre-bid itself.
- 21.13.3 Submission of all the drawings on "as built" basis covering all changes/modifications, if any, due to site conditions in four sets to Employer after commissioning of the project for record purpose.
1. One soft copy of as built drawings shall also be submitted.
 2. O & M Manuals in four sets.
- 21.13.4 The Contractor shall forward to Employer, Schedule of supply within 15 days' time from the date of Award of Contract.



22 Installation, Testing & Commissioning:

The Scope of Installation, Testing & Commissioning covered under this specification shall be but not limited to the following:

22.1 Statutory Approvals: Obtaining statutory approvals / clearances, wherever required, from Government departments but not limited to the following:

1. State Renewable Energy Development Agency
2. State Power Utilities
3. Electrical Inspectorate (CEIG)
4. State Load Dispatch Centre
5. Other applicable permissions / clearances relevant for the Project site.
6. copy of documents of all such clearances taken should be submitted to the Employer

22.2 Erection, Testing & Commissioning of Wind Farm shall include:

1. Construction of civil foundations for WTG towers.
2. Transportation of all materials to WTG locations.
3. Erection of WTG towers on foundations.
4. Installation of WTGs (Nacelle, Hub Rotor Assemblies and other components) on erected towers.
5. Installation, testing and commissioning of unit substation for WTGs and adequate Internal evacuation system for the Wind farm.
6. Testing and commissioning of WTGs.
7. Installation, testing and commissioning of Grid interfacing equipment including transformers, 33 kV feeders from WTGs up to the Point of Common Coupling, panels, kiosks, protection equipment, metering equipment for evacuation of power from the wind power plant to the Pooling sub-station.
8. Installation, testing and commissioning of tri-vector type energy meter(s) for recording data regarding export and import of power to/from grid on real time basis.
9. Installation, testing and commissioning VAR drawl compensation system, if required.



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10. Installation, testing and commissioning of Centralized Monitoring and Control System

11. (CMCS) for remote operation of the WTGs, receiving the data relating to WTGs, processing and getting required report on energy generation, wind speed etc.

22.2.1 Construction of control room for housing of CMCS.

22.2.2 Access Infra-Structure: Contractor shall assess suitability of internal roads w.r.t. requirement and arrange construction/ strengthening as desired and also check suitability of land around each WTG for placement of crane, etc.

N.B. Internal Roads shall form part of the shared infrastructure along with Part-01(Solar PV Plant) and Part-03 (Energy Storage System) that are part of the Plant Facilities.

22.3 Operation and Maintenance of the wind farm on comprehensive basis for the 10 (Ten) years. The rates quoted by bidder for Comprehensive O&M of the Plant Facilities on yearly basis for 10 years shall be inclusive of the O&M of Part-02 (Wind Plant).

22.3.1 The Contractor shall be responsible for all the required activities for maintenance and successful running of the WTGs for:

- Optimum energy generation as well as maintenance of associated facilities of the wind farm.
- Deputation of Engineering and other supporting personnel.
- Keeping the WTGs in operational mode so as to get optimum energy generation from the Wind Farm. Any Planned annual shutdown period shall be mutually decided with the Employer.
- Monitoring controlling, troubleshooting maintaining of records, registers.
- To maintain proper and adequate inventory of all spares, consumables and fixing / application of the same as per WTGs
- Conducting periodical maintenance check, testing over hauling and taking preventive action for smooth running of wind farm as required.
- General up keeping of all equipment, building, roads etc.
- Submission of daily/periodical reports to Employer on energy generation & operating conditions of the wind farm.



- Continuous monitoring of performance of the WTGs and regular maintenance of the whole system including WTGs, transformers, overhead lines, outdoor kiosks, switchgear, equipment etc. for extracting and maintaining the maximum energy output from the wind farm.
- To maintain at the facility accurate and up-to-date operating logs, records and monthly reports regarding Operation & Maintenance of the facility.

22.3.2 The daily and monthly energy output of each WTG shall be recorded. Daily Generation Reports shall be shared with the Employer. Monthly Performance reports indicating turbine wise energy production, down time, capacity utilization factor, machine availability etc. shall be prepared for each WTG as well as for the wind farm and furnished in soft mode to Employer in the first week of the following month. The Report shall comprise of details like energy generation, grid availability, breakdowns, generation hours, low wind hours, machine availability etc. which shall be sent through e-mail and /or made available to Employer.

22.3.3 Employer shall be given online access to the real time SCADA Data at its head office so as to visualise the plant operation and performance status on real-time basis.

22.3.4 Quarterly and Annual performance Reports covering monthly performance details based on the following parameters shall be prepared and submitted to Employer: A sample format for Quarterly Performance Report is added in Sheet 10.

(a) Estimated annual energy generation submitted along with the bid. Giving all Gross P50, Net P50, P75 and P90 values. Monthly values if available in EYA report shall also be provided in the Annual Performance Report

(b) Actual energy generation at LCS panel during the year.

(c) Monthly billed energy generation during the year including the breakup of exported and imported energy, reactive power consumption etc.

(d) Machine Availability during the year

(e) Internal Grid Availability during the year

(f) External Grid Availability during the year

(g) Details of Non-Available hours including breakup for at-least following parameters

- Scheduled Maintenance hours during the year
- Unscheduled Maintenance hours (Breakdown hours) during the year



- Any other non- availability due to Operator's fault within the responsibility of O&M Contractor
- Force Majeure hours which caused unavailability of the wind plant during the year
- Unavailability Due to Curtailment
- Unavailability due to Employer's instructions
- Any Other Non-Operational Hours that is not the responsibility of O&M Contractor

(h) Average Wind Speed Recorded for the year. Nacelle anemometer wind speed. Mast data if available.

(i) Details of Major breakdown and rectification done

22.3.5 The above report shall be submitted annually.

22.3.6 Employer at its discretion may get the performance checked from an independent technical consultant.

22.3.7 Maintenance: The Contractor shall draw the preventive maintenance schedules for daily, monthly and yearly and attend to the breakdowns keeping in view that the machine availability is always more than 98% during high wind season and 96% during lean wind season. A copy of such Preventive Maintenance Schedule shall be submitted to the Employer. The Contractor shall carry out the periodical/plant maintenance as given in the manufacturer's service manual and perform minimum two certified services per annum. Such programme for all the equipment shall be prepared as per operating manuals of manufacturer's and shall be implemented in letter and sprits.

22.3.8 Regular periodic checks of the WTGs shall be carried out as a part of routine preventive maintenance during low wind period. In order to meet the maintenance requirements stock of consumables are to be maintained as well as various spare as recommended by the manufacturer at least for 2 years to be kept for usage. This shall also include maintenance of other major equipment involved in wind energy farm like overhead line equipment, switchgear, outdoor 33 kV VCB kiosk and metering panel. Particular care shall be taken for outdoor equipment to prevent corrosion.



22.3.9 Maintenance record is to be maintained to record regular maintenance work carried out as well as any breakdown maintenance along with the date of maintenance, reasons for the breakdowns, steps taken for attending to the breakdown, duration of the breakdown etc. Schedules will be drawn such that some of the jobs other than breakdown, which may require comparatively long stoppage of the WTG's, shall be carried out preferably during the non-windy season.

22.3.10 The Contractor will attend to breakdown jobs immediately for repair/replacement /adjustments and complete at the earliest during the currency of O&M Contract. The Contractor shall immediately report the accidents, if any, to the Engineer In charge & to all the concerned authorities as per prevailing law of the State showing the circumstances under which it happened, and the extent of damage and / or injury caused. O&M Contractor would be solely & fully responsible / liable to pay for any losses/damages/claims, etc. and Employer will be fully indemnified for such losses / claims.

22.3.11 The Contractor shall comply with the provision of all relevant Acts of Central or State and rules made there under from time to time.

22.3.12 The Contractor shall at his own expense provide all amenities to his workmen as per applicable laws and rules.

22.3.13 The Contractor shall ensure that all safety measures are taken at the site to avoid accidents to his or his Co-Contractor or Employer's Workmen.

22.3.14 If in the event of negligence or mal-operation by the Contractor's operator any failure of equipment take place such equipment should be repaired / replaced by Contractor free of cost within a reasonable period of time.

22.4 Quality Spares & Consumables: In order to ensure longevity and safety of the core equipment and optimum Performance of the system the Contractor should use only genuine spares of high quality standards as recommended by manufacturers.

22.5 Tools and Tackles: The Contractor shall arrange for all the necessary tools and tackles for carrying out all the maintenance work.

23 Technical Specification for WTGs & Electrical System for Interfacing with Grid

The Wind Plant shall be in accordance to but not limited to the following minimum technical specifications requirement.

23.1 Type and Rating of WTGs

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- 23.1.1 The offered WTG shall be Horizontal Axis 3 Blade WTG with minimum 2.0 MW rated capacity.
- 23.1.2 The WTGs shall be designed and tested to have a life of not less than 20 (twenty) for continuous operation as per IEC 61400-1 "Wind turbines - Part 1: Design requirements" or any other internationally accepted Standard for the Wind Turbine Design. Bidder shall indicate the list of components whose life is less than 20 (twenty) years; otherwise life of other major equipment (such as power panel, transformer, VCB yard, insulators, isolators, pitch motors and control panel etc.) shall also be provided along with the bid. WTG should be designed to perform satisfactorily in Indian climatic conditions with particular reference to the Project site.
- 23.1.3 The Offered WTG model should be listed in the Revised List of Models and Manufacturers (RLMM list) of MNRE as on the date of bid submission should be offered. Any WTG model not listed in RLMM as on the date of last date of bid submission shall not be considered for evaluation.
- 23.1.4 The WTG shall have adequate yawing, pitching and breaking control systems in order to optimise the WTG operations and regulations of the rotor blade movement.
- 23.1.5 Generator shall have insulation class 'F' or better (IEC 85).
- 23.1.6 Two independent braking systems of which at least one must be of the aerodynamic type having fail-safe feature. Brake should function even if the grid supply fails.
- 23.1.7 Generator shall be protected against short circuit, earth fault, overload, over and under-voltage.
- 23.1.8 The generators shall be provided with temperature sensors installed in the stator windings being part of the generator protection system.
- 23.1.9 WTGs shall have adequate protection and controls to operate in parallel and synchronized manner with grid. The tolerance limits indicated may, however exceed in actual conditions and the WTGs shall be protected from damage against such exceeding of limits.

23.2 Tower



23.2.1 Tubular tower or Hybrid (Tubular plus Lattice) Tower giving a minimum hub height of 100 mts and above the ground level and must be coated with corrosion proof layer so that it can withstand environmental impact for at least 25 years. Tower should be painted with anti-corrosion paint in accordance with EN-ISO 12944 (Part-4).

23.2.2 All materials, components and equipment shall function and work properly during the lifetime against deterioration that may be caused due to hostile climate conditions. The bidder shall submit descriptions of protection methods to be used for all components. All exposed iron components such as tower, nacelle and hub should be galvanized. Only hot dipped galvanized bolts and nuts should be used. Switchboards shall have two coats of epoxy painting of minimum 120 microns thickness over two coats of primer. Alternatively these can have powder coating having thickness more than 60 microns.

23.3 Transmission or Gearing Mechanism

The transmission may be direct or built as composite gearbox with generator through an independent gearbox coupled with the Generator or directly coupled to the generator or without gearbox.

23.4 Blades:

Blades shall be sturdy enough to maintain its surface smoothness, shape and alignment. Safety system of the blades assembly shall be of failsafe design.

23.5 Capacitor Banks

Adequate capacitor shall be provided so that the reactive power consumption is minimum. But, in no case over compensation is solicited.

23.6 Soft Start

23.6.1 The WTG must be equipped with power electronics or thyristorized soft start feature to limit the starting current to rated value.

23.7 Electrical Systems

23.7.1 The electrical power and control installations of the WTGs must be designed for unattended, automatic service. The design must ensure

- High reliability (well-proven principles).
- Easy maintenance and services.



- Maximum power production.

23.7.2 All installations must be designed, fabricated and tested in accordance with latest publications from the international organisations of standards, or Indian equivalent

23.8 Power Panel

For each turbine a switchboard is to be installed within the space of Tubular tower. The switchboard must include all power distribution for the turbine and the cabin, protection systems, soft start, capacitor control.

General data for the switchboard:

- Frequency 50 Hz with + 1 Hz/-02 Hz variation limit or as per the Grid Codes.
- Short Circuit level I at incoming terminals (suitable rated excl. contribution from the turbine)
- AI Incoming cable of suitable cross-section, armoured.
- Spare space (extensions) 10%
- Enclosure material shall be: Protected against humid environment and vermin proof.
- The switchboard must be designed and manufactured in accordance with relevant standards viz. IEC: 439, IEC-144, IEC-157-1, IEC-158, IEC- 292, IEC-255 & IEC-337.

23.9 Labelling

All components, internal wiring and terminals must be numbered according to the drawings and marked/labelled at locations, which are easily readable.

The switch board panel identification must be indicated on the front in a conspicuous way. It should be identical with the number of the WTG controlled by the switchboard.

23.10 WTG Local Control Panel

23.10.1 Each WEG shall have a Local Control System (LCS) and it shall be designed for automatic, unattended operation based on a microprocessor/ PLC-controlled system with adequate power backup. It shall have facility for fibre optic cable/RF based communication with Central SCADA with a facility for remote control and a centralized remote monitoring system for control and monitoring and database system.

23.10.2 The local control system (LCS) together with the power system must fully protect the mechanical and electrical installations of the WTG against break down and at the same time ensure a maximum overall energy production under given wind conditions.



23.10.3 The local control system shall be designed for automatic operation with minimum of attendance. Power back-up system for at-least 72 hours operation shall be included. The control panel of LCS shall be installed within the tower or a separate local control room. The microprocessor/ PLC and power control units shall be located at well ventilated place. In case of tubular tower, the LCS shall be capable of operating satisfactorily at such temperature that may exist inside the tower without exceeding the permissible temperature rise. The LCS shall be able to display basic operating functions of the WEG along with provision for stopping and restarting the WEG. This should either be, by providing suitable display on meters or through port compatible to Laptop. In case, if the manufacture does not have LCS control system in their design, they have to make necessary arrangement to display the control and operational parameters. The system shall as a minimum be able to display:

1. Grid condition,
2. Brake position,
3. Generator rpm.
4. Instantaneous power (kW)
5. Energy transmitted to the Grid (kWh)
6. Cumulative energy generation (kWh)
7. Cumulative energy consumption (kWh)
8. Wind speed and direction,
9. Instantaneous kVAR consumption,
10. Cumulative kVAR consumption
11. Status of capacitor bank connection,
12. Temperature of generator, yaw motor, gear box, gear oil etc.
13. Voltage (V), of all the three phases in RMS values.
14. Current (A) of all the three phases in RMS values.
15. Frequency (Hz)
16. Rotor Revolution Speed (Rotor rpm)
17. Total run hours of WTG



18. Status of WTG

19. Yaw angle

20. The LCS shall also initiate shut down, display and give alarm at following conditions:

- Low oil level or pressure in gear box (if applicable).
- Yaw failure
- Cable twist failure
- Control system failure
- Vibrations of the nacelle.
- Worn brake-pads
- Abnormal temperature in generator, gearbox (if applicable), yaw motor, brake callipers.
- Grid failure i.e. frequency error, excess current asymmetry, voltage failure.
- Over speed of rotor and generator.
- Activation of emergency stop.
- Aerodynamic brake operation.
- Over temperature in switchboard (Power Panel).
- Failure of capacitance (if applicable)

21. This shall also stop the WTG and restart when conditions are acceptable again with display for:

- Low wind speed.
- Excessive wind speed.
- Untwisting of cables.
- Activation of stop push-button (Restart when start push-button is activated).
- Abnormal grid condition e.g. over/under voltage, over/under frequency and current asymmetry.



- 23.10.4 LCS shall have the functionality of stopping the WEG automatically whenever the grid supply fails and the LCS shall release the WTG after a shut-down caused by grid failure and the WTG shall start automatically provided it was released by the Central Control system. The WTG shall be manually restarted in case of all other shut-down situations.
- 23.10.5 Any shut down must be reported through the system.
- 23.10.6 All relay set points at relays or instruments must be adjustable within safety limits of the equipment. These include Voltage and Frequency sensing relays also.
- 23.10.7 LCS must be capable of reporting any shut down to the Central SCADA, giving enough information to identify the cause of failure. All set points of microprocessor/PLC Controller be adjustable. The LCS must be interactive with Central SCADA but not completely depend on that. If there is a fault in the Central Control System, the LCS must continue to control the WTGs and keep it in operable condition.
- 23.10.8 Indicative list of digital and analog I/O's for the system being offered is to be furnished by the bidder.
- 23.11 Earthing & Lightning Protection
- 23.11.1 Earthlings (or grounding) of WTGs and all related electrical installations shall be under the scope of bidder. All electrical frames shall be effectively connected to earth at least at two points. Material required for earth electrode as well as earth current conductor shall be supplied by the bidder. Combined earth resistance at each WTG shall be less than two Ohm.
- 23.11.2 Earth electrode shall be designed to withstand the maximum possible short circuit current. Lengths of electrodes shall be such that the combined earth resistance shall be less than two Ohms.



23.11.3 Suitable independent earthing system shall be provided for protection of blades, nacelle, and tower against any lightning surge. Effective earth resistance on individual electrodes shall be less than 3 Ohm (three Ohm) and the combined earth resistance shall be less than 2 (two) Ohm. The work shall be executed, as per IS: 2309 / 3043. Bidder should append a drawing showing the earthing arrangement for WTG and transformer. Care shall be taken to protect electric and electronic equipment within the control panel against any lightning/switching surges which are expected in electrical network. For this purpose the bidder shall provide suitable arrangement in the panels. The bidder shall provide suitable lightning protection system at the highest possible point on the WTG.

23.12 MCCB/ACB

MCCB/ACB at the power panel of each WTG provided should take care during full load current exceeding the specified limit.

23.13 Electrical System for Interfacing with the Grid

23.13.1 Each WTG will be connected to grid through unit transformer of suitable capacity and voltage ratio, internal 33 kV overhead line, common control & metering station(s), if required / common EHV sub-station(s) at wind farm up to grid interconnection point. External overhead line up to the specified sub-station, complete with all associated switch gears and materials shall be provided. The design of the electrical system shall be in accordance with the Indian Electricity (IE) Rules, Chief Electrical Inspector General (CEIG) requirements, Standard Practices of DISCOMS, Code of Practices issued by Bureau of Indian Standards (BIS), APERC Regulations and Orders, CEA Regulations on Grid Connectivity etc.

23.13.2 Any item not specifically mentioned but found essential for successful operation of electrical system with full safety according to statutory requirements shall be included in scope of work of the bidder.

23.14 Wind Monitoring Mast

23.14.1 The bid should include supply, installation and maintenance of one wind monitoring mast at offered site till the power curve testing is carried out.

23.14.2 The height of the wind mast should be close to the hub height of the WTGs installed therein with all the equipments and sensors (anemometers, wind vanes, temperature and pressure sensors and dataloggers etc.) required as per the IEC-61400-12-1: 2017 for the performance of the Power Curve Verification Test. This shall include all required data loggers, sensors etc. capable of recording data for a minimum of 10 minute intervals to ensure correct and reliable data collection and its computation for analysis, for verification of generation with reference to the actual wind conditions at Hub height.

N.B.: The bidder must quote this item separately in the price bid.

23.15 Central Monitoring and Control System (CMCS)/SCADA

At the project site CMCS with proper software such as SCADA shall be provided. This should be complete with all hardware and software for displaying, recording, monitoring and control of operational parameters. Necessary interface facilities shall be provided.

There shall be a provision of un-interrupted power supply (UPS) system of appropriate capacity for CMCS to avoid any data loss.

23.16 Floating Stock of Gear Boxes (not applicable for gearless machines)

To avoid linger down time due to gearbox failure in the WTG, the contractor should have a floating stock of gearboxes at their closest service centre/factory. Whenever the gearbox requires any repair the contractor shall send one from their stock for temporary replacement to keep the machine running even during the period or repair of the gearbox at no extra cost.

24 Guarantee / Warrantee

24.1 Any material, equipment and/or accessories which prove defective or which fail to meet the design guarantee or Performance Guarantee during the defects liability period (As mentioned under GCC clause 27.2) the Contractor shall replace / rectify at his own cost such material, equipment and/or accessories.

24.2 The Contractor shall guarantee the wind farm and installation work for a period of the defects liability period as mentioned under GCC clause 27.2. Any damage or defect that may arise or lie undiscovered at the time of issue of completion certificate, connected in any way with the equipment or materials supplied by him or in the workmanship, shall be rectified or replaced by the Contractor at his own expenses as deemed necessary by



the Engineer-in-Charge or in default, the Engineer-in-Charge may cause the same to be made good by other workman and deduct expenses (for which the certificate of Engineer-in-charge shall be final) from any sums that may be then or at any time thereafter, become due to the Contractor or from his Performance Bank Guarantee.

24.3 Serial Defect Liability Period shall be as per the GCC clause 27.2. Serial Defect shall mean occurrence of the similar faults in at-least 10% of the WTGs in a given time interval. Under this Serial Defect Liability, the Bidder will be required to rectify or replace all such serial defects in all the WTGs of the Project.

25 Inspection and Testing

25.1 All major/critical items (towers, rotor blades, nacelle assembly, generators, transformers, and control panels) shall be inspected and tested through third party inspection agency during manufacture and in assembled condition prior to dispatch in accordance with the standard practice/ QAP of the manufacturer and applicable Standards at no cost to Employer. Copies of test certificates for such inspections in triplicate shall be supplied before dispatch of the equipment.

25.2 After the award of work, the successful bidder shall furnish a complete list and details of all tests to be conducted on all major equipment.

25.3 The bidder shall also furnish a schedule of inspection / testing so that Employer may associate is representative to witness the tests. The Contractor shall also furnish copies of all test/inspection reports for records and reference of Employer.

25.4 Employer or its authorized representative will carry out inspection of the all major equipment at random at manufacturer's works or at wind farm site.

25.5 Contractor shall arrange and extend necessary cooperation for effectively carrying out inspection / testing. However, this shall not absolve the responsibility of the Contractor in providing the performance guarantee/warranty.

25.6 Inspection shall be carried out (through sampling method) on major items: towers, rotor blades, nacelle assembly, generators, transformers and control panels. For HT/EHT Circuit Breakers manufacturers test certificate shall be submitted. All other items like cables, conductors, relays and associated equipment/components shall confirm to relevant international/national standards.

25.7 All the standard tests in accordance with the Standards adopted shall be carried out at

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the manufacturer's works on all the major equipment and accessories so as to ensure efficient operation and satisfactory performance of all the components.

25.8 Functional Guarantee Test Procedure

Functional Guarantee Test Procedure for Provisional/Operational Acceptance of the Part 2 of the Pant Facilities (Wind portion) shall be performed as per the detailed procedure laid out in Annexure A Part II: PG Test Procedure.

26 Documents and Submittals

26.1 The Contractor shall furnish complete documentation that will be used for determination of contract compliance, as well as O&M of the Wind Farm.

26.1.1 The documentation shall be in English, well detailed and instructive so that all maintenance and modifications can be performed in the field without manufacturer's support. Miscellaneous documentation and manuals shall be in bound form.

26.1.2 Review and acceptance of submittals shall not encumber the Employer with responsibility for the adequacy or safety of the Contractor's design.

26.1.3 Titles shall clearly indicate the function of the document, the Employer and location of the facility.

26.2 The Contractor shall provide three copies of the following information, drawings and documents, within four weeks of the placement of order:

- i) Technical particulars and general data of WTGs, Generator, Rotor, Tower, Yawing system, Brake system, Gear system (in case of geared machines), Hub, Nacelle, Main shaft, Main bearing, Coupling, Power panel, Control system, Power factor compensation (if required), AC-DC-AC convertor(if required).
- ii) Technical particulars of transformers indicating losses, circuit breakers, current transformers, potential transformers and cables.
- iii) Technical particulars of transformers indicating losses, circuit breakers, current transformers, potential transformers and cables.
- iv) Specification of anti-corrosion treatment.
- v) PERT diagram showing broad time schedule of supply, erection and commissioning.
- vi) Protection scheme of unit substation and WTG.



- vii) Micrositing plan of WTGs.
- viii) Wind farm layout drawings indicating WTGs, roads, overhead lines, sub-stations, buildings etc.
- ix) G A drawing of entire electrical system for grid interfacing & Interconnection.
- x) Foundation drawings for towers.
- xi) SLD of the evacuation system.

26.3 Progress Reports

The EPC contractor shall submit fortnightly and monthly progress report (soft and hard copies) along with catch up plants against slippages to Consultant and simultaneously to Employer. Employer shall hold project review meetings with Consultant and EPC Contractor at predefined periodicity.

27 Standards & Statutory Requirements

The WTGs and other equipment should conform to the relevant International / Indian Standards and shall meet all the CEA/CEIG and local statutory requirements. The Bidder shall furnish the standards adopted by them.

28 Design Improvement

- 28.1 The bidder may suggest for improvement in specifications, if any, of equipment which could yield in better performance of machines. Such suggestions could be discussed based on merits and modifications in the specifications could be considered, if found appropriate.
- 28.2 If any of the agreed change is such that it affects completion schedule, the parties may agree for revised completion schedule before the bidder proceeds with the change.



SHEET-5

Work Sheet for Estimated Annual Energy Production from Wind Plant (For Each Model Separately)

(To be furnished by the bidder)

Bidder shall furnish an Independent Energy Yield Assessment Report prepared by National Institute of Wind Energy (NIWE) for estimated Annual Energy Production (AEP) of the wind farm for the site for the offered WTG model by the bidder.

Bidder shall reach to NIWE with all its input documents required for carrying out an independent energy yield assessment, giving the reference to this specific Project Bid. NIWE will follow the standard procedure for carrying out the energy yield assessment using WASP software model. The Wind Resource Data available with NIWE, as provided by SECI will be used for the assessment of EYA for all such Bidders independently by NIWE. NIWE will ensure that the same data is used for EYA of all the bidders. Bidders will not be allowed to receive the raw wind data used by NIWE, however they may be allowed to verify the same with NIWE as per the NIWE policy of interacting with the client for any such independent energy yield assessment.

The Report submitted by the Bidder as prepared by NIWE shall contain all the information such as the information on WTG model used, WTG model power and thrust curve, micro siting of the WPP, micro siting of external WTGs along with the details of the external WTG models (WTG model name, rating, hub height and rotor diameter, power curve) used for EYA, contour, Wind frequency distribution used, site specific air density considered, turbulence intensity, details of losses considered, uncertainty considered, estimated annual AEP at 1 year, 10 year and 20 year average, WTG location wise Gross AEP and Net AEP, any limitation of the study, etc. along with all the information that NIWE provides as a part of its independent energy yield assessment report.

A summary Table shall be provided in the report for following parameters

Parameter	Value
Capacity of WTG :	
Hub Height :	
Mast Location Air Density at Mast Height:	
Mast Location Air Density at WTG Hub Height	
Mast Location:	
Average mast location wind speed at mast height	
Average mast location wind speed at WTG hub height	
Power Law Index :	
Turbulence Intensity	
Average Air Density at WTG Hub Height	

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The Losses assumptions to be considered for the Energy Yield Assessment shall be as per the following Table

Standard Loss Category		Sub-category	Loss value (%)
1. Availability	a	Turbine	95.00%
	b	Balance of plant	99.00%
	c	Grid Availability	99.00%
2. Wake effects	a	Internal wake effects	As determined by NIWE through Modelling
	b	External wake effects	As determined by NIWE through Modelling
	c	Future wake effects	99%
3. Turbine performance	a	Site Specific Power curve adjustments	99.00%
	b	High wind hysteresis / Sub Optimal Performance	As determined by NIWE
4. Electrical	a	Electrical Efficiency	97.00%
	b	Facility Parasitic Consumption	99.50%
5. Environmental	a	Lightning	99.80%
	b	Rotor Blade Degradation	99.50%
	c	Environmental Loss	100.00%
6. Curtailment	a	Load Curtailment	100.00%
	b	Grid Curtailment	98.00%
	c	Environmental/Permit Curtailment	100.00%
	d	Operational Strategies	Any Loss Factor due to any sectoral management required.



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7. Other Factor	a	Any Other Factor as deemed Appropriate by NIWE based on the assessment	
Aggregate Losses			

The Uncertainties shall be as assessed by NIWE and shall contain at-least following level of uncertainties assessment.

Uncertainty factor	Error	sensitivity	1 year	10 year	20 year
Wind Measurement uncertainty					
LT Scaling uncertainty					
Wind resource variability (Inter Annual Variation)					
Vertical extrapolation uncertainty					
Horizontal extrapolation uncertainty					
Wake modelling Input file accuracy (Orography + Roughness)					
Power curve uncertainty					



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Uncertainty factor	Error	sensitivity	1 year	10 year	20 year
Any other Specific Uncertainty as deemed necessary by NIWE while assessment					
Total Uncertainty					

N.B.: The estimated long-term average annual CUF (P90 value) for 20 years based on the Power and Thrust Curve of the proposed WTG Model, as assessed by NIWE, shall not be less than the parentage (%) as specified under the Bid Evaluation Criteria.

Although the Annual Energy Yield from NIWE Report as submitted by the Bidder will be considered final for Evaluation, SECI may if required during the evaluation, get the energy yield assessment done from any third-party consultant or NIWE itself for all the Bidders, if SECI feel that so necessary. Bidders shall submit all the desired (WTG Power and Thrust Curve, Hub Height and Rotor Diameter information, temperature de-rating curves, and any other information that may be deemed necessary during the evaluation) to SECI as is required for carrying out the Independent Energy Yield Assessment Report for their offered WTG model.



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SHEET-6

Guaranteed Power Curve of WTG offered

(To be furnished by the bidder)

Standard Power Curve

Wind Speed (m/s)	Power (kW)	Thrust Coefficient (C_t)
1		
2		
3		
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5		
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7		
8		
9		
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11		
12		
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21		
22		
23		
24		
25		

Air Density

Reference of Certified Power Curve be given and a copy thereof furnished.

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Site Specific Air Density Corrected Power Curve

Wind Speed (m/s)	Power (kW)	Thrust Coefficient (C_t)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
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19		
20		
21		
22		
23		
24		
25		

Site Specific Air Density considered for correction is to be mentioned by the Bidder.

Site Specific Air Density Considered is -----



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SHEET-10 Sample Quarterly Performance Report for Wind Plant

FORM OF QUARTERLY OPERATING REPORT

Schedule to Common Terms Agreement

Quarterly operating data for Quarter ended *:

EX-ANTE ANNUAL REFERENCE DATA

Expected project P50 Annual Production:

GWh

Expected project P99 (1 year) Annual Production:

GWh

Expected project P90 (10 year) Annual Production:

GWh

Expected project P99 (10 year) Annual Production:

GWh

Expected average annual wind speed:

m/s

Units	Q1			Q2			Q3			Q4			Total to Date
	January	February	March	April	May	June	July	August	September	October	November	December	
Expected monthly output													
Expected monthly P50 (if available)													
Resource and Production													
Actual monthly average wind speed at hub height													
Gross Energy Generated [1]													
Net Energy Generated [2]													
Total Energy Sold													
Wind farm performance													
Turbine availability as per Contract (3)													
Periods/production where turbines were contractually unavailable													
Unavailable due to planned maintenance													
Unavailable due to unplanned maintenance													
Any other unavailability that is responsibility of O&M provider													
sum of above should equal 100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Periods/production where turbines were contractually "deemed available"													
Unavailable due to high wind speed													
Unavailable due to wind sector management													
Unavailable due to curtailment under wildlife protection plan													
Unavailable due to grid curtailment													
Unavailable due to BoP outages													
Any other unavailability that is NOT responsibility of O&M provider													
specify reasons / excluded event:													
Sales													
Weighted average monthly sales price													
Observations For this reporting quarter, describe any technical reasons for performance over/above ex-ante P50 levels and over/above contractual availability. Also describe unusual number of trips and any outage events longer a few hours (provide details if required on a separate sheet)													

[1] Energy production measured at the turbine meters without taking into account electrical losses on the Electrical Works

[2] Energy production delivered at the Point of Interconnection (POI) as defined in the PPA

[3] Includes any deemed availability as per the terms of the O&M contract

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C Battery Energy Storage System

29 Scope of Work

The Scope of Work covered under this specification shall be, but not limited to, the following:

29.1 For the initial design and fabrication of the equipment, the Contractor shall:

- Carry out studies, design, manufacturing, workshop test, transport, customs clearance, unloading, inspection, storage, erection, painting, commissioning (including cleaning and flushing operations), acceptance tests of the complete equipment, project management, personnel training and afterlife handling of the batteries. This shall include a control system that provides standard input/output channels and appropriate control actions for all required operational and protective features.
- Fully document the design and expected performance of the BESS by means of documents, drawings, reports, data, and other submittals, as required herein.
- Perform factory acceptance testing of the BESS.
- Conduct design review meetings during initial design and fabrication, in Consultation with the Employer with special reference to the geographical/climatic conditions of the Project site.
- Obtain site-specific data in preparation for developing installation implementation plans.
- Develop site installation/construction drawings, specifications, and calculations.
- The special tools and measuring tools necessary during erection, disassembling, fine tuning, control or maintenance of the whole package.
- All cranes, hoisting equipment, scaffolding, welding equipment, tools, safety equipment, site offices, sanitary, warehouse and workshop needed for safe and reliable mounting of the BESS system, and all the works on Site. It is the full responsibility for implementing the services to perform all the tasks.
- Supply an initial complement of spare parts (at a to-be-determined level).
- Provide warranty for the entire BESS and its constituent equipment.

29.2 The major component of BESS package:

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- The batteries
- Battery management system.
- Bi-directional Inverter for the BESS
- Transformer (Primary side 33 kV) for each subsystem
- MC Switchgear/ RMU
- DC Cable
- LV AC Cable
- MV Cable
- Filter devices (If applicable)
- Self-sufficient protective environment for the batteries
- Fire detection and protection
- Cooling installation
- Container
- All the relevant communication systems
- Dedicated containers for the batteries, with required fire protection as well as the required auxiliary (HVAC, lighting, etc...).
- Dedicated containers for the PCS with required auxiliaries as well as the required auxiliary (HVAC, lighting, etc...).
- Electrical protections systems
- CT's and VT's to be installed at the MV-side of the transformer (i.e. needed to regulate the voltage and frequency at the PCC).
- The AC auxiliary supply system
- DC supply of the auxiliary/operation equipment
- Any other equipment/ component required for functional operation of BESS

29.3 Transportation and Site Setup

Interconnection of the BESS as part of the Plant Facilities at the point of common connection (PCC). The Contractor shall be responsible for all equipment and installation activities up to the system side of the PCC. The Contractor will be responsible for completing the necessary work for interconnection point.

29.4 For installation/interconnection, the Contractor shall:

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- Develop drawings, specifications, and calculations for Contractor's scope of installation equipment and services (that is, up to the BESS side of the PCC).
- Develop detailed start-up and site acceptance test (SAT) plans.
- Obtain all permits necessary to transport the BESS to the site.
- Ship the BESS to the project site.
- Assemble BESS components on site to produce a functional system (as required).
- Perform start-up testing and SAT of the BESS.
- Provide on-site Contractor representative during installation and/or interconnection activities by the Employer and during start-up and SAT of the BESS by Contractor.
- Obtain permits necessary to prepare the site and to install and interconnect the BESS to the grid.
- Provide a complete set of as-built drawings.
- Provide a training class for the Employer's technicians and maintenance personnel.

29.5 Operation and Maintenance: Employer intends to entrust the operation and maintenance (O&M) of the BESS on comprehensive basis to the Contractor on turnkey for 10 (Ten) years. The rates quoted by bidder for Comprehensive O&M of the Plant Facilities on yearly basis for 10 years shall be inclusive of the replacement/ augmentation costs if any. In case of augmentation, the following points shall be complied:

- Planning permission (i.e. through new containers or buildings)
- Grid code compliance (i.e. changing technical characteristics of the project)
- Fire suppression systems remaining suitable
- Compatibility of the existing ESS installation, including protections, HVAC, foundations, etc.

29.6 The primary use of this system is complete power management along with Solar & Wind power integration and DG integration if available. The supply and application specific

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ratings response requirements is provided in Table 1 & 3 below. The Performance Metrics for BESS Service Performance Assessment are provided in Annexure ____.

29.7 Definitions:

PCC – Point of common coupling, the electrical boundary between the Solar PV/Wind Power Plant and the electrical network. The Point of common coupling shall be at incoming feeder of 33kV Main Switchgear located in Pooling Substation.

Unit battery – A unit battery is the minimum field-replaceable stored energy component or assembly. It may consist of one or more electrochemical cells, electrically interconnected in any series and/or series–parallel configuration. A unit battery has one (and not more than one) set of positive and negative terminals, by which it is interconnected with the rest of the storage system.

FAT – Factory Acceptance Test

BESS – Transportable, containerized energy storage system based on commercially available electrochemical storage solutions, capable of receiving, storing and delivering electrical energy at specified rate(s) suitable for the application laid out in the specifications herein. It comprises of unit batteries, battery management system (BMS), auxiliaries, such as HVAC and fire suppression systems, step-up transformers, ac switchgear, Control Systems etc.

BMS - or Battery Management System, is any electronic system that manages a rechargeable battery (cell or battery pack), including protecting the battery from operating outside its Safe Operating Area, monitoring its state, calculating secondary data, reporting that data, controlling its environment, authenticating it and / or balancing it.

29.8 Site-Specific Implementation Requirements

Procurement-Specific Location and Site Characteristics for Design: Table-1 below lists supply-specific location and site characteristics

Table 1: Procurement-Specific Location and Site Characteristics

Item	Characteristic
Location	Ramagiri Village, Ananthapuramu District, Andhra Pradesh

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Site characteristics:	
Annual Temperature Range	15oC – 45oC
Precipitation	Mean Annual: 535 mm (316 mm during southwest monsoon (June-September))
Seismic Zone (Geological Survey of India, 2014)	Zone II
Design elevation	544 m above sea level
Electrical infrastructure: AC system interconnection requirement at Point of Common Connection (PCC)	The BESS will be connected to the 33 kV incoming feeder of Pooling Substation with respect to voltage, frequency, and phase configuration along with necessary protection requirements as per regulation. The BESS control functions shall be designed for maximum flexibility with regard to use cases identified to meet the performance metrics as identified in this document.

Codes and Standards

IEC 61427	Secondary cells and batteries for renewable energy storage for On-grid applications: Non-chemistry Specific (applicable to all secondary battery types)
IEC 62619 (2017):	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for large format secondary lithium cells and batteries for use in industrial applications
IEC 2620 (2014)	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Large format secondary lithium cells and batteries for use in industrial applications
IEC 62935	Planning and Installation of Electrical Energy Storage System
UL1973	Energy storage for stationary applications such as for PV: Non-chemistry Specific (applicable to all secondary battery types)

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IEC 62485-2-	Safety requirements for secondary batteries and battery installations - to meet requirements on safety aspects associated with the erection, use, inspection, maintenance and disposal: Non-chemistry Specific (applicable to all secondary battery types)
IEC 61508	Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems: Applicable for all Battery Energy Storage Systems
UL 1642	Standard of Lithium Batteries (Safety of Lithium Ion Batteries)
IEC 62281	Safety of primary and secondary lithium cells and batteries during transport: Applicable for storage systems using Lithium Ion chemistries
IEC 61850/ DNP3	Communications networks and management systems. (It shall be ensured that Plant SCADA and the BESS control system communicate with each other over the protocol and the combined parameters are accessible over a common HMI.)
IEEE 375	IEEE Guide for the Protection of Stationary Battery Systems
IEEE 491	IEEE Guide for Selection and Use of Battery Monitoring Equipment in Stationary Applications
IEC 0076	Power transformers
IEC 0947	Low-voltage switchgear and control gear
IEC 1439	Low-voltage switchgear and control gear assemblies
IEC 62933	Electrical Energy Storage (EES) System

30 Technical Specification of Battery Energy Storage System

30.1 Procurement-Specific Ratings and Requirements: below specifies project-specific BESS capabilities and ratings for this Project.

Table 2: Supply-Specific Ratings and Requirements

Item Description	Requirement
Battery Technology	Any battery technology with totally Maintenance Free suitable for operation in site-specific climatic conditions can be used.

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Rated No of Cycles (Minimum)	5000 cycles at rated energy capacity at 80% Depth of Discharge (DoD) at 25°C and up to 0.5 C Rate of Discharge
Nameplate watt rating*, AC (A)	A = 10 MW
Nameplate watt-hour rating, ac (B)	B = 20 MWh at 10 MW net AC output at the beginning of life and not less than 80% of this capacity at any point of time up to End of Battery Life.
System ac-dc-ac efficiency*:	80%
Use case requirements	1. Ramp Rate BESS shall demonstrate Ramp Rate control of generated power . The ramp rate pf +/-10% per minute shall be considered for wind and solar plant subject to the maximum capacity of the BESS System 2. Curtailment Mitigation The BESS shall be operated in a manner to minimise losses that could be incurred on account of anticipated generation Curtailment. In the event of requirement to reduce the export of energy to the grid, BESS shall be used for curtailment avoidance. 3. DSM Penalty Mitigation In the event of deviation from forecasted generation for Wind and Solar Plants, the BESS shall be utilize in a manner to



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	minimise losses that could be incurred on account of penalty.
Ventilation System inside the Container	Should be such as to maintain minimum and maximum Temperature as recommended by the manufacturer for optimum performance of the batteries on continuous basis.
BESS Response Time	shall be less than 500 milliseconds
<i>*To be verified as per the procedure described in Annexure A Part II: PG Test Procedure to this Section for Performance Guarantee Tests and to be verified on annual basis as per Schedule. All measurement instruments for conducting the tests shall be maintained by the Contractor.</i>	

30.2 System Parameters

Overall System Real Power and Energy Ratings

During discharge, the BESS shall be rated to supply at the PCC the continuous net AC real power and AC energy output specified in Table 2: Supply-Specific Ratings and Requirements above. These ratings shall be referred to in all project documentation, including this specification, as the nameplate watt rating and the nameplate watt-hour rating. All nameplate ratings shall be achievable over the End of Battery life, as specified in Clause 30.6.129.7. The nameplate watt rating and nameplate watt-hour rating shall be achievable during discharge for the full range of stated environmental conditions, provided that the battery is fully charged and the HVAC system (if incorporated in the BESS) has stabilized. In any case, the BESS shall be capable of being discharged at reduced power levels from that specified above. However, in no case will the energy discharged from the battery be greater than the nameplate watt-hour rating.



The Contractor shall clearly state in its O&M manual as well as during design review the expected efficiencies of the major subsystems (battery, PCS) as well as the expected losses from auxiliaries.

Note: There may be specific requirements on the attainable power level during charging, which the Contractor may need to identify in co-ordination with the grid operator/Employer. However, unless otherwise specified in those sections, the real power level attainable during charging shall be at the Contractor's discretion, so long as the other charging requirements in this specification are met.

30.3 Design, Fabrication, and Construction Requirements of BESS

30.3.1 General

The methods and materials specified in this technical specification are intended to represent minimum requirements. Reliance thereon shall not diminish the responsibility for meeting performance and other requirements stated in this technical specification.

The design of the BESS shall incorporate the principle of modularity, with a view to reducing life-cycle costs and ease of replenishment of storage capacity while facilitating ease of maintenance, space requirements, and reliability. The design should also facilitate rapid and easy replacement of the unit batteries without significant downtime. The Contractor shall ensure BESS compatibility with more than one battery unit makes/models to enable replenishment, if and when required over the Project Life. Overall, the design philosophy shall be to minimize and optimize all costs to the Employer, not simply initial capital costs or low maintenance costs. Life-cycle costs include the following: initial system cost, unit battery replacement cost, periodic equipment upgrades, maintenance costs, auxiliary system energy consumption, charging energy costs (that is, costs due to overall battery and PCS losses), and any other contributors to life-cycle energy cost.

30.3.2 System-Level Design and Performance Requirements

The major equipment items shall include a battery, battery management system (BMS), PCS and output/isolation transformer which is to be integrated with the Plant Facilities Energy Management System (EMS) defined elsewhere in this document. Additional equipment shall include HVAC, wiring, connectors, protective devices, grounding, junction boxes and enclosures, instrumentation, enclosures, and all other items needed for a fully functional, grid-interactive BESS to meet the requirements set forth in this specification.



All systems and components of systems—including electrical storage unit, switching devices in the PCS, components of monitoring and control systems, and components of auxiliary systems— must use proven and previously demonstrated technology. Electrochemical cells, PCS switching devices, and control system hardware and software must be commercially available and in use for other markets. Electrochemical cells must be replaceable (in small orders also) with a maximum four-week lead time under normal business conditions. Designs using experimental or otherwise undocumented components are not permitted.

The BESS shall be characterized using language and methods consistent with IEEE 1679, “Recommended Practice for the Characterization and Evaluation of Emerging Energy Storage Technologies in Stationary Applications.”

The BESS shall be IEEE 1547 (Standard for Interconnecting Distributed Resources with Electric Power Systems)—compliant.

The prudent design of the BESS should include careful consideration of resonance and Ferro-resonance.

30.4 Containerization and Transportability

30.4.1 The BESS shall be containerized, using either standard International Organization for Standardization (ISO) 668 shipping containers or custom-designed power equipment centres. The container or containers shall be designed to be drop-shipped onto a properly prepared pad or foundation (such as compacted soil, concrete pad or platform, and so on). When fully installed, all BESS components—including battery racks all auxiliaries, such as HVAC and fire suppression systems, step-up transformers to match grid, AC switchgear, and so on—and tools shall be enclosed in (or on) the containers, even if certain components must be separately shipped and installed at the site.

30.4.2 Containers shall be designed and constructed to meet IP54 and NEMA 3R requirements. The design and installation of Containers shall meet relevant regulatory requirements for occupational safety and health under national and state legislations.

30.4.3 All containers and packaging of separately shipped components shall be suitable for land or sea transport, including offering suitable protection of the equipment inside against damage from weather and vibration or shock from transportation.



The containers and their contents shall be designed to be easily prepared for transport, shipped, connected and operated at site. The Contractor shall ensure that all required bracing and shipping stabilization equipment to enable transport is either kept at hand or brought to the site in a timely manner before transport.

30.5 Additional transportability requirements are as follows:

30.5.1 In designing for transportability of the lithium-ion batteries, the Contractor shall follow the relevant guidelines (Sub-section 38.3) set forth in the United Nations document “Recommendations on the Transport of Dangerous Goods—Manual of Tests and Criteria” (ST/SG/AC.10/11/Rev.5), with specific reference to obtaining UN38.3 and UN3480 certifications at the battery module and/or container level.

30.5.2 The BESS container or containers shall be of a size and weight to be capable of being transported to project site with due consideration for the load bearing restrictions imposed by bridges, if any.

30.5.3 Containers shall incorporate standard lugs or other means for lifting by crane or shall be properly palletized for movement with forklift trucks, or both.

30.6 Design Life and Life-Cycle Costs

30.6.1 End of battery life – End of battery life is that point in time when the BESS can no longer meet the power and/or energy discharge requirements of this Specification due to age or non-repairable malfunction of the battery subsystem, and/or non-replaceable components. When the system is no longer able to provide these requirements, the system has reached its end of life. Battery End of life shall be not less than 10 years from the date of Commissioning.

30.6.2 Disposal Plan – The Contractor shall provide the disposal plan of the battery which may be required after end of the battery life.

30.6.3 It shall be the responsibility of the Contractor to make periodic replacements/replenishments of unit batteries, if and when required, up to the End of Battery Life as described above. Outage time as a result of replacement will also be counted as an “Accountable BESS Outage” for the purpose of computing BESS Availability.

30.7 Reliability, Availability, and Operability of the BESS

30.7.1 The BESS shall be designed for high reliability, defined in the following terms:

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Starting reliability: (99% starting reliability means that the unit shall start in 99 of 100 attempts)

Mean-time-to-repair- The time taken from the time of notification of a need for repair to the time of completion of repairs (that is, inclusive of time for arrival of spare parts and repair personnel at the location of the BESS)

Availability

Availability is the percentage of hours that the BESS is available during the year. The availability guarantee shall begin upon facility commissioning. Annual availability shall be calculated as follows:

$$\left[1 - \left(\frac{\sum \text{Accountable BESS Outage duration in hours}}{8760} \right) \right] \times 100$$

Where:

- *Accountable BESS outages* are outages caused or necessitated by the BESS equipment that result in reduced capacity or loss of essential function of the BESS. These outages may be initiated by failure of components, loss of battery capacity (to the extent that End of Battery Life is not reached), operation of protective devices, alarms, or manual action. Such outages include both forced outages due to equipment problems and scheduled outages for BESS maintenance.
- *Accountable BESS outage duration* is the elapsed time of accountable BESS outages from the instant the BESS experiences reduced capacity or is out of service to the instant it is returned to service or full capacity. If the BESS experiences reduced capacity but is determined by the Employer to be available for service even if the Employer elects not to immediately return the equipment to full capacity, such time will be discounted from the outage duration.
- The Procurement specific nameplate ratings shall be as defined in Clause 30.1 above. The BESS shall be considered to be under an accountable outage if any of those ratings cannot be met. The BESS shall also be considered to be under an accountable outage if a scheduled (or required) charge cycle cannot be completed. The data required for assessment of the availability of the BESS shall be collected through the Plant Facilities integrated SCADA system.
- It shall be possible to fully remove, repair, and replace in the field any failed or poorly



performing component within a day, assuming that spare parts, test equipment, and maintenance personnel are on the site. This capability shall be demonstrated in the factory acceptance test (FAT) for unit batteries and other key components.

The BESS shall be capable of unattended operation, with provision of remote monitoring and control.

30.7.2 Planned Maintenance Outage

The Contractor shall provide a guarantee for the maximum length of time required for this type of maintenance operation.

30.8 Battery Subsystem Design Requirements

30.8.1 Electrochemical Cells

Only cells that are commercially available or for which suitable (not necessarily identical) replacement cells can be supplied on short notice will be allowed. *For both premature cell failures and end-of-battery-life replacement, the Contractor shall guarantee cell availability and the length of down time (hours or days) required to replace cells.* The cells may be supplied as separate, individual units or as group of cells combined into modules. The cells shall meet the seismic requirements for the planned location of the BESS. Cell and module design shall accommodate the anticipated vibrations and shocks associated with the transportation of the BESS and shall resist deterioration due to vibrations resulting from the same. Associated hardware and paraphernalia should also be able to withstand the rigors of transportation. The transport plan shall be shared with the Employer and approved prior to dispatch.

Labelling of the cells or unit batteries shall include manufacturer's name, cell type, nameplate rating, and date of manufacture, in fully legible characters. All cells shall be traceable to the point of origin for purpose of addressing safety issues.

30.9 Electrochemical Storage System

- a. The storage system may consist of one or more unit batteries. If the storage system consists of more than one unit battery, these may be electrically interconnected in any desirable series and parallel configuration to achieve the overall system storage and power rating requirements.
- b. Each electrically series-connected string of unit batteries shall include a means of



disconnecting the string from the rest of the system and of providing over-current protection (during a fault). The means of disconnect shall provide for a physical interruption of the string electrical circuit, which shall be visible to anyone servicing the individual unit batteries in the string and shall be capable of being locked or secured in an open position.

- c. If the disconnect means consists of removal of a unit battery, the storage system shall be designed to allow maintenance personnel to determine that there is no current flowing in the string and provisions to ensure that the PCS is off before the unit battery is removed. Procedures for maintenance and/or field replacement of unit batteries shall neither require nor recommend removal of the unit battery without first ensuring that no current is flowing in the string circuit.
- d. Over-current protection, whether on the AC or DC side, in paralleled unit battery strings shall be sized and coordinated so that currents from other strings do not contribute to a fault in any unit battery string.
- e. Where appropriate, DC wiring shall be braced for available fault currents. Protection shall include a DC breaker, fuse, or other current-limiting device on the battery bus. This protection shall be coordinated with the PCS capabilities and battery string protection, and shall take into account switching or other transients and the inductance/resistance (L/R) ratio at the relevant areas of the DC system. The Contractor shall produce a fault analysis and protection coordination study for the battery dc subsystem during final design. *The Employer reserves the right to withhold permission to ship the BESS until the fault analysis has been satisfactorily completed.*
- f. Cells, wiring, switch gear, and all DC electrical components shall be insulated for the maximum expected voltages plus a suitable factor of safety.
- g. The battery system shall include a system to detect and alarm excessive ground leakage current levels. Ground fault detection shall be enabled for the container or, if more than one electrical series string is installed in the container, for each series string. The detection/trip level shall be field adjustable. The Contractor shall have overall responsibility for the safety of the electrical design and installation of the battery, as well as all aspects of the BESS.
- h. The battery system shall include a monitoring/alarm system and/or prescribed



maintenance procedures to detect abnormal unit battery conditions and notify proper personnel of their occurrence.

- i. Abnormal conditions shall include but not be limited to (1) weak unit batteries that could reasonably be expected to fail to provide rated capacity upon full discharge, (2) high-resistance or open-unit batteries, (3) high-resistance or open external unit battery connections, (4) unit batteries with temperatures exceeding operating thresholds, and (5) internally shorted unit batteries. Unit battery monitoring, whether automatic or manual, should be specified to alert the proper personnel in a timely manner that an abnormal unit battery condition exists or may exist. All alarms shall be part of the control system and shall include remote display or annunciation capability.
- j. The unit batteries shall be racked or shall be housed in stackable modules. The unit batteries or cells shall be arranged and installed to permit easy access for equipment and personnel. The moveable units shall be arranged and installed to permit easy access for equipment and personnel to carry out unit removal and replacement activities. For all systems, it shall be possible to remove and replace a prematurely failed unit battery or cell (as appropriate), when system performance specifications cannot be met. The lengths and widths of all aisles and spaces into which personnel may enter in the field for operations and/or routine or unscheduled maintenance purposes, as well as egress routes from these aisles and spaces, shall conform to applicable codes and standards. All racks and metallic conductive members of stackable modules shall be grounded to earth. Racks shall meet the seismic load and road vibration requirements and shall include means to restrain cell movement during seismic events and transport. The Contractor shall furnish analyses and/or other data that show that the rack and cell designs are designed to meet all potential seismic and transport vibration requirements.
- k. The design of all modules and racks shall specifically account for the anticipated vibrations and shocks associated with the periodic transportation of the BESS.

30.10 Cell/Battery Auxiliary Systems

The cells and battery system shall be supplied with all required and/or recommended accessories. This includes inter-cell connectors and monitoring devices for cell temperature and cell voltage, if required.



30.11 Power Conditioning System Design Requirements

30.11.1 General

- a. The PCS may consist of one or more parallel units. Paralleling may be at the DC or AC terminals. Line-commutated systems or systems that require the presence of utility voltage or current to develop an AC output are not acceptable. The PCS circuit topology shall be voltage source (that is, the PCS at its AC terminals shall appear to the grid as a voltage source rather than as a current source and, at its DC terminals, shall be capable of reversing current flow in the battery without reversing the polarity of the DC bus).
- b. All load-carrying cables within the PCS subsystem shall have a suitable load factor of safety. The PCS shall preferably be air-cooled suitable for the site climatic conditions, with final rejection of waste heat to the ambient air. The air-handling systems shall include filtering that is adequate to keep dust from the interior of the PCS system.
- c. The PCS shall be housed within one or more appropriate weatherproof and dustproof enclosures, with provisions to prevent moisture condensation and to prevent the entrance of water, airborne salt or dust, rodents, insects, and/or similar materials or pests into air intake/exhaust ports.

30.11.2 Power Conditioning System Rating

The PCS shall be capable of delivering Real power as specified in Table 2: Supply-Specific Ratings and Requirements. This rating shall be referred to in all project documentation, including this specification, as the nameplate VA rating. To account for losses in the PCS, the DC input power to the PCS will be higher than the rated PCS output power. The available DC input power will be the BESS nameplate watt rating divided by the PCS full load efficiency (as specified in the datasheet) during discharge.

30.11.3 Power Conditioning System Protection and Control

The PCS, in conjunction with the control system, shall be capable of completely automatic, unattended operation, including self-protection, synchronizing and paralleling with the grid, and disconnect. The control of the PCS shall be integrated with the overall BESS controls. The PCS shall include all necessary self-protective and self-diagnostic features to protect itself from damage in the event of component failure or the excursion of operating parameters beyond a safe or expected range. This includes excursions due to internal or external causes. The self-protective features shall prevent the PCS from being operated



in a manner that may be unsafe or damaging. Faults due to malfunctions within the PCS, including commutation failures, shall be cleared by the PCS over-current protection device(s).

30.11.4 Power Conditioning System AC Interface with AC bus

- The BESS must meet applicable harmonic current and voltage specifications in accordance with applicable standards. Harmonic suppression may be included with the PCS or at the BESS AC system level. However, the Contractor shall design the BESS electrical system to preclude unacceptable harmonic levels in the BESS auxiliary power system. BESS inverter shall also be capable to charge from the grid, if required.
- In addition to interconnection standards specified in this document, there may be specific requirements for interconnection, which need to be ascertained by the Contractor in co-ordination with the utility at the PCC/designated substation.
- The PCS transformer may include tertiary windings to supply BESS auxiliary power requirements. The transformer must be dry type. The PCS shall include provisions for disconnect on both its AC and DC terminals for maintenance work. Conductor separation must be clearly visible. The detailed maintenance procedure shall be addressed in the O&M manual.

- Electromagnetic Interference

The PCS shall not produce electromagnetic interference (EMI) that will cause misoperation of instrumentation, communications, or similar electronic equipment within the BESS.

- Islanding

The PCS design shall include provisions to limit run-on and islanding as per applicable standards upon the loss of grid. This capability shall be demonstrated to the Employer's satisfaction during the FAT.

1.2 Battery Management System.

The battery management system shall maintain the internal operations of the battery modules and racks. Necessary monitoring and control to protect the battery cells, modules, and racks and ensure operation within manufacturers specifications and the avoidance of unsafe operating conditions. The BMS shall automatically control the charge and discharge of individual battery modules, balancing between modules in a rack to optimize



performance, monitor battery cell/module health, as well as provide safeguards from potential damage. The BMS should include, but not be limited to, the following capabilities. In addition, the BMS should comply with the battery supplier's recommendations for monitoring and control.

- a. Battery Module Protection: Protect the battery modules from operating outside battery supplier recommendations including temperature.
- b. Charge/Discharge Control: BMS shall control the charge and discharge of the individual modules per the application defined in this technical specification.
- c. State of Charge Determination: BMS shall determine and report the state of charge ("SOC") of each module in the battery storage system.
- d. State of Health Determination: BMS shall determine and report the state of health ("SOH") of each battery module. Parameters shall include, but not be limited to, energy of the battery module (MWh), internal resistance of the battery modules, self-discharge of the battery module, rack current, cell voltages (min and max), and internal module temperatures.
- e. Module Balancing: BMS shall automatically balance the charge between modules (and internal the modules, between cells) to optimize performance, and prevent over-voltage, of the battery storage system.
- f. Historical Performance: BMS shall log the historical performance of the battery storage system for recall in the future as further described in this technical specification.
- g. Alarms and Faults: BMS shall generate and report any faults, coordinating with the plant controller regarding the battery modules and/or racking.
- h. Safety: BMS shall provide protection of the battery modules in the event of an emergency to prevent unsafe operation, including over-voltage or over-current conditions. The BMS shall coordinate with safety and protection systems of the overall battery storage system, including fire suppression, as needed to avoid catastrophic failure.

30.12 AC System

The BESS AC system includes all switch gear, bus work, cable, connectors, transformers, and protective relaying required for connecting the BESS at the PCC. The Contractor shall design, procure, ship, and assemble on-site all AC interconnection equipment on the BESS side of the PCC. On-site assembly of Contractor supplied equipment shall be coordinated



with the utility. The Contractor shall design, fabricate, ship and install all cabling required for connecting the BESS to the PCC. The BESS AC system shall include potential transformers, current transformers, and any other metering equipment so that the performance monitoring and documentation requirements of this specification can be met. Metering accuracy shall be the same as that for Part 1 and 2 of the Plant Facilities.

30.12.1 Protection and Control

- a. The power system (PCS), AC and DC switchgear/protective devices shall be designed to provide safe, reliable operation with minimum interruption. Reliable operation shall be supported by a sensitive and properly coordinated protection system. The protection system shall be capable of monitoring significant operating parameters and sensing all abnormal operations or fault conditions. It shall isolate the faulted circuits or components without causing damage to other circuits and components of the system. The protection system shall also provide adequate indications and/or alarms for identification of the faulted circuits, components, and abnormal conditions, allowing preventive action and rapid restoration of service.
- b. The grid may have its own protective schemes at the point of common connection (PCC) that will be the responsibility of the Contractor to be fulfilled.
- c. Integration of the protective relaying and metering into the BESS controls shall not circumvent normal protective relaying. Protection shall not be interlocked with the position of any isolating/interrupting devices.
- d. The BESS shall provide breaker failure protection for the primary interrupting device (that is, breaker, high-voltage interconnect, low-voltage interconnect) that is responsible for disconnecting the BESS and/or high-voltage ground sources from the distribution system.
- e. The BESS shall be capable of interrupting line-to-line fault currents and line-to-ground fault currents available at the PCC and flowing in the Contractor's equipment in either direction for faults on either side of the PCC. Faults due to malfunctions within the BESS shall be cleared by the BESS protective devices.
- f. BESS and high-voltage ground sources should be disconnected from the distribution system and the system operators must be notified if any of the following occur:
 - The BESS local interconnection protection system fails
 - The interrupting device fails.



- The DC supply is lost
- The signal channel fails

The BESS interconnection protection must be capable of distinguishing between external faults on the transmission system and internal faults within the facility. The automatic reconnection scheme must be disabled for faults occurring within the facility.

The BESS shall include provisions to protect against transient voltage surges from switching, lightning, and similar causes, in accordance with applicable standards. The overall PCS design shall also limit surges on the DC bus to twice the normal maximum DC bus voltage.

30.12.2 Auxiliary Power

The BESS shall include an auxiliary power system (separate or same as the Plant Facilities auxiliary system), that shall be metered. The auxiliary power system shall include all step-down transformers, breakers, fuses, motor starters, relaying, panels, enclosures, junction boxes, conduits, raceways, wiring, and similar equipment, as required for the BESS operation. The auxiliary power system shall include separate potential transformers and current transformers, so that auxiliary power consumption can be measured and electronically recorded in real time, independently of operation of the PCS or of net power flows to and from the battery. The auxiliary power system and/or control system design shall provide for whatever emergency power is necessary for an orderly system shutdown during abnormal conditions such as a loss of grid power. The auxiliary power system and/or control system design shall also provide for the capability to restart automatically after BESS shutdowns of several days. Redundant auxiliary system shall be provided for BESS. The back-up time for DC auxiliary system shall not be less than the 4 hours.

31 BESS Control and Communication

31.1 Control System General Requirements

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The control system shall be designed to provide for automatic, unattended operation. The control system design shall provide for local manual operation and remote operation or dispatch from a remotely located computer. The control system shall be programmable for establishing or adjusting all parameters, set points, algorithms, limits, and so on that are required for effective operation as described in this specification. The control system shall be designed to prevent externally supplied, control panel or local signals from causing the BESS to operate in an unsafe manner or in a manner that may damage the BESS.

31.2 Control Functions and Protocols

31.2.1 To the extent possible, all BESS control functions and operating modes shall be in accordance with standard functionalities for smart distributed resources, as documented in the IEC 61850-90-7.

31.2.2 The communication protocol for the BESS shall be according to IEEE 1815-2010, Standard for Electric Power Communications—Distributed Network Protocol (DNP3), as further developed in DNP3 Application Note AN2011-001, DNP3 Profile for Basic Photovoltaic Generation and Storage or IEC 61850.

31.2.3 If data points and/or control functions outside the standard point definitions in DNP3 AN2011-001/IEC 61850 are created by the Contractor, the Contractor shall maintain a systematic log of the same for the purpose of maintaining/facilitating interoperability with future standards/protocols for distributed energy resources

31.3 Additional Control System Functions

31.3.1 Shutdown/Startup/Standby

The start and stop controls shall be as per DNP3 AN2011-001 standard specifications or IEC 61850. The control system shall use these controls for an orderly and safe shutdown, even in the absence of grid power. The control system shall also use these controls for an orderly startup sequence, which shall provide for a safe system reset from any standby or operating condition so that the unit goes through a normal startup sequence in the same way it would when being powered up after loss of power or being in a shutdown state. The control system shall include provisions for a standby state (that is, BESS available but not charging or discharging), which shall be the end result of a normal startup sequence. It shall also be possible to enter the standby state from any of the other operating states except connect/disconnect.



31.3.2 Initiation of Shutdown

The control system shall initiate shutdown under the following conditions and shall remain in the shutdown state until a reset signal, either local or remote, is initiated. An appropriate alarm shall be set.

- Emergency trip switch.
- Loss of the low-voltage AC or utility grid voltage.
- An AC circuit breaker trip (either side of transformer).
- Door interlock: Initiate shutdown when the door is opened (with appropriate provision for maintenance work). Interlocks shall be self-resetting.
- Smoke/fire alarm.
- Control logic trouble.
- A DC ground fault (field-adjustable setting).
- Remote disable (no reset required).
- grid system faults (balanced and unbalanced; line-to-ground, line-to-line, and three-phase).
- Abnormal frequency
- Abnormal voltage
- Islanding condition.
- Protection or control scheme failures, including the following:
 - Failure of local interconnection protection system
 - Failure of critical breaker trip coil or interrupting device
 - Loss of DC supply

31.3.3 Reset Alarms

For all system-generated alarms, the control system shall provide for the resetting of those alarms. This function is intended for alarms that, after they are set (for example, by a fault condition, as listed above and elsewhere in this specification), must be cleared by operator intervention to allow normal operation to be restored.

31.3.4 Modify Storage Settings

The control system shall provide for modification of various set points and fixed

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operation/control settings associated with the various control functions.

31.3.5 Event/History Logging

The control system shall provide for the automatic logging of the following information:

- All errors or failures
- All startup and shutdown actions
- All control actions
- All responses to control actions
- All limit violations, including returns within limits

31.3.6 Status Reporting

The control system shall provide for reading and reporting of various BESS- supplied status information in accordance with the data collection and reporting requirements specified in this technical specification.

31.3.7 Time Synchronization

The control system shall provide for synchronization of its real-time clock with a standard time source.

31.3.8 Change Operational Mode

The control system shall support the mechanisms inherent in DNP3 AN2011-001 for activating/deactivating control functions. The control functions are expected to be executed by command from a remote host, but may also be scheduled.

31.3.9 Perform Self Diagnostics

The control system shall provide for self-diagnostic functions.

31.4 Control System Hardware Requirements

All local control and monitoring system components shall be housed in appropriate controlled environment enclosures (indoor) with the IP4X degree of protection, either as separate arrangement or in conjunction with Plant SCADA system.

31.5 Control System Self-Protection and Self-Diagnostic Features



- 31.5.1 The BESS shall include appropriate self-protective and self-diagnostic features to protect itself and the battery from damage in the event of BESS component failure or from parameters beyond the BESS's safe operating range due to internal or external causes. The self-protective features shall not allow local or remote signals to cause the BESS to be operated in a manner that may be unsafe or damaging to the BESS. All protective operations resulting in a shutdown shall be carried out in an orderly and safe manner, even in the absence of utility power.
- 31.5.2 Temperature sensors shall be incorporated in critical components within the BESS. The BESS shall alarm and go to standby/fault mode when an over-temperature condition is detected.
- 31.5.3 The BESS shall alarm upon detection of a DC ground fault. The alarm trip level shall be field adjustable.
- 31.5.4 Door interlock switches shall be provided for all BESS container doors. The BESS shall alarm and go to shutdown mode when an BESS door is opened. Doors shall be fitted with provisions for external locks.
- 31.5.5 The BESS shall alarm and go to shutdown mode upon detection of smoke.
- 31.5.6 Surge-protection devices shall be provided at the input and output terminals of the BESS.

31.6 Control Panel

The BESS shall include a local control panel or console, which is easily accessible, on or within the BESS container. As a minimum, the following operator controls shall be located on the control panel:

- Trip/reset for the BESS AC circuit breaker or contactor.
- Trip/reset for DC circuit breaker(s)/contactor(s).
- PCS on/off.
- Reset toggle or push button. When reset is initiated, the control system shall resume control and proceed to the appropriate operating mode.
- Reset cut-out selector switch to disable remote or local reset signals.
- A selector switch to manually set the operating state (that is, the shutdown, disconnect, or operate state) and to have the control system set the operating state automatically.
- A selector switch to manually set the operating mode and to have the control system



set the operating mode automatically.

- The control panel or console shall also include meters, indicators, and displays.

31.7 Performance Monitoring and Data Acquisition

31.7.1 The BESS shall include a (Data Acquisition System) DAS to provide continuous monitoring and display of key operational parameters, as well as permanent archival of all measured parameters. The DAS shall include sensors, transducers, wiring, signal isolation and conditioning circuitry, and data acquisition and analysis hardware and software as required to perform the functions described in this section. The DAS shall be of standard commercial manufacture and shall use components suitable for operation in the climatic conditions prevailing at site.

31.7.2 The DAS shall measure operational data, as described in this Clause, and shall record all data points to fixed and removable non-volatile memory. The DAS shall be capable of making all monitored data and events available through the DNP3 / IEC 61850 communication interface and shall permit display of current values and recent historical trends on a local screen for all recorded points. In addition, the DAS shall provide panel meter displays of certain operational parameters, as prescribed below.

Provision of monitoring and event data via the communication interface shall adhere to DNP3 AN2011-001 / IEC 61850 to the extent possible and capture at least the following data points:

- Frequency at the AC bus
- AC real power
- Power factor
- Real energy delivered
- Real energy received
- Auxiliary power
- Auxiliary energy
- DC power
- DC voltage
- DC current
- Phase A voltage
- Phase A angle



- Phase B voltage
- Phase B angle
- Phase C voltage
- Phase C angle
- Battery state of charge
- Battery string currents
- Battery temperature

31.7.3 Digital displays, on the BESS Control Panel, shall be no less than 1 in. (2.54 cm) high and shall update at least once per second. The DAS shall be integrated with the Plant Facilities SCADA described elsewhere in this Technical Specification either as addendum or within an overall Energy Management System interface. The DAS shall, at a minimum, provide remote data inquiry from personal computer– based platforms and data file export capabilities in ASCII format on independent media (such as a universal serial bus drive) that are readable on personal computer-based systems.

31.7.4 The DAS shall continuously measure or calculate the data points identified in 31.7.2 and shall make them available via the communication network as specified. All measured parameters shall also be permanently archived in all modes of operation. For continuously varying quantities, the Contractor shall propose for Employer's review and approval an approach to data archiving that is suitable for each quantity measured. The final approach will be decided during product design.

31.7.5 The DAS shall provide unsolicited message capability for reporting critical alarms. The Contractor and the Employer will agree on a list of alarms that are reported the instant they are detected. However, a minimum of following parameters shall be displayed on BESS local control panel, console, or SCADA computer:

- Main temperature Alarm (on system temperature exceeding a predetermined threshold)
- Smoke/fire Alarm (on system detection of smoke/fire)
- DC leakage current (battery leakage current to ground exceeding a predetermined threshold)
- Breaker status (connect/disconnect switch)
- AC voltage OK (system ac voltage exceeding a predetermined threshold)



- Battery temperature alarm (battery temperature exceeding a predetermined threshold)
- Synchronization error shutdown
- PCS fault
- Weak Unit Battery Alarm
- AC system fault
- Control logic problem (problem with the ESS control logic)
- DC fuse blown
- Container door open (BESS container door opening)

31.7.6 The BESS shall include provisions for determining and storing in non-volatile memory the sequence of abnormal events, trips, and/or alarms that cause the BESS to go the disconnect or shutdown state. It is preferable that this function be implemented separately from the normal operations data acquisition function of the DAS so that failures in the latter (hardware/software failures or power interruptions) will not prevent the permanent logging of abnormal event sequences. The BESS shall include provisions to transmit, at a minimum, the data displayed on the panel meters and the alarm/status indicators to the remote computer.

31.8 BESS Grounding and Lightning

A suitable equipment grounding system shall be designed and installed for the BESS. This system shall be designed to be tied to an existing site grounding system. The system also shall be adequate for the detection and clearing of ground faults.

All exposed non-current-carrying metal parts shall be solidly grounded as per relevant IS Codes. Particular attention shall be given to prevention of corrosion at the connection of dissimilar materials such as aluminium and steel.

Suitable Lightning Protection shall be provided for entire BESS system as per relevant standard.

31.9 BESS Wiring

31.9.1 All wiring shall be continuous for each wiring run (splices are not acceptable)

31.9.2 Wiring that may be exposed to mechanical damage shall be placed in conduit or armoured.



- 31.9.3 Wires shall have identifying labels or markings on both ends. The labels or markings shall be permanent and durable. Stick-on labels will not be allowed. All field wiring between separate equipment items supplied by the Contractor shall be color-coded according to appropriate standards.
- 31.9.4 In general and where practicable, control and instrumentation wiring shall be separated from power and high-voltage wiring by use of separate compartments or enclosures or by use of separate wire ways and appropriate barrier strips within a common enclosure.
- 31.9.5 BESS and PCS control and instrumentation system wiring shall be bundled, laced, and otherwise laid in an orderly manner. Wires shall be of sufficient length to preclude mechanical stress on terminals. Wiring around hinged panels or doors shall be extra flexible and shall include loops to prevent mechanical stress or fatigue on the wires.
- 31.9.6 Insulation and jackets shall be flame retardant and self-extinguishing.
- 31.9.7 Wiring to terminal blocks shall be arranged as marked on wiring diagrams. Terminal groupings shall be in accordance with external circuit requirements.
- 31.9.8 Raceway and cable systems shall not block access to equipment by personnel. There shall be no exposed current-carrying or voltage-bearing parts.
- 31.10 Mechanical
- 31.10.1 All exposed surfaces of ferrous parts shall be thoroughly cleaned, primed, and painted or otherwise suitably protected to survive outdoor conditions for at least 25-year design life of the system.
- 31.10.2 Outdoor enclosures shall be weatherproof (IP65) and capable of surviving intact under the site environmental conditions specified. Outdoor enclosures shall be equipped to prevent condensation.
- 31.10.3 Components mounted inside enclosures shall be clearly identified with suitable permanent designations that also shall serve to identify the items on drawings provided.
- 31.10.4 The site temperatures and the effect of temperature on component life shall be considered in developing the thermal design for all components, including the battery and PCS. Irrespective of the heat-removal system design the final rejection of all waste heat from the BESS shall be to the ambient air. Air-handling systems shall include filters to prevent dust intrusion into the BESS.



31.10.5 The BESS shall include an HVAC or ventilation system designed to maintain battery temperatures at levels acceptable to the Contractor's normal battery warranty conditions, conducive to acceptable battery life, and as required to maintain battery capacity for all seasons/climatic conditions at the site. The air handling/distribution system shall be designed to promote temperature uniformity within the battery.

31.11 Other Design Requirements

31.11.1 Noise Levels

31.11.2 The Contractor shall provide for and maintain noise mitigation devices like Noise mufflers at site, if required.

31.11.3 Fire Protection

31.11.4 The Contractor shall design and install a fire protection system that conforms to good engineering practice. The fire protection system design and associated alarms shall take into account that the BESS will be unattended. If required by the type of fire protection system provided, the Contractor shall calculate and take into account the heat content of the battery cell materials in designing an appropriate fire protection system. Separate fire protection systems may be used in the battery, PCS, and control areas.

31.11.5 Toxic Materials

31.11.6 If any toxic substance can be emitted from the equipment during a failure, fire, or emergency or protective operation, description of the toxic nature of the substances as well as treatment for exposure to it shall be included in the O&M manual. Their treatment and disposal shall be in accordance with the New Hazardous Waste Management Rules 2016 notified by the Government of India.

31.12 Spare Parts and Equipment

The Contractor shall evaluate the design with regard to expected failure rates, modes, and effects; overall BESS reliability; and planned mode of servicing. Based on this evaluation, the Contractor shall recommend and furnish an initial complement of spare parts that are not readily available. For example, these spare parts may include spare unit batteries and a small rectifier to maintain the unit batteries, as well as fuses, printed circuit boards, and switching devices (gate turnoff thyristors [GTOs], silicon-controlled rectifiers [SCRs], insulated gate bipolar transistors [IGBTs], and so on).



31.13 BESS Maintenance and Repair

31.13.1 The Contractor shall supply all labour, equipment, and materials needed to maintain the BESS performance and safe operation, including all maintenance required to satisfy the warranty terms and conditions.

31.13.2 The Contractor shall list all maintenance activities to be carried out under the maintenance contract. For each maintenance item, the list shall include a description of the item, the expected frequency (maintenance interval), the time required to perform the maintenance, any anticipated parts replacement, and any potential problems in carrying out the maintenance.

31.14 Factory Acceptance Testing of BESS

The Contractor shall develop and submit to the Employer for its review and approval a comprehensive FAT plan that shall demonstrate that the BESS will meet the requirements of the specification. The Employer shall have the right to request reasonable changes to the test plan. The Contractor shall conduct a Factory Acceptance Test ('FAT') of the BESS and control system at the factory before shipping.

31.14.1 Where full-scale testing of larger systems at the factory may be difficult or impossible due to the large system, the FAT shall be carried out at a subsystem or module level and shall consist of tests of 100% of the subsystems or modules that comprise the complete BESS, to the extent possible. In the FAT plan, the Contractor shall clearly state what is being tested and shall fully explain any features or functions of the fully assembled BESS that would not be fully tested in the reduced-scale testing proposed. In such a case, the SAT plan shall further describe how the tests that could not be carried out in the factory will instead be carried out at the site.

31.14.2 After the Contractor determines that the BESS is fully operational, the Contractor shall conduct a FAT, witnessed by the Employer and/or the Employer's representative. The FAT shall consist of the Contractor demonstrating to the Employer that the BESS is fully operational and performs as specified. This includes but is not limited to the following:

- Visual inspection of all provided equipment, including dimensions and overall design.
- Verification of proper mechanical construction such as electrical connection torques.



- Heat Generated.
- Verification of sensors, metering, and alarms.
- Verification of all control functions, including remote control and monitoring, and communications interfaces.
- Verification of BESS performance at full and partial power and energy ratings.
- Verification of maintenance and replacement features for unit batteries and other key components.
- Verification of compliance with specifications.

31.14.3 During the FAT, the BESS shall meet the following:

- Be operated and function as specified and designed in all the operating states, use cases, and duty cycles specified herein
- Meet the power and energy requirements specified herein
- Be demonstrated to meet the safety and response to catastrophic failure requirements specified herein
- Have the efficiencies, response capabilities, and other features specified herein and/or proposed by the Contractor

Note: *The methodology for measurement of procurement specifications is provided in the Annexure A Part II: PG Test Procedure to this Section.*

31.14.4 Operation of all control, protective relaying, and instrumentation circuits shall be demonstrated by direct test, if feasible, or by simulating operating states for all parameters that cannot be directly tested. Automatic, local (control console), and remote operation of the controls shall be demonstrated.

31.14.5 Factory testing shall demonstrate operation at expected temperature extremes at the project site. If this is not possible for the full BESS at the manufacturing facility, independent laboratory certification of operation of critical components and subsystems in the battery, PCS, and control systems shall be submitted at the time of the FAT. The Contractor shall submit to the Employer for approval, 90 days before the FAT, a list of components and subsystems for which independent lab testing certification will be sought.



31.14.6 The Contractor shall perform any and all system modifications required during startup and testing. The testing may be suspended as a result of a BESS malfunction and resumed only on rectification of problem items. Such suspension and resumption will occur at the sole discretion of the Employer.

31.14.7 The BESS will not be accepted for shipment until all FATs have been successfully completed. In addition, the Employer will verify that all provisions of the contract have been met, including verification of all required submittals, any spare parts delivery, and any required system modifications.

31.14.8 BESS shall be tested in accordance with UL9540.

32 Commissioning and Functional Guarantee test procedure

32.1 The Contractor shall develop and submit to the Employer for its review and approval a comprehensive SAT plan that shall demonstrate to the Employer that the ESS will perform as specified at the Employer's site. The Employer shall have the right to request reasonable changes to the test plan.

32.2 The Contractor shall develop and perform SAT procedures to ensure that the BESS will perform as designed and that the system meets the performance criteria specified elsewhere in these specifications. The SAT plan shall include procedures to test operating scenarios described in the specification. These procedures may involve special requirements and/or witnessing by the local independent system operator. To the extent achievable, all use cases and operating modes described in the specification shall be tested.

32.3 After the Contractor has determined that the BESS is fully operational, the Contractor shall conduct the SAT, witnessed by the Employer and/or the Employer's representative. The tests shall include, as a minimum, the following:

- Verification of sensors, metering, and alarms
- Verification of all control functions, including automatic, local, and remote control
- Verification that the performance criteria in the specification can be met or exceeded
- Demonstration of all of the intended use cases
- Demonstration of interface protection circuits and functions and control interfaces
- Tests shall demonstrate that the BESS capabilities, efficiencies, response, and



features are as proposed by the Contractor.

- Testing shall include, as a minimum, measurement of harmonic content and power factor at full and partial power levels for both charge and discharge.
- Operation of all control, protective relaying, and instrumentation circuits shall be demonstrated by direct test, if feasible, or by simulating operating states for all parameters that cannot be directly tested. Automatic, local, and remote operation shall be demonstrated.
- The SAT shall also specifically address discovery of problems or failures that may have occurred during or as a result of shipment.
- The Contractor shall perform any required modifications and repairs identified by the testing, before acceptance by the Employer.
- The Employer will not accept the BESS for commissioning until all acceptance tests have been successfully completed and all provisions of the contract have been met.

32.4 Functional Guarantee - Actual Operating Experience

Since it may not be possible, due to system constraints, to test all facets of the BESS function as part of the performance verification tests specified in the preceding sections the actual operating experience of the BESS during the performance guarantee period after initial startup shall be deemed an extension of the performance verification tests. The performance guarantee period shall not be construed as a substitute for the warranty requirements, as specified in the subsequent Clause. Actual operating experience will be documented through Contractor-furnished records, and other system monitoring equipment and associated BESS performance. Documented failure or malfunctions of any BESS component during the performance guarantee period shall be deemed a failure of the system commissioning test. The Contractor shall, at no cost to the Employer, make the necessary repairs, replacements, modifications, or adjustments to prevent the same failure or malfunction from occurring again. The replacement of certain BESS components in response to a system failure may necessitate, at the discretion of the Employer, the duplication of certain performance verification tests, which shall be performed at the Contractor's expense.



33 BESS Warranty

33.1 The Contractor shall provide a warranty for the entire BESS and its constituent equipment.

33.2 At a minimum, the Contractor shall provide an unconditional, 5 (five) -year parts and labour warranty on all BESS equipment except battery (unit or racks). For the battery storage, the warranty shall cover parts warranty including battery nominal capacity ratings in order to meet the End of battery Life condition described in this specification.

33.3 Warranty replacement shall be required for individual unit batteries that degrade in performance to the point at which the BESS cannot meet the requirements specified in this specification up to the End of Battery Life and/or for unit batteries that materially degrade the availability, reliability, safety, or functionality of the BESS.

33.4 The warranty shall guarantee the availability of battery replacements delivered to the site within 2 weeks of notification during the battery warranty period. This period, shall, however, not be considered part of the Accountable Outage period for assessing BESS availability.

33.5 Additional warranty requirements are as follows:

- The warranty shall specify the terms and conditions of the warranty, including operating conditions requirements, procedures that must be followed, and all maintenance requirements. The warranty terms shall be easy to understand and shall be clearly stated.
- The warranty shall provide an explicit statement as to the warranted cycle life and the warranted calendar life of the battery.
- The warranty shall include a simple and easy to understand proration formula, if any, to be used in crediting the Employer for unused life or capacity of equipment replaced or repaired.
- The warranty shall specify guaranteed battery replacement costs. The Employer shall be provided the option to secure the guaranteed replacement cost at the time of the initial supply agreement.
- The warranty shall specify the scope of service associated with software updates.
- The warranty shall specify the scope of service included in replacement or repair of



the equipment.

- The warranty shall specify all labour, materials, shipping charges, and other Employer expenses not included in the warranty.
- The warranty shall specify the estimated time to complete the repairs/replacement required to restore the BESS to the warranted performance level. The time shall be given as the number of working days from the time of Employer's notice to the Contractor that the BESS has failed to meet the performance requirements.

34 Documentation and Submittals

34.1 The Contractor shall furnish complete documentation that will be used for determination of contract compliance, as well as O&M of the BESS.

34.2 Review and acceptance of submittals shall not encumber the Employer or the Host Utility with responsibility for the adequacy or safety of the Contractor's design.

34.3 Titles shall clearly indicate the function of the document, the Employer and location of the facility.

34.4 At a minimum, Contractor's documentation shall consist of the following:

- Construction and installation drawings/ documents
- Construction materials submittal
- Equipment drawings and specifications
- Operation and maintenance manual
- Maintenance schedule
- Critical path method project schedule
- Master test plan and procedures
- Quality assurance manual
- Software documentation
- System Study reports including the Steady state analysis, Power Quality and Dynamic Study
- Test reports
- Training manuals
- Technical datasheets of, at least:



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- Datasheet of the BESS
- The transformer
- The inverter (also see annex 4)
- P/Q-chart
- The battery
- The Auxiliary transformer
- The MV-switchgear / RMU
- The LV-switchgear
- The LV-switchboard
 - Cell-type and chemistry
 - Module/rack/overall capacity (in Ah)
 - Module/rack/ overall energy (in kWh)
 - Continuous and temporary discharge current rating (C-rate)
 - Continuous and temporary charge current ratings (C-rate)
 - Round trip DC-DC efficiency at 25°
 - Operating DC voltage range
 - Operating temperature range
 - Self-discharge rate [% energy loss/day]
 - Module weight

D Energy Management System and Common Infrastructure

35 SCADA System for Plant Facility

35.1 General Requirements

35.2 The Contractor shall provide complete SCADA system with all accessories, auxiliaries and associated equipment and cables for the safe, efficient and reliable operation of entire Plant Facility.

35.3 The Contractor shall provide all the components including, but not limited to, Hardware, Software, Panels, Power Supply, HMI, Laser Printer, Gateway, Networking equipment and associated Cables, firewall etc. needed for the completeness.

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35.4 SCADA System shall have the provision to perform the following functions.

- (i) Real-time acquisition and display of data, status, alarms and trends.
- (ii) Display of status of major equipment in Single Line Diagram (SLD).
- (iii) Display and storage of measured values
- (iv) Display and storage of derived/ calculated/ integrated values
- (v) Generate, store and retrieve user configurable Sequence of Event (SOE) Reports
- (vi) Remote monitoring of essential parameters on the web using standard modem (Internet connection for transferring data to web shall be taken by Contractor in the name of Employer for O&M period).
- (vii) Providing supervisory information for alarm, various types of displays, status information, trending, historical storage of data etc.

35.5 It shall be possible to remove/ replace redundant controller or various modules (like any I/O module, interface module, etc.) from its slot for maintenance purpose without switching off power supply to the corresponding rack without releasing any spurious signal to controller and causing disturbance or loss of controller functions for other controller.

35.6 The Control system shall be designed to operate in non-air-conditioned area.

35.7 Human Machine Interface System (HMIS)

35.7.1 Graphical Interface Unit (GIU) / Operator work station (OWS) shall enable monitoring and operation of all devices.

35.7.2 The system shall have built-in safety features that will allow/ disallow certain functions and entry fields within a function to be under password control to protect against inadvertent and unauthorized use of these functions. The system security shall contain various user levels with specific rights as finalized by the Employer during detailed engineering. However, no. of user levels, no. of users in a level and rights for each level shall be changeable by the programmer (Administrator).

35.7.3 The system shall have suitable hardware and software-based firewall for network security to restrict unauthorized access to HMI/Solar SCADA PCs and system.

35.8 Hardware at Main Control Room

35.8.1 The Hardware as specified shall be based on latest state of the art Workstations and Servers and technology suitable for industrial application & power plant environment.



35.8.2 All the peripherals shall conform to the following minimum requirement but the exact make & model shall be as approved by Employer during detailed engineering. The LAN to be provided shall support TCP/IP protocol (Ethernet connectivity) with OPC RDI for interface with PLCs/other systems and shall have data communication speed of min. 100 Mbps. All network components of LAN and Workstations shall be compatible to the LAN, without degrading its performance.

35.8.3 3 Nos of Engineering Work Station (EWS) and 3 Nos of Operator Work Station (OWS) shall be provided in the Main Control Room with the minimum specification mentioned in the following table.

WORKSTATION SPECIFICATIONS		
Parameters	Values	
	OPERATOR	ENGINEERING
Grade	Industrial Grade	Industrial Server Grade
Processor	64 Bit	64 bit Server Grade
Hard disk	1 TB - RAID 1	1 TB - RAID 1
Memory	8 GB RAM upgradable to 16 GB	16 GB RAM upgradable to 24 GB
Monitor	Min 22" LED Flat Monitor with non-interfaced refresh rate min. 75 Hz. Communication port-2 Serial bus, one parallel Dual 10/100/1000 Mbps. Ethernet Graphic Memory=16 MB Expansion slot=3	
Removable bulk storage drive (DVD / DAT)	6 GB (minimum)	6 GB (minimum)
Removable Bulk Storage Media for above (with each server/ work-station)	10 nos.	10 nos.
DVD R/W	16x or higher	16x or higher
Intelligent UPS (on line) with remote monitoring for each workstation/ server	1 no. with 30 mins. Battery backup on machine load	
Keyboard	ASCII	



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Pointing Device	Mouse	Mouse
Screen display unit (3Nos.)	Min 50" LED Flat Monitor with wall mounted arrangement for the display of SCADA screen	
Colour Laser Printer (2Nos.)	Paper – A3, Automatic Duplex Printing, Heavy duty type with resolution of 600 dpi Resolution	

35.9 Programming Functionalities

Programming of the PLC Processor / controller as well as programming of HMIS shall be user friendly with graphical user interface. All programming functionalities shall be password protected to avoid unauthorized modification.

36 Software Requirements

36.1 All necessary updated software required for implementation of control logic, operator station displays / logs, storage & retrieval and other functional requirement shall be provided.

36.2 Industry standard operating system like WINDOWS (latest version) etc. to ensure openness and connectivity with other system in industry shall be provided. SCADA system shall support following standard protocols (included but not limited to) to communicate with different sub system/Devices:

- (i) Modbus (TCP/IP, RTU, ASCII)
- (ii) Sub Station Protocol like IEC-61850
- (iii) IEC 60870 – 5 – 101/ 104
- (iv) Any other protocol on which the offered equipment (by Contractor) will communicate with SCADA.

36.2.1 The Contractor shall provide software locks and passwords to Employer for all operating & application software. Also, the Contractor shall provide sufficient documentation and program listing so that it is possible for the Employer to carry out modification at a later date.

37 System Spare Capacity

Over and above the equipment and accessories required to meet the fully implemented system as per specification requirements, Control System shall have spare capacity of

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10% along with the necessary hardware/equipment/accessories to meet the future expansion requirement.

38 Data Communication System (DCS)

The DCS shall have the following minimum features.

38.1 Redundant communication controllers shall be provided to handle the communication between I/O Modules (including remote I/O) and PLCs and between PLCs and operator work station.

38.2 The design shall be such as to minimize interruption of signals. It shall ensure that a single failure anywhere in the media shall cause no more than a single message to be disrupted and that message shall automatically be retransmitted. Any failure or physical removal of any station/module connected to the system bus shall not result in loss of any communication function to and from any other station/module.

38.3

38.4 Built-in diagnostics shall be provided for easy fault detection. Communication error detection and correction facility (ECC) shall be provided at all levels of communication. Failure of one bus and changeover to the standby system bus shall be automatic and completely bump less and the same shall be suitably alarmed/logged.

38.5 Data transmitting speed shall be sufficient to meet the responses of the system in terms of displays, control etc. plus 20% spare capacity shall be available for future expansion.

38.6 Contractor shall employ redundant fiber optic backbone for data communication between remotely located equipments and main control room.

38.7 The Contractor shall furnish details regarding the communication system like communication protocol, bus utilization calculations etc.

39 Operator Interface Displays/Logs/Reports

Suitable Operator Interface Displays/Logs/Reports for control operation & monitoring shall be provided. The details shall be furnished and finalized during detailed engineering stage.

39.1 Historical Storage and Retrieval System (HSRS)



- 39.1.1 The HSRS shall collect, store and process system data from man-machine interface system and plant information system (MMIPIS) data base. The data shall be saved online on hard disk and automatically transferred to erasable long-term storage media once in every 24 hours periodically for long term storage. Provision shall be made to notify the operator when hard disk is certain percentage full. The disk capacity shall be sufficient to store at least thirty days data.
- 39.1.2 The data to be stored in the above system shall include alarm and event list, periodic plant data, selected logs/reports. The data/information to be stored and frequency of storage and retrieval shall be finalised during detail engineering stage.
- 39.1.3 The System shall appropriately store all the data collectively for the plant facility and individually for each component (Solar PV Plant, Wind Plant and BESS) of the Plant facility in such a way that it can easily be used for assessment of all the performance guarantee and warrantee provided by the bidder as per the bid document.

40 Control and Power Supply Scheme

Contractor shall provide the UPS/DC Power supply of suitable rating to cater all the load requirements of SCADA system and its auxiliaries. The power backup for the entire system should be at least for 04 hours.

41 Control Cabinets / Panels / Desks at Main Control Room

- 41.1 The cabinets shall be IP-22 protection class. The Contractor shall ensure that the temperature rise is well within the safe limits for system components even under the worst condition and specification requirements for remote I/O cabinets.
- 41.2 The cabinets shall be totally enclosed, free standing type and shall be constructed with minimum 2 mm thick steel plate frame and 1.6 mm thick CRCA steel sheet or as per supplier's standard practice for similar applications.
- 41.3 Two spray coats of inhibitive epoxy primer-surface shall be applied to all exterior and interior surfaces. A minimum of 2 spray coats of final finish colour shall be applied to all surfaces. The final finished thickness of paint film on steel shall not be less than 65-75 micron for sheet thickness of 2 mm and 50 microns for sheet thickness of 1.6 mm.



42 Software Licences

The Contractor shall provide software license for all software being used in Contractor's System. The software licenses shall be provided for the project and shall not be hardware/ machine-specific.

Contractor shall provide Minimum 4 nos of licenses for remote monitoring (Concurrent viewing of data at 4 different locations authorized with user ID/ Password) of the essential parameters of solar plant on the web using popular web browser without requirement of additional software. User ID and password for remote view can only be changed by SCADA Administrator.

43 Solar Plant SCADA minimum Requirements: -

The Contractor shall provide control and monitoring of all the equipment including String Monitoring, Inverter, Transformers, MV Switchgears etc.

43.1 Programmable Logic based control system at Main Control Room

43.2 Bidder shall provide PLC based SCADA at Main Control Room. For other locations such as Inverter room, Sub Pooling Switchgear Room (if applicable) bidder may offer IO modules/ RTU/ PLC for completeness of SCADA.

43.3 PLC Processor

- The processor unit shall be capable of executing the following functions.
- Receiving binary and analog signals from the field to server.
- Implementing all logic functions for protection and annunciation of the equipment and systems.

43.4 The SCADA shall be OPC version 2.05a compliant and implement an OPC- DA 2.05a server as per the specification of OPC Foundation. All data should be accessible through this OPC server. SCADA shall have OPC connectivity for other systems.

44 Wind Plant SCADA minimum Requirements:-

44.1 Local Control System (LCS)

Each WEG shall have a Local Control System (LCS) and it shall be designed for automatic, unattended operation based on a microprocessor/ PLC-controlled system with adequate power backup.

44.2 COMMUNICATION WITH LCS

- a. The LCS performs the data acquisition on the wind WTGs and grid. All data measured



on WTGs must be accessible for SCADA. Besides the WTGs, the LCS is to measure voltage on three phases and frequency of the grid.

- b. Data transmission between LCS and SCADA shall be serial interface, 20mA current loop or standard RS-232C. Contractors may specify in the Tender the method of interfacing between LCS and SCADA.

44.3 Controls

- a. The sensors must be robust and reliable and calibrated by certified testing agencies and the measured data must fulfill the requirements of accuracy.
- b. The following operation of the individual WTGs shall be possible to carry out from SCADA:
- (i) Stop the WTGs
 - (ii) Start the WTGs
 - (iii) Reset the counters
 - (iv) Change the alarm limit.
- c. After certain faults as per LCS settings, the WTGs are restarted automatically. To avoid excess voltage drops, the SCADA must inhibit start of more than one WTG at a time. The time between start of WTGs must be adjustable in the range 0 to 60 sec. All alarms must be reported immediately to SCADA. All alarms must be reported in written format (emails or Print out) in clear text, describing the kind of alarms, where the alarm occurred and the time of initiation of the alarm. Resetting of alarms is to be reported in written format (emails or Print out) in the same Form. It must be possible to specify maximum and minimum limits for all alarms.

44.4 Display of Data

The display screen shall show the following pictures and data which is indicative in nature & shall be as per manufacturer's design:

- a. Actual power generation and operation status (on/off) of each WTG.
- b. Wind speed, direction (figure and arrow), air temperature, and air pressure from wind masts
- c. Table showing the following data for WTG

Sr. No.	Data to be displayed
1.	WTGs number

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2.	Active power
3.	Reactive power
4.	Energy production, main generator
5.	Energy production small generator (if any)
6.	Power factor
7.	Operation time (main and small generator)
8.	Total operation time
9.	Local wind speed
10.	Local wind direction
11.	Ready for yawing, green yes/white no
12.	Ready for normal operation, green yes/white no
13.	Freewheeling, green on/white off
14.	Operation, green on/white off
15.	Yawing left, green yes/white no
16.	Yawing right, green yes/white no
17.	Automatic cable untwisting, green on/white off
18.	Automatic reset expected, red yes/white no
19.	Generator 1, green on/white off
20.	Generator 2 if any, green on/white off
21.	Manual operation green on/white off
22.	Remote stop executed, green on./white off
23.	Manual reset required, red yes/white no
24.	List of alarms/failures
25.	Rotor speed
Mechanical Parameters in graphical form	
1.	Wind WTGs number
2.	Gear oil temperature
3.	Oil level (ok/alarm)
4.	Main bearing temperature
5.	Mechanical brake temperature
6.	Brakes activated (on/off)
7.	Yaw motor temperature
8.	Nacelle temperature
9.	Yaw system, hydraulic pressure



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10.	Yaw angle
11.	Rotor speed
	Electrical Parameters in graphical form
1.	Generator temperature
2.	Generator revolution
3.	Active power
4.	Reactive power
5.	Power factor
6.	Voltage (3 Phase)
7.	Current (3 phase)
8.	Frequency
9.	Switch board temperature
	Wind Power Plant Parameters
1.	Operation (on/off)
2.	Number of active alarms (not reset)
3.	Active power
4.	Reactive power
5.	Power factor
6.	Wind speed
7.	Wind direction
8.	Total active power
9.	Total reactive power
10.	Average active power
11.	Average reactive power
12.	Air Temperature

- d. It must be possible to reset alarm in the screen picture (after the cause of failure is rectified).
- e. Alarms, which are reset at the WTGs, shall automatically be reset on this screen picture.
- f. Active alarms with text, date and time may be in red colour. After reset text, date and time must change to white, but all the alarm history with rectification date shall be available in the fault log for minimum duration of 1year.
- g. The last 10 alarms must always be presented on screen.

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- h. Manual stop also to be reported on the alarm list.
- i. It must be possible to switch different WTGs from the screen pictures "Wind WTGs",
- j. Manual stop also to be reported on the alarm list.
- k. It shall be possible to carry out the following tasks from the screen, but with password. In order to avoid errors, activation of any of these tasks shall cause a text to appear on the screen, which has to be answered before the order can be executed. For example the text could as "Stop the wind WTGs type Yes/No"
 - 1. To start/stop the WTGs
 - 2. Reset counters and change alarm limits.
 - 3. To start/stop all the WTGs, reset counters and change alarm limits

45 EMS (Energy Management System)

45.1 General Requirements

Energy Management System (EMS) system shall be a computerized system for real time monitoring, operation, control, reliable & efficient operation of the Plant facilities. EMS shall be able to acquire real time data of various equipment of Plant facilities, have in built logic/programming to monitor, control, and optimize the performance of Plant facilities as per specification. Contractor shall provide complete EMS system with all accessories, auxiliaries and associated equipments and cables for the safe, efficient and reliable operation of entire Plant facilities and its auxiliary systems. Contractor shall include in his proposal all the Industrial Grade Hardware, Software, Panels, Power Supply, HMI, Laser Printer, Gateway, Networking equipment and associated Cable etc. needed for the completeness even if the same are not specifically appearing in this specification.

The system shall be fully compliant to the relevant international standards such as EN 16001:2009, ISO 50001:2011.

45.2 EMS functionality for the BESS Control: -

The following operation modes of BESS can be set from the EMS system:-

- Automatic mode: This means that a part of the power quantity of the BESS behaves according to the selected operation mode.
- HMI mode or manual mode: in this mode, the operator has the possibility to:
 - Select the operation point
 - Direct control of active and reactive setpoints of the PCS.
 - Command of the balance of plants



- OFF-mode: A BESS is then not producing any power. The system is disconnected from the grid.
- STANDBY-mode: the BESS is connected to the grid, but the IGBT's in the PCS system are in an off-state (i.e. open switching)

Also, the performance of every application mode will be controlled and adaptable by this system.

This energy management strategy will be operated by the SCADA in Main Control Room. Any failure in the process or the control system including instrumentation must be detected and logged. This means that the instrumentation, electronic and electrical equipment shall include those failure detections.

Detailed diagnostic shall be locally memorized when alarm groups replace individual monitoring in the main control room.

A communication with the SCADA system must be possible to receive set points and transmit set points for each application mode. The SCADA should be able to remotely control the BESS. The EMS should allow the SCADA at least the following:

- Change the operation mode of each BESS independently
- Start/Stop each application mode appointed to a BESS.
- Change the application mode of each BESS (multiple modes can be selected together)
- Select the amount of power dedicated to each selected application mode.
- Specifically, for following use cases considered for the Project:
 - Power ramp rate control
 - Power Curtailment
 - Deviation Settlement Mechanism(DSM)
 - Change the setpoints for the SOC management
 - Direct control of active and reactive setpoint of a PCS
- Adapt the parameters needed for the operation of every application mode



The preferred communication protocol is MODBUS over a serial or Ethernet connection (Modbus RTU or MODBUS TCP). Other solutions can be proposed but are subjected to the approval of the client.

45.3 EMS functionality for the Plant Control: -

The EMS monitors grid and Plant facility variables and should be programmable for selecting the optimum-operating mode of the whole plant w.r.t. active and reactive power, grid voltage, grid frequency, etc. Additionally, it can receive external set points and automatically adapt the Plant Facility behaviour to the new settings.

The EMS shall perform following functionality to Control the Plant facilities: -

- Communication with grid or SCADA
- Communications with PV Inverters, WTG's, BESS and other power units
- Measuring and processing of the electrical magnitudes at EMS (voltage, current, PF)
- Control capability of PV Inverters, WTG's, BESS and other power units

The EMS shall allow following operation modes for the Plant facilities:

- Reactive Control (Q Control, setting point of reactive power Q at EMS)
- Power Factor Control (PF Control, setting point of $\cos(L)$ at EMS)
- Voltage Control (V closed loop control, setting point of V at EMS)
- Voltage Droop (Reactive power vs Voltage programmable curve or droop)
- Apparent Power Control (S Lim, setting point of S Lim at EMS)
- Active Power Limitation (P Lim, setting point of P Lim at EMS)
- Power Ramp Rate Control (setting point of maximum %Pn/min)
- Frequency Regulation (Power vs Frequency programmable curve or droop)

In addition to these operating modes, the EMS shall be prepared to work under voltage dips, allowing the inverters to inject the corresponding reactive power to provide the corresponding voltage support at the EMS. The EMS can receive the target values specified by grid operators using a standard protocol (i.e. Modbus TCP/IP) and over different communication media

45.4 Measurements

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To perform the application modes described above, measurements are needed at the Point of Common Coupling (PCC). The measurements are (but not limited to):

- Frequency measurement: The harmonic pollution level on the grid could be a major issue for the frequency regulation. The EMS should take into account the probable presence of harmonics 5, 7, 11 and 13 at least. This could be an issue in the frequency measurement and/or can delay the response time. This could be taken into account in the frequency measurement strategy (Bidder to explicit the frequency measurement, filtration and regulation).
- Voltage measurement: This is needed to perform voltage regulation and reactive power compensation
- Output power: This will be measured with an accuracy précised by the supplier. The measurement equipment should be class 0.2

45.5 Control & Power Supply Scheme

Contractor shall provide the UPS/ DC Power supply of suitable rating to cater all the load requirements of EMS system and its auxiliaries.

45.6 Software Documentation & Listings

All technical manuals, reference manuals, user's guide etc. in English required for modification/editing/addition/deletion of features in the software of the EMS System shall be furnished. The Contractor shall furnish a comprehensive list of all system/application software documentation after system organization for Employer's review and approval. All The software listings for application software, Project data files etc. shall be submitted by the Contractor. All the EMS Software with license Key shall be handed over to the Owner on the DVD/CD media. All the hardware and software shall be licensed to SECI.

45.7 IO List for the BESS Operations

A non-exhaustive indicated IO list is described in the table below.

<u>Signals for BESS operation</u>	
Digital signals from grid-SCADA to the BESS control-system (i.e. the EMS)	
command: stop	
command: run	
command: manual/automatic switch	

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command: "SOC management" active/inactive switch
Signal: MV circuit breaker at PCC: open
Signal: MV circuit breaker at PCC: close
Signal: MV circuit breaker at PCC: withdrawn
Digital signals from BESS control-system (i.e. the EMS) to the SCADA
Signal: stop mode
signal: running mode
signal: ready to start
signal: unavailable stop mode
signal: local control active
signal: manual control active
signal: SOC management active
alarm : insufficient GSR for SOC recovery
signal: emergency trip (from button)
command: trip of circuit breaker at PCC (specific polarity)
Major alarm (group of alarms to be defined with Client)
Minor alarm (group of alarms to be defined with Client)
Low voltage Alarm
High Voltage alarm
Monitoring alarm (loss of frequency measurement...);
SOC alarm (levels to be defined by the Supplier);
Alarm: loss of reference values (Pref, SOCref, deadband) ;
Trip command of circuit breaker at PCC;
Circuit Breaker Failure initialization; (if one protection relay trips) ;
signal: signal interface with clients control-system in service;
signal: fire alarm (buildings/container);
signal: degraded mode (if applicable),
Analog signals from EDT control system to ESS control system +feedback
Selection of the application mode & the adaptable parameters of each
application mode (e.g. ramp rate value in ramp rate control or the frequency
deadband in frequency regulation). This will be described by the Tenderer.
SOC command SOCref
Manual mode switch
Measurements for automatic operation mode
3 voltage transformers at the PCC
3 current transformers at the PCC
Current/voltage measurement at each departure at the LV-switchboard.

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This list is indicative only and shall be updated during detailed design stage based on the Project design.

The bidder will be responsible for providing all the material, equipment and services which are not mentioned in the Tender, but required for the successful installation, testing, commissioning and operation of the plant facilities.

46 Power System Study:

The aim of this document is to define the conditions and the technical characteristics to be considered in order to perform the network calculation studies related to the Plant Facility (Solar, Wind and BESS).

Network calculation studies shall be performed in order to validate the design of the Plant Facility and the sizing of the electrical equipment with regards to several constraints like:

- The requirements of the operator of the power Utilities and as stated in grid codes, grid connection agreements.
- The requirements of the local, national or international codes, standards and regulation associated to the design of the Plant Facility.
- The requirements of the specific projects for which the network calculation studies shall be performed.
- Electrical Studies shall be limited to the Electrical Configurations relevant to the project.

46.1 Scope of Work:

The following task shall be performed for the Plant Facility in order to validate the design of the Plant Facility including the sizing of the component.

- The computer modelling of the internal electrical distribution system of the Plant Facility.
- The power load flow study
- The reactive power compensation study
- The short circuit calculation study



- Power Quality Analysis including the Harmonic study, Flicker Analysis
- Dynamic Study

46.1.1 Simulation Software and Modelling of Network:

The reputed simulation software shall be used by the Contractor to perform the network studies.

The Contractor shall model the internal electrical network of the Plant Facility up to the Point of Common Coupling.

The Contractor shall populate the data-base of the model with the most up-to-date information related to the characteristics of the equipment which make part of the internal electrical network of the Plant Facility.

The Contractor shall use the most up-to-date and the most accurate static and dynamic model of the Plant component in order to populate the data-base of the model.

46.1.2 Load Flow Study

The Contractor shall perform the Load flow study of the internal electrical distribution system of the Plant Facility.

The aim of the power load flow study is to validate the sizing of the equipment constituting the internal electrical distribution system of the Plant Facility.

In particularly, the load flow study shall validate the characteristics of the tap changers of each transformer:

- The type (no-load or on load)
- The number of steps
- The voltage magnitude (-/+ V)
- The step voltage (%)
- The load flow calculation study shall include but not limited to the following for each simulation cases:
- The phase angle (°), the nominal voltage (V), the voltage drop, the active (kW) and reactive (kVAr) power load flow at each PCC of the Plant Facility



- The active (kW) and reactive (kVAr) power load flow in each branch of the electrical distribution system
- The active power losses (kW) and reactive power losses in each electrical component of the electrical distribution system
- The voltage (V), the voltage drop (%) and the PF at each bus-bar (node) of the electrical distribution system
- The position of the no-load and of the on-load tap changer (%) of each transformer

46.1.3 Reactive Power Compensation Study

The Contractor shall perform the reactive power compensation study of the internal electrical distribution system of the Plant Facility. The reactive power compensation study shall take into consideration all the other equipment of the electrical distribution system of the Plant Facility and that aims at modifying the voltage levels of the system and, consequently, the reactive power load flow of the system (e.g. transformers' OLTC or NLTC).

46.1.4 Short Circuit Study

46.1.5 The Contractor shall perform the short circuit calculation study of the internal electrical distribution system of the Plant Facility according to IEC 60-909.

46.1.6 In addition to the power load flow study, the short circuit calculation study aims at validating the sizing of the equipment constituting the internal electrical distribution system of the Plant Facility.

46.1.7 Based on the different possible scenarios, the short circuit calculation study shall be performed in order to calculate the maximum and the minimum short circuit levels on each bus-bar (node) of the internal electrical distribution system of the Plant Facility.

46.1.8 The short circuit calculation study shall show graphically, and for each simulation:

- $I''k_3$: 3-phase initial symmetrical short-circuit current
- I_p : Peak short-circuit current
- I_k : Steady state short circuit current
- $I''k_1$: Phase-to-ground initial symmetrical short-circuit current

46.1.9 Power Quality Analysis

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The Contractor shall perform the Power Quality Analysis including the harmonic and flicker study of the internal electrical distribution system of the Plant Facility. Prior to the harmonic study, the Contractor shall update or complete the model of the internal electrical distribution system of the Plant Facility by populating the data-base of the equipment which has specific harmonic behaviors. The voltage and current THDs of the Plant Facility shall be evaluated with regards to the requirements of the grid codes and relevant standard.

Short Term Perceptibility (Pst), Long Term Perceptibility (Plt) shall be evaluated for plant facility in compliance with grid code and relevant standard.

46.1.10 Dynamic Analysis

The Contractor shall perform the dynamic study of the control system of the Plant Facility. to evaluate (without being limited to):

- The capability of the Plant Facility to ride through low voltages and high voltages
- The capability of the Plant Facility to tolerate voltage and frequency deviations
- The capability of the Plant Facility to provide power frequency responses
- The capability of the Plant Facility to provide active power curtailment responses

Prior to the control system dynamic study, the Contractor shall update or complete the model of the internal electrical distribution system of the Plant Facility by populating the data-base of the equipment involved in the behavior of the regulation systems.

The Contractor shall perform the control system dynamic study according to different scenarios (representing different regulation control functions) and that shall be proposed.

The scenarios proposed by the Contractor shall cover the full scope of validations to be performed to fulfil the objectives of the Plant Facility control system dynamic study.

For each scenario, the Plant Facility control system dynamic study shall show, graphically, the changes of the magnitude of the measured signals over time.



Part II: Civil

A Civil, Mechanical and Plumbing Works for Solar PV Plant

47 General Requirement

- 47.1 This section of Technical Specifications describes detailed technical and functional requirements of all civil, structural, mechanical & plumbing works included in the scope for Solar PV plant.
- 47.2 This excludes design, supply and installation of Galvanised 220 kV and 132 kV Transmission Line towers, Tower extensions & accessories and 11 kV, 22 kV, 22kV & 33 kV transmission poles & accessories which shall be designed following latest guidelines of respective SEB (State electricity board)/ STU (State transmission utility) and got approved from them before execution. In absence of SEB/ STU guidelines REC (Rural electrification corporation) standards may be followed. Support at corner with angle $> 10^\circ$ shall be provided with 4-pole structure or lattice tower. Use of PCC spun poles is not acceptable. Approved copies of these designs & drawings shall be submitted to the employer for reference and record.

46.2 Standards & Codes

- 47.2.1 All design and construction of civil works shall conform to relevant Indian standards such as BIS, IRC, MORTH, NBC etc.
- 47.2.2 Design of steel structures shall conform to IS: 800, 801 or 802 as applicable. Design of concrete structures shall conform to IS: 456. For design of liquid retaining structure IS: 3370 shall be followed. Only in case of non-availability of Indian standard, equivalent American or British standard may be used for design with prior approval of the Engineer and the contractor shall submit proper justification for the same along with his request to the Engineer for review and approval, and the decision of the Engineer shall be final and binding.
- 47.2.3 All the design/ drawings shall be prepared/ approved either by in-house Engineering Team of the contractor (or by his Engineering Consultant) with qualified engineering staff with relevant experience in successful design of solar SPV plants.



- 47.2.4 The design calculations for MMS, RCC structure, Steel structure, Foundation system, Road work, Drainage work, etc. shall be submitted for prior approval of Engineer before commencement of construction.
- 47.2.5 As per project requirements, the Employer may ask for approval of all civil designs and drawings by a Chartered Civil/ Structural Engineer.
- 47.3 The design calculations shall be supplemented with a neat sketch showing the structure geometry, node and member nos., lengths of various typical members, support points and type of supports, types of materials & type of sections with properties considered in analysis & design. The report shall also include back-up calculations for various loads adopted in design, brief write-up on primary load cases and design load combinations considered and conclusions on design results (with supporting sketches) for easy reference and clarity. Where a computer program (other than STAAD) is used for analysis and design, the contractor shall include a write-up on the computer program used along with examples for validation check. Design Input (format suitable to the programme used and also in STAAD format) and output file shall also be given in the design report and in soft copy to facilitate its review and approval by the Engineer.
- 47.4 The methodology for construction of MMS and its foundations, Road & drainage works and Procedure for pile load test shall also be submitted for prior approval of Engineer before start of these works.

48 Topographical Survey

- 48.1 The contractor shall be responsible for detailed Topographical Survey of the proposed project site. The work shall be carried out through an agency with relevant experience and qualified survey team.
- 48.2 The Topographical survey shall be conducted at 20m x 20m grid, or as directed by the Engineer, with the help of digital surveying instruments like Total Station.
- 48.3 The Contractor shall carry the Bench Mark from nearest GTS Bench mark or any other established source like Railway station, Permanent PWD/ WRD structure etc. as approved by the Engineer, by fly-levelling and establish two permanent bench marks (PBM) at site. All subsequent transfer of levels shall be carried out with respect to these PBMs. The work shall also include constructing permanent reference pillars (RP) at suitable locations as directed by the Engineer. These reference pillars shall be labelled permanently with their



- respective coordinates and reduced levels for future use. The Permanent Bench Marks (PBM) and reference pillars (RP) shall be shown on the survey drawings.
- 48.4 While carrying bench mark to the project site, levels shall also be established on the permanent objects like culverts etc. at least on one object in every 1 (one) km if available along with route with adequate description about the objects. These levels shall be maintained at site & also mentioned in the survey report to facilitate locating these objects later on.
- 48.5 The survey work shall be carried out in UTM grid system. The contractor shall also establish the latitudes and longitudes of all the corners of the project site. At least 50m width of the adjoining plots and surrounding areas shall also be covered in the survey for correlation with adjoining plots and facilities. The grids for the survey work shall be established in N-S & E-W direction (corresponding to Geographical North or Plant North) as directed by the Engineer.
- 48.6 Positions, both in plan and elevation, of all natural and artificial features in the area like waterways, railway tracks, trees, cultivation, houses, fences, pucca and kutcha roads including culverts and crossings, foot tracks, other permanent objects like telephone posts and transmission towers etc. are to be established and subsequently shown on survey maps by means of conventional symbols (preferably symbols of survey of India Maps). All hills and valleys within the area/areas are to be surveyed and plotted on maps by contours. Any unusual condition or formation on the ground, locations of rock outcrops (if visible on the surface) and springs/falls, sand heap/dune, possible aggregate deposits etc. shall also be noted and plotted on contour maps.



- 48.7 The record of measurement of all Reduced Levels (RL) shall be submitted in digital format, (in x, y z coordinate system) along with preliminary contour plan of the site, for Engineer's review before submission of final contour map. The contour interval shall be as required for proper representation of the topography however it shall not be more than 0.5m. The Contractor shall submit survey maps of the site in 1:10,000 scale indicating grid lines and contour lines, demarcating all permanent features like roads, railways, waterways, buildings, power lines, natural streams, trees, sand dunes etc. Present use of the site i.e. mining, quarrying, agriculture etc., existing drainage pattern of the site, possibility of water logging and high flood level of the area shall also be captured in the document. The project plot boundary with coordinates of all corner points along with coordinate grid of 50m x 50m interval shall be marked on the contour map. The formation levels of the proposed power plant have to be fixed with reference to High Flood Level of the proposed site. The ground level and plinth level of structures shall be fixed taking into consideration the highest flood level and surrounding ground profiles.

49 Geotechnical Investigations

- 49.1 The contractor shall be responsible for detailed Geotechnical investigations at the proposed project site for the purpose of foundation design for various buildings, structures, HT lines, Module Mounting Structures(MMS) etc. and other design/ planning requirements. The investigation work shall be carried out through any Govt. approved/ NABL accredited agency. The contractor shall submit the credentials of the proposed agency along with relevant certificates in support thereof for verification/ approval of the Investigation Agency by the Engineer.
- 49.2 The scope of work includes execution of complete soil exploration including boring and drilling, standard penetration test (SPT), collecting disturbed (DS) and undisturbed samples (UDS), collecting ground water samples, trial pits, electrical resistivity tests (ERT), field & laboratory CBR tests, conducting laboratory tests on collected samples of soil & ground water and preparation and submission of report. SPT shall be carried out in all types of soil deposits and in all rock formations with core recovery up to 20% met within a borehole. SPT test shall be conducted at every 1.5m interval or at change of strata. The starting depth of SPT shall be 0.5m from ground level. UDS shall be collected at every 1.5m interval or at change of strata.



- 49.3 The field investigations shall mainly include drilling of Bore holes of 150 mm diameter and min. 5m deep boreholes (50% of total No. of boreholes shall be 10m deep), conducting SPT and collecting Disturbed (DS) and Undisturbed samples (UDS), conducting in-situ CBR test for approach road to the plant, internal roads & peripheral road; Trial pits if specified (min 2mx2mx2.5m deep) and ERT s. However, the Contractor has to carry out drilling for at least 3m in the hard strata or refusal area to ensure that the refusal is not due to the localized hard strata or boulder. Number and location of bore holes, CBR tests and Trial pits shall be decided as per the project layout, site topography and soil conditions in consultation with the Employer. There shall be minimum 1 nos. of Borehole per 5 acres of the area (However, total number of boreholes shall not be less than 5), 3 nos. of Trial pits, 5 nos. of CBR test & ERT, 5 nos. of Ground water samples for laboratory investigations. The soil/ rock samples for laboratory investigations shall be collected from each borehole and trial pit in sufficient nos. (Note- In case the project plot is divided in to number of discrete blocks separated from each other, min. 3 nos. of bore holes, 2 trial pits, 3 ERT and 3 CBR tests shall be taken per such block).
- 49.4 The proposed Geotechnical investigation plan indicating proposed locations of Trial pits, Boreholes, CBR test & ERT shall be submitted to the Employer for review and approval before start of work.
- 49.5 Laboratory tests shall be conducted on DS & UDS samples and ground water samples in sufficient no. & shall include, Soil classification, Grain size analysis including Hydrometer analysis, determination of Bulk and dry density, Specific gravity, Natural moisture content, Atterberg limits, Tri-axial shear tests (UU), Undrained shear test, Consolidation tests, Unconfined compression tests, Free swell index, chemical analysis of soil and water samples to determine the carbonates, sulphates, chlorides, nitrates, pH, Organic matter and any other chemicals harmful to concrete and reinforcement/ steel. Undisturbed samples of 100 mm diameter, 450 mm long from the boreholes at intervals of 1.5 m and every change of stratum starting from 1.5 m below ground level onwards & Disturbed samples shall be taken at 1.5 m intervals and at changes of strata and shall be contained in airtight container. The depth of Water Table, if encountered, shall be recorded in each borehole. Laboratory tests on rock samples shall be carried out for Hardness, Specific Gravity, Unit Weight, Uniaxial Compressive Strength (in-situ & saturated), Slake Durability etc. Laboratory CBR test on soaked samples shall also be conducted on min. 5 no. of soil



- samples to ascertain the suitability of soil for sub-grade and requirement of any treatment of subgrade soil in case of CBR <2% as per IRC requirements.
- 49.6 After completion of field and laboratory work, the contractor shall submit a Geotechnical Investigation Report for Engineer's approval. All bore log details and lab test results shall be presented in the report as per provisions of relevant BIS standards indicating BH coordinates, Existing GL, Depth of water table, Method of drilling etc. The report shall include a Map showing the locations of various field tests including coordinates, calculations and recommendations for foundation type and safe bearing capacity (SBC) for various Plant buildings (ICR, MCR etc.) and Open installations, Switch Yard structures & Sub-Station (as applicable), Transformer foundation, HT lines (as applicable), MMS foundation etc. corresponding to settlement of 25mm & 40mm.
- 49.7 The report shall include the study for "Liquefaction potential assessment of the ground and suggestions for any ground improvement measures" as required.
- 49.8 The report shall also include ground water analysis (water sample collected from bore well) to ascertain its suitability for construction purposes, recommendations for type of cement, grade of concrete & minimum cement content as per prevalent soil characteristics with respect to presence of aggressive chemicals and environment exposure conditions as per relevant BIS specifications. However, minimum grade of concrete shall be M25 (M30 in coastal areas/ marshy soil) for all RCC works except liquid retaining structures like underground water tank etc. where minimum grade of concrete shall be M30 (M35 in coastal areas/ marshy soil). Cement higher than 43 Grade, shall not be used in construction.
- 49.9 In case the contractor wishes to adopt concrete pile foundation for MMS supports the Geo-tech. report shall also include the calculations for safe pile capacity under direct compression, lateral load and pull out. The report shall include recommendations about type of pile, its depth and dia. to be used.
- 49.9.1 In coastal areas and in marshy or swelling type soil, under reamed or driven precast concrete pile shall be used. In case contractor wishes to use helical piles the design, fabrication and installation shall conform to IBC (International building code).
- 49.9.2 The contractor shall carry out field trials for initial load test on pile to verify the pile design to confirm the safe load carrying capacity under direct compression, Lateral load and Pull out.



- 49.9.3 The nos. of piles to be tested under each category shall be finalized corresponding to geotechnical characteristics at site, plot area etc. However, minimum 5 nos. of piles shall be tested (min. 3 nos. in each block if the plant site is divided in discrete blocks separated from each other) under each category of load.
- 49.9.4 The locations of test piles shall be distributed over the plant site and to be finalized in consultation with Engineer. In case the MMS column is fixed using base plate-anchor bolt assembly, the adequacy of provided pile reinforcement in job (working) pile corresponding to the set of test loads shall be reviewed by the contractor for any additional requirement of reinforcement and the same shall be provided in the pile to be cast for initial load test.
- 49.9.5 In case the Contractor proposes to embed the Column leg in the pile for fixing, the test pile shall be provided with embedded column leg as per approved design and any dowels as required for application of test load. The drawing for the Test pile shall be submitted to Engineer for his approval before casting the test pile. The load test on pile shall be conducted after min. of 28 days from the date of casting. In case the contractor desires to conduct the test earlier than 28 days, he may use suitable higher-grade concrete or if there is substantial evidence from earlier cube test results on design grade concrete to demonstrate the early gain of required compressive strength prior to application of the test load.
- 49.9.6 However, under no circumstances the test shall be conducted before 15 days of the date of casting the pile. All the dial gauges and hydraulic jack assembly shall be properly calibrated as per the requirements of relevant BIS standards and valid calibration certificate to this effect from Govt. / NABL accredited Test agency shall be submitted to the Engineer before use.
- 49.9.7 The contractor shall submit detailed methodology for conducting the tests in line with IS: 2911 (Part 4) for Engineer's approval before commencement of any test. After completion of these tests the contractor shall compile the test results and submit the report in a proper format as specified in the BIS standard with recommendations/ conclusions for Engineer's approval. The pile work shall start only after approval of the final pile design duly verified/ confirmed with initial load test results.
- 49.10 All buildings/ Open installations (MCR, ICR etc.), Switchyard and Sub-station area shall have levelled ground. No foundation for MMS, Buildings, Switch yard equipment &



structures, Sub-stations, HT Line Towers, Transformer etc. shall rest on filled up ground. However, minor structures like cable trench, cable rack, pipe pedestal etc. may rest in filled up soil with max. safe bearing capacity for design consideration not more than 3 T/m².

50 Other Investigations

- 50.1 The contractor shall obtain and study earthquake and wind velocity data for design of module mounting structure and also obtain and study other input data or parameters related at proposed project site for design of the project from metrological department/ local govt. authorities. This shall include data related to Rainfall, Maximum & Minimum ambient Temperature, Humidity, HFL etc.
- 50.2 The contractor shall carry out Shadow Analysis at proposed site and accordingly design strings and array layout with optimum use of space, material and man power. In case of large variations in topography (3° to the horizontal) the study shall also include the effect of topographical variations on array layout and MMS structure design adequacy and stability. The contractor shall submit all the details/ design to the Engineer for review/ approval.
- 50.3 The contractor shall also identify potential quarry areas for coarse and fine aggregates to be used for concrete and shall carry out the concrete mix design for different grades of concrete to be used before start of work. The concrete mix shall be designed for each source of cement and aggregates as per provisions of relevant BIS Standard. The concrete mix design shall be carried out through NABL accredited Laboratory or any Govt. agency approved by the Engineer. In case the contractor proposes to use RMC, he shall submit the Concrete mix design report from the RMC supplier for review and approval by the Engineer. (In case of RMC, reports for periodic cube tests from the supply batch shall also be submitted for review and record).

51 Area Grading and Land Development

- 51.1 The Finished Grade Level (FGL) of the proposed plant shall be fixed with reference to the highest flood level (HFL) and surrounding ground profile at proposed site to avoid flooding of plant site. The data regarding HFL at proposed site shall be obtained from the metrological department by the contractor. In case of absence of this data, the contractor shall assess the required information through local site reconnaissance. The area at and around all buildings/ open installations (ICR, MCR etc.), transformer yard and switch-yard



- shall be uniformly levelled at suitable RL to be finalized considering topography and HFL at site. The minimum plinth level of all buildings/ open installations shall be 450mm above FGL. Module mounting structure foundation/ Pile cap or any other pedestal shall be min. 200mm above FGL.
- 51.2 A detailed drawing for site levelling and grading (if necessary) shall be submitted by the contractor before commencement of grading and area development works. The estimated volume of cutting and filling shall also be marked on the Grading drawings for reference. The final grade levels to be adopted for different blocks shall be clearly marked on the Plant Layout/ Module Layout drawing.
- 51.3 The contractor is responsible for making the site ready and easily approachable by clearing bushes, felling of trees (mandatory permissions/ licenses/ statutory clearances from competent authorities if required for cutting of trees, blasting or mining operations, disposal of waste material etc. shall be obtained by the contractor), cutting, filling with selected excavated earth or borrowed earth including identifying borrow areas. Except in exceptional cases (with approval of the Engineer), filling shall be made up of cohesive non-swelling material. The filling for levelling/ reclaiming the ground/ area shall be done in layers not more than 150mm of compacted thickness in case of cohesive (clayey) soils and 250mm compacted thickness in case of granular (sandy) soils with compaction up to 95% (of modified proctor density) and 80% (of relative density) respectively. The slope at edge of graded areas shall not be steeper than 1:1.5 (1 Vertical: 1.5 Horizontal) in cutting and 1:2 (1 Vertical: 2 Horizontal) in filling. In case of filling with rock material, the edges shall be provided in line with provisions of relevant BIS standard.
- 51.4 It shall be ensured that the land is graded or levelled properly for free flow of surface run-off and the grade levels shall be fixed with respect to high flood level at site, drainage pattern and system requirements. It shall be ensured that the land is used optimally to have maximum solar power generation considering full utilization of the plot areas. It is advisable to follow the natural flow of water at the ground as far as possible for drainage design.
- 51.5 In case the filled up earth is brought from outside the plant or borrow areas (when the material inside plant area is not found suitable for grading work or if directed by the Engineer), the contractor shall carry out all required soil investigations to ascertain the suitability of the borrowed soil for land development and filling purposes. Contractor's scope shall also include arranging land lease, getting all necessary statutory approvals for



mining, payment of necessary challan etc. Excess earth, if any, shall be disposed of properly at location as directed by the Engineer.

52 Roads

52.1 Suitable approach road (as applicable) from nearest public road up to plant Main gate, Access road from Main gate to Main control cum office room (MCR), Internal access roads connecting MCR and other facilities/ buildings/ open installations like Local control room(s) (LCR)/ Inverter control room(s) (ICR), Sub-station & Switch yard (as applicable) etc. and Internal peripheral road along the boundary fence/ wall shall be provided for safe and easy transportation of men, material and equipment during construction and maintenance.

52.2 The Approach road connecting nearest public road and the Main gate shall be of 5m wide carriage way with 0.5m wide shoulders on either side. The access road connecting Main gate and MCR and internal access road(s) connecting MCR to various facilities/ buildings shall be of 3.5m wide carriage way with 0.5m wide shoulders on either side while the peripheral road shall be of 2.5m wide carriage way with 0.5m shoulders on either side. The top of road (TOR) elevation shall be minimum 200 mm above FGL to avoid flooding of roads during rains. The roads shall be provided with alongside drains as per design requirements of drainage system to avoid flow of storm water over the road. The roads shall be designed and constructed as per IRC SP-20 corresponding to design vehicular traffic of minimum - 150 Commercial vehicles per day and critical field CBR value of the subgrade. Shoulder shall be of min. 150mm thickness.

52.3 However, following minimum road section details shall be followed:

Approach road from nearest existing Public road to Main Gate, Access road from Main Gate to MCR building and Internal roads connecting MCR building with LCR building and other facilities:

(viii) Topping: wearing course of 20 mm thick pre-mix carpet or surface dressing, compacted 75mm thick, with murrum blended with WBM Grade-III, as applicable.

(ix) WBM (CBR>100%): compacted 75mm thick, Grade III

(x) WBM (CBR>100%): compacted 100 mm thick, Grade II

(xi) Granular sub-base (CBR>15%): compacted 200 mm thick in two layers of 100mm thickness each,

(xii) Compacted subgrade: top 300mm thick, compacted up to 98% of standard proctor



density

(xiii) Shoulders: compacted 150mm thick, murrum blended with WBM Grade-III

Peripheral Road:

(xiv) Topping: surface dressing, compacted 75 mm thick, murrum blended with WBM Grade -III

(xv) WBM (CBR>100%): compacted 75 mm thick, Grade III

(xvi) WBM (CBR>100%): compacted 75 mm thick, Grade II

(xvii) Granular sub-base (CBR>15%): compacted 150 mm thick in two layers of 75mm thickness each,

(xviii) Compacted subgrade: top 300mm thick, compacted up to 98% of standard proctor density

(xix) Shoulders: compacted 150mm thick, murrum blended with WBM Grade-III

52.4 Soaked CBR value of sub-grade shall not be less than 2%. Where the CBR of the subgrade is less than 2 % a capping layer of 100 mm thickness of material with a minimum CBR of 10 % is to be provided in addition to the sub-base required for CBR of 2 %. When the subgrade is silty or clayey soil and the annual rainfall of the area is more than 1000 mm, a drainage layer of 100 mm over the entire formation width should be provided conforming to the gradation given in Chapter 6 of IRC SP-20. This layer will form a part of the designed thickness of sub-base.

52.5 In case of no-availability of murrum in the nearby areas of the project site, suitable other screening/ blending material for WBM construction may be used conforming to provisions of IRC SP 20.

52.6 The construction of road shall conform to relevant IRC/ MORTH standards.

52.7 Drain, cable or any other crossing shall be provided with RCC box or precast concrete pipe culvert. The culvert design shall conform to relevant IRC standard. Except for module cleaning system the pipes for road culverts shall be of minimum class NP3 conforming to IS 458 with min. soil cover of 750mm above the pipe. In case of soil cushion less than 750mm suitable concrete (M20) bedding/ encasement shall be provided. Water supply pipe for module cleaning and service/ drinking water crossing the road shall be laid through Medium class GI steel pipe conforming to IS: 1161.

52.8 Minimum dia. of casing pipe to be used at road/ drain crossing for laying any facility like



electric cable, water pipe line etc. shall be 150mm.

52.9 Maintenance pathways of min. 1.0m width shall be provided between SPV arrays for easy movement of maintenance staff, tools, equipment and machinery, washing of modules etc. The pathway area shall be generally levelled and well compacted manually/ mechanically. Areas of depression, valley zones or wherever there is noticeable change in topography, the same shall be levelled by laying & compacting murrum or any other suitable granular material so as to match the top finished surface with ground topography/ grade to avoid accumulation of water in the region and allowing its free flow to keep the area devoid of mud/ sludge.

52.10 The design and drawings for approach road, all internal roads and culverts shall be submitted to the Engineer for approval before execution.

53 Surface/ Area drainage

53.1 The contractor shall design and construct storm water drainage network for smooth disposal of storm water from the plant to the nearest available drainage outlet.

53.2 The storm water drainage system shall be designed and planned to ensure no water stagnation in the plant.

53.3 The design shall conform to the provisions of IRC SP 42 and best Industry practices. (The design rainfall shall be taken as max. hourly rainfall at 25 years return period at project site as provided in the Isopluvial map of the relevant subzone annexed with Flood Estimation Reports of Central Water Commission (CWC).

53.4 The coefficient of run-off for estimation of design discharge shall be considered as per catchment characteristics, however it shall not be less than 0.6.

53.5 The drainage scheme shall be designed considering the plant plot area and the surrounding catchment area contributing to the plant area drainage as per the topography.

53.6 The storm water drainage system shall be a network of open surface drains (with rectangular or trapezoidal cross section) and shall generally be designed to follow the natural flow of water and ground contours.

53.7 Suitable size plant peripheral drain as per design (min. bottom width x depth: 500mm x 500mm) along inside of plant boundary wall/ fence shall be provided for smooth channelization of outside storm water and to avoid flooding in the plant. The size of all internal and road side drains shall not be less than 450mm (bottom width) x 500mm



(depth).

- 53.8 All trapezoidal drains shall be lined with either brick or RR masonry/ concrete or stone slabs as suitable to the site conditions. The min. Thickness of the lining shall be 115mm for brick masonry, 75mm for concrete slabs, 150mm for RR masonry and 100mm for stone slabs. The lining shall be in CM (1:4) and the joints shall be raked and pointed with CM (1:3), however, the joints in lining of plant peripheral drain may be left without pointing.
- 53.9 In case of rectangular drain, the thickness of the wall shall be checked against structural stability. Min. thickness shall be 230mm for brick wall, 300mm for RR masonry and 125mm for RCC work, except for garland drain around buildings where the min. wall thickness can be 115mm, 200mm and 100mm respectively for brick masonry, RR masonry and RCC work.
- 53.10 The structural design of drains shall be as per provisions of relevant BIS standards and good industry practice.
- 53.11 The drain outfall shall be connected to the nearest existing natural drain(s)/ water body outside plant premises and it shall be ensured that the drainage water shall not re-enter the plant nor encroach/ flood in the adjacent property/ plot.
- 53.12 The proposed drainage scheme along with design calculations and drawings shall be submitted to the Engineer for review/ approval before start of construction.
- 53.13 The contractor shall also explore the possibility of providing rain water harvesting system for water conservation by constructing suitable collection wells along the drains or through provision of detention ponds etc. The scheme for rain water harvesting along with design calculations shall be submitted for approval.

54 Peripheral boundary Wall/Fence

- 54.1 The plant peripheral boundary shall be provided with either Chain link or barbed wire fencing or masonry boundary wall as specified.
- 54.2 The boundary fence/ wall shall be provided along the Solar PV plant boundary to demarcate the plant boundary and to keep away the unauthorised access to the plant. The fence/ wall shall be provided with Main entry gate. The fencing/ wall shall be with 2.5m height above grade level including 400mm dia. GI concertina wire along with 3 no. of barbed wires on either arm to be fixed on Y shape angle brackets. The main gate shall be min. 5.5m wide (clear) (4 m carriage way + 1.5m wicket gate).



Chain link fencing

- 54.2.1 The fencing shall be of Chain link (GI or poly coat GI as applicable) mesh fabric with internal, corner and stay posts of RCC (min 200mm x 200mm size, M30 grade) or GI angle (min. ISA 75x75x6 mm), as applicable, along with 150mm height 230 thick brick/ 300 thick RR masonry toe wall, with 100mm thick PCC (1:3:6) foundation.
- 54.2.2 The brick masonry toe wall shall be plastered with 15thick CM (1:4) plaster on both faces and shall have min. 50 thick PCC (1:2:4) coping finished smooth and projecting 25mm on either side of the wall with top sloping inwards. The depth (below NGL) and width of toe wall foundation shall not be less than 450mm and 500mm respectively.
- 54.2.3 Spacing of intermediate posts shall not be more than 2.5m. Every 10th intermediate post shall be provided with a stay post while every corner post shall be provided with two stay posts.
- 54.2.4 Joints in RR masonry shall be properly raked and pointed with CM (1:3). At pond or drain area suitable grid of MS solid SQ bar of min. Size 25 mm x 25 mm (spacing of vertical bars not more than 125mm) shall be provided in place of toe wall for smooth flow of water.
- 54.2.5 The GI chain link mesh fabric (40x40 mm with min. wire gauge 3.15mm, both ends twisted) and fencing shall conform to IS: 2721. Poly coat GI chain link mesh (50x50mm) shall conform to ASTM 668 and fencing shall conform to ASTM 567.
- 54.2.6 All MS sections shall be painted with 2 coats of epoxy paint over 2 coats of suitable primer.

Boundary wall

The boundary wall structure shall be a RCC beam-column structure with wall of either brick (min. 230mm thick), RR masonry (min. 300mm thick) concrete block (min. 200mm thick) or of Pre-cast RCC wall panels (min. 75mm thick). The top of the wall shall be provided with concrete coping (min. 50mm thick with 40mm projection on either side).

Barbed wire fencing

The details of barbed wire fencing shall be same as those for chain link fencing except providing barbed wires (4mm dia.) in place of chain-link mesh. The fence shall have 10 nos, of horizontal barbed wire lines and top 400mm height provided with 3 no. of barbed



wire lines fixed to Y shaped angle supports welded to every angle post. Every 5th bay of the fence shall be provided with additional cross barbed diagonal wires.

Main Gate

54.2.7 The Main entry gate (2.5m height) shall of rugged design with solid MS steel sections (20x20mm). The spacing of vertical members shall not be more than 125 mm.

54.2.8 The gate shall be complete with MS flat guide track, castor wheel(s), GI fittings & fixtures like hinges, aldrop, locking arrangement, posts etc.

54.2.9 The main gate shall be of 2.5m height and shall have 4.5m wide Gate for vehicular movement and an adjacent 1.5m wide wicket gate for pedestrian movement.

54.2.10 The gate shall be provided with the Project name plate (2.5mx 1m, 3mm thick MS plate). The gate shall be painted with 2 coats of epoxy paint over 2 coats of suitable primer.

54.3 All design and drawings for peripheral boundary fence/ Wall and Main gate shall be submitted for Engineer's approval before execution.

55 Plant Layout

55.1 The contractor shall submit drawing showing proposed Project Plant and SPV module Layout.

55.2 The Plant and SPV module layout shall be a comprehensive drawing showing various requirements of the project like, Reference coordinate grid, Geographical and Plant North, Layout of boundary fence including coordinates of all corner points, Location of main entrance gate and any other access gates as per project needs, Block wise FGL, Layout of main approach road to the plant, Internal and peripheral roads, Security Room/ cabin (s), all Buildings and Open installations with coordinates, Temporary Storage yard/ facility to be used by the contractor during construction, Contractor's & Engineer's site office, Proposed Array layout, Lightening arrester, UG/Over ground water Tank(s), Storm water drains, Corridor for buried cables etc.

55.3 The cable corridor shall be laid through clear gap between arrays and shall not be laid below modules for easy maintenance.

55.4 All the facilities and buildings shall be presented with suitable Legend.

55.5 The drawing shall be in suitable scale to have proper representation of the information.

55.6 The Plant & SPV module layout drawing shall be submitted by the contractor for review/

approval by the Engineer.

56 Design Loads

- 56.1 Unless otherwise specified elsewhere, Dead load, Live load, Wind load and Seismic load for buildings and structures shall be considered as per provisions of relevant BIS standards.
- 56.2 The following minimum imposed load as indicated for some of the important areas shall, however be considered for the design. If actual expected load is more than the specified minimum load, then actual load is to be considered.

S. No.	Area	Imposed (Live) Load
1	Roof	1.50 kN/ Sqm
2	Building floors (GF) & Grade Slab	10.00 kN/ Sqm
3	RCC Floors (General)	5.00 kN/ Sqm
4	Outdoor platforms, Stairs, Landing and Balconies, Walkway, Chequered plate & Grating (except cable trench cover)	5.00 kN/ Sqm
5	Road culverts & allied structures over drain & pipe crossings subjected to vehicular traffic	Design for Class – 'A' loading (Wheeled & Tracked both) as per IRC Standard
6	Underground structures such as Sump, Pit, Trench, Drain, UG tank etc.	In addition to Earth pressure and Ground water table at FGL, a surcharge of 10kN /Sqm shall also be considered. The structure shall be designed for following criteria – (a) Inside empty with outside fill+ surcharge and water table at GL & (b) Inside water with no fill & water table outs side
7	Pre-cast and chequered plate cover over cable trench	4.00 kN/ Sqm
8	a) Main access & Internal Roads b) Peripheral Road	i. As per IRC SP 20 corresponding to vehicular traffic of 150 commercial vehicles per day and critical in-field CBR ii. As per IRC SP 20 corresponding to vehicular traffic of 45 commercial



vehicles per day and critical in-field
CBR

Primary Loads

- (xx) Dead Load (DL)
 - (xxi) Live Load (LL)
 - (xxii) Snow Load (SnL)
 - (xxiii) Wind Load (WL) – Both along X & Z horizontal direction
 - (xxiv) Seismic Load (EL) – Both along X & Z horizontal direction
- 56.3 Basic wind speed (V_b) at project site shall be taken as per IS 875 (part-3) unless otherwise specified elsewhere.
- 56.4 To calculate the design wind speed (V_z), the factors K_1 (probability factor or risk coefficient), K_2 (terrain roughness and height factor) and K_3 (topography factor) shall be considered as per IS 875 (Part-3) (However, minimum values for K_1 , K_2 and K_3 shall be 1.0, 1.05 and 1.0 respectively)
- 56.5 In case of plant site within 60 km of sea coast, the importance factor for cyclonic region, ' k_4 ' shall be taken as 1.15. Provisions of IS: 15498 shall also be followed to ensure general safety of the structure.
- 56.6 To calculate the design wind pressure ' p_d ', factors ' k_a ' (area averaging factor) and ' k_c ' (combination factor) shall be taken as 1.0. (The factor ' k_d ' shall be taken as 1.0 in case of plant site within 60km of sea coast).
- 56.7 The Seismic Load shall be considered corresponding to Earth quake zone at site as per IS: 1893 (Part- 4) with Importance factor 1.5.
- 56.8 The Snow Load shall be considered as per IS:875 (Part-4).

Notes for WL on MMS

WL shall be considered as detailed below for estimation of WL ($\pm X$, $\pm Z$ direction) under primary loads.

Load due to wind on side (exposed) face of respective MMS members (Drag force) for wind acting in ($\pm$) X & Z direction shall also be considered along with (i) & (ii) below.

(xxv) Load due to fair (positive pressure) wind direction on design tilt angles of MMS members for wind acting in ($\pm$) X, Z direction



(xxvi) Load due to adverse (negative pressure) wind direction on design tilt angles of MMS members for wind acting in ($\pm$) X, Z direction

Design Load combinations

56.8.1 Appropriate Load factors in LSM design for concrete structures and appropriate Factor of safety in WSM design (ASD) for all steel structures including MMS shall be considered as per relevant BIS standard. No increase in permissible stress is permitted in design of MMS

56.8.2 Following load combinations shall be considered in design:

(v) DL+LL

(vi) DL+LL $\pm$ WLx

(vii) DL +LL $\pm$ WLz

(viii) DL+LL $\pm$ ELx

(ix) DL+LL $\pm$ ELz

(x) DL+SnL $\pm$ WLx

(xi) DL +SnL $\pm$ WLz

(xii) DL+SnL $\pm$ ELx

(xiii) DL+SnL $\pm$ ELz

56.8.3 All buildings, structures and foundations shall be designed to withstand loads corresponding to worst design load combination.

57 Foundations (General)

57.1 Contractor shall design all foundations for buildings, equipment, HT line Towers, Switch yard structures, Transformer, MMS & other structures as per relevant BIS standards and recommendations of Geotechnical investigation report.

57.2 All foundations of one building shall be founded at same RL (Reduced level) with respect to foundation depth below lowest NGL (Natural ground level) in the building area. The Levels shall be obtained with reference to the already established TBM using digital survey instrument such as Total Station.

57.3 All design & drawings shall be submitted to the Engineer for approval before execution.

58 MMS Foundation

58.1 Module mounting structure (MMS) may be supported on isolated/ strip footing or pile



foundation.

Bored cast-in situ, Driven precast or under reamed Concrete pile

- 58.1.1 In case the contractor proposes to provide concrete pile; the type, dia. and length of pile shall be as per recommendations of Geotechnical investigation report corresponding to prevalent soil characteristics at site. However, the min. dia. and depth of the pile shall be 300mm and 1800mm respectively except when very hard strata/ rock ($N > 100$) is encountered at a higher level, the pile shall be extended in to the hard strata minimum 1.0 times the diameter of the pile with total depth of the pile not less than 1200mm below cut-off level.
- 58.1.2 As specified above, the MMS support shall project minimum 200mm above FGL (Finished grade level) to avoid any damage to the MMS column/sub support due to direct contact of rain water/ surface run-off. This shall be ensured through either single stage construction of entire pile length including portion above FGL or by providing a collar (to be cast in second stage) which shall project min. 75mm in plan beyond the pile face and shall extend min. 250mm below GL.
- 58.1.3 For proper bonding, the surface of first stage concrete shall be made rough by trowelling and cleaning out laitance and cement slurry by using wire brush on the surface of joint immediately after initial setting of concrete. The prepared surface should be clean watered to get saturated dry condition when fresh concrete is placed against it. The prepared surface shall be applied with a suitable bonding agent before construction of pile cap/ collar as required.
- 58.1.4 In case the column post/stub is supported through base plate-anchor bolt assembly, the same shall only be provided through RCC pile cap to be designed as per provisions of relevant BIS standard with min. clear overhang of 75mm. The pile shall embedded min. 50mm in the pile cap and the pile reinforcement shall be extended in to the pile cap for proper anchorage.
- 58.1.5 In case of collapse of foundation strata during drilling of the pile bore, removable steel liner shall be used to maintain design depth and diameter of the pile for proper concreting.
- 58.1.6 The design & installation of piles shall conform to IS: 2911.
- 58.1.7 The bore shall be free from water before pouring of pile concrete. For under water concreting tremie shall be used.



Helical/ Screw Pile

- 58.1.8 The design, manufacture, testing and installation of Helical/ Screw pile shall conform to ICB-2009 and Practice Note 28- **“Screw Piles: Guidelines for Design, Construction & Installation, ISSN 1176-0907 October 2015 (IPENZ Engineers New Zealand)”**
- 58.1.9 The design of pile shall be undertaken and verified by a suitably qualified geotechnical or structural Chartered Engineer with experience in the design of helical/screw piles.
- 58.1.10 The pile shall be designed and manufactured in accordance with accepted engineering practice to resist all stresses induced by installation into the ground and service loads.
- 58.1.11 The steel grade for pile shaft, helix plates and other accessories shall be with min. F_y 350 MPa. Min. thickness (BMT) of shaft and helix plate shall be 6 and 8mm respectively in case of coastal installations and soils containing aggressive chemicals and at other project sites it shall be respectively 5 and 6mm. Cap plate and col base plate shall be min. 12mm thick and of min. grade E-250 conforming to IS:2062.
- 58.1.12 All materials shall be hot dip galvanized conforming to relevant BIS standard with min. thickness of galvanization 80 microns.
- 58.1.13 Wherever the pile shaft is required to be infilled with concrete grout, the same shall be of min. grade M30 (anti shrink)
- 58.1.14 The allowable axial design load (Direct compression & Pull out), Pa, of helical piles shall be the least of the following values:
- (xiv) Sum of the areas of the helical bearing plates times the bearing capacity of the soil or rock comprising the bearing stratum.
 - (xv) Capacity determined from well-documented correlations with installation torque.
 - (xvi) Load capacity determined from initial load tests.
 - (xvii) Axial capacity of pile shaft.
 - (xviii) Axial capacity of pile shaft couplings.
 - (xix) Sum of the axial capacity of helical bearing plates affixed to pile.
- 58.1.15 The lateral allowable load capacity of the pile shall be calculated using P-Y analysis and shall be verified with field trials. The allowable design lateral load shall be equal to the min. of (i) the total lateral load producing max. lateral deflection of 5mm and (ii) 50% of the total lateral load at which the lateral displacement increases to 12mm.
- 58.1.16 Dimensions of the central shaft and the number, size and thickness of helical bearing plates shall be sufficient to support the design loads.



58.1.17 The Design Report shall include following details.

- (xx) Design loads
- (xxi) Geotechnical Strength Reduction Factors and supporting methodology
- (xxii) List of design standards
- (xxiii) Design methodology and how specific loads such as seismic, lateral and settlement are addressed
- (xxiv) Founding stratum
- (xxv) Estimated length
- (xxvi) Connection design and details between pile shaft & pile cap plate and Col base plate
- (xxvii) Pre-production and production load testing to support design including acceptance criteria.

58.1.18 Helical piles shall be installed to specified embedment depth and torsional resistance criteria as per design. The torque applied during installation shall not exceed the maximum allowable installation torque of the helical pile

58.1.19 Special inspections shall be performed continuously during installation of helical pile foundations. The information recorded shall include installation equipment used, pile dimensions, tip elevations, final depth, final installation torque and other pertinent installation data as required.

58.1.20 The installation of piles shall be done by an agency having adequate experience in helical pile construction.

58.1.21 The method statement for pre-production load testing (initial test) and construction of Helical Pile shall be submitted for review and approval. The method statement shall comply following requirements:

58.1.21.1 Helical pile pre-production load testing

The Piling Contractor shall provide a method statement for the pre-production load testing. The method statement shall be submitted 2 weeks prior to pile installation for testing and shall contain the following information (as a minimum):

- Programme of the testing, detailing the timing and sequence of each load test including any additional investigations proposed
- The general arrangement of the equipment



- A method for measuring the displacement at the head and toe of each test pile
- Template for the Pile load test report
- Confirming the criteria for determining the acceptability of the compression, tension and lateral load tests
- A contingency plan in the event that a load test is deemed not acceptable
- A procedure for verifying the capacity for each individual pile, this may include correlating the installation torque for each pre-production pile with the load test results
- All pile load tests shall be supervised by suitably experienced personnel, who are competent to operate, monitor and record each test throughout its duration. Each pile load test shall be continuously monitored throughout its duration.

58.1.21.2 Helical Pile Construction

The contractor shall provide a method statement for each piling operation to be undertaken in executing the Works. The method statement shall describe all proposed equipment and detail the construction sequence. The method statement shall be submitted with the tender and shall contain the following information (as a minimum):

- Programme of the works, detailing the timing and sequence of individual portions of the works
- Full details of the installation plant to be used, including manufacturer's information and proof of servicing/recent upkeep and calibration
- Proposed phasing of excavation/filling operations such that the design stresses in the piles (and any supporting frames) are not exceeded
- The contingency plan to be adopted, to minimize disruption and delay, in the event of encountering obstructions
- Anticipated noise levels (measured in dB) and vibration levels (measured in mm/sec) arising from piling operations (if applicable)

58.1.22 The Piling Contractor shall nominate a suitably experienced, professionally qualified engineer, as the "Piling Supervisor".



58.1.23 Unless specified else were, the field trials for initial load tests on concrete and helical/ screw pile shall conform to IS: 2911 (Part 4) & Practice Note-28 (IPENZ Engineers New Zealand) as applicable. The no. and location of such tests shall be as per the provisions stipulated under Cl. No. 26.8.

58.1.24 Contractor shall also carry out routine tests on 0.5 % of the total no. of working/ job piles as per provisions of IS: 2911 (Part 4). In case of unsatisfactory results, min. no. of routine tests may be increased up to 2% of the total no. of working/ job piles as per the directions of the Engineer

59 Module Mounting Structure (MMS)

59.1 The module mounting structure design shall generally follow the existing land profile. The top of the table shall be in one plane.

59.2 In MMS analysis the column support shall be assumed at EGL/NGL.

59.3 In case of topographical variations more than 3°, the contractor shall carry out detailed study of its effect on array layout, shadow analysis and structural stability of MMS.

59.4 The structure shall be designed to allow easy replacement of any module and shall be in line with site requirements.

59.5 The MMS stub/ column, rafter, purlin, ties and bracing members shall conform to following Indian standards.

- IS: 2062 – Hot rolled Medium and High tensile structural steel
- IS: 811 – Cold formed light gauge structural steel sections
- IS: 1161 – Steel tubes for structural purposes
- IS: 4923 – Hollow steel sections for structural use
- Minimum grade of steel for sections conforming to IS: 811 & IS: 4923 shall be E350 conforming to IS: 2062 and Y_{st} 310 conforming to IS: 1608 respectively.

59.6 The contractor can also propose new light gauge structural steel or structural aluminium sections other than specified in IS: 811 subject to approval of the Engineer. In this case the contractor shall submit his proposal stating the technical advantages of the proposed sections for Engineer's review along with supporting literature and sample design calculations conforming to present specifications at the time of bidding.

59.7 The minimum thickness excluding anti corrosive treatment (BMT) of various elements of MMS structure shall be as following:

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- Stub/ column – 3.15mm,
- Rafter – 2.5mm &
- Purlin & other members – 2.0mm

59.8 The primary loads and load combinations for design of MMS structure shall be as specified under Cl. No. 33. The design shall be done by Working stress method and no increase in allowable stress shall be permitted.

59.9 The maximum permissible deflection/ side sway limits for various elements of MMS under serviceability conditions shall be as following:

- Lateral deflection/ side sway for Column – Span/ 240
- Vertical deflection for Rafter and Purlin – Span/ 180
- Lateral deflection for Purlin – Span/240

59.10 In case of natural frequency in first mode less than 1 Hz, the design of the MMS structure shall also be checked against dynamic effects of wind as per provisions of IS – 875 (Part-3) using gust factor method.

59.11 The purlins shall be provided with following min. 10mm dia. GI sag/ tie rods:

- 1 no. tie rod in middle of each span
- 1 no. diagonal tie rod at each corner in end spans

59.12 Lateral restraint to compression flange if any due to PV panels is not permitted in purlin design.

59.13 The vertical diagonal bracing shall be provided in alternate spans of each unit (table) of MMS.

59.14 MMS shall support SPV modules at a given orientation & tilt and shall absorb and transfer the mechanical loads to the ground properly.

59.15 Welding of structure at site shall not be allowed and only bolted connections shall be used.

59.16 The MMS structure shall be hot dip galvanized with minimum GSM 610 kg/ sqm and/or minimum coating thickness of 80 microns for protection against corrosion. Galvanization shall conform to IS-2629, 4759 & 4736 as applicable.

59.17 It is to ensure that before application of this coating, the steel surface shall be thoroughly cleaned of any paint, grease, rust, scale, acid or alkali or any foreign material likely to interfere with the coating process.

59.18 The bidder shall ensure that inner side is also provided with galvanization coating.



- 59.19 The galvanization shall be done after fabrication of members and cutting of holes to ensure galvanization of all cut/ exposed edges.
- 59.20 In case the proposed section is made up of Aluminum, anodized coating shall be Gr. AC25 and shall conform to IS: 1868.
- 59.21 The array structure shall be so designed that it will occupy minimum space without sacrificing the output from SPV panels at the same time.
- 59.22 All fasteners and washers (2 round + 1 spring) both for MMS connections and fixing of PV Module shall be adequately protected from atmosphere and weather prevailing in the area.
- 59.23 Fasteners and washers to be used for erection of mounting structures and those for fixing Module over MMS shall be of stainless steel grade SS 304 & SS 316 with property class A2-50 and A2-70 respectively conforming to relevant ISO standard and must sustain the adverse climatic conditions to ensure the life of the structure for 25 years.
- 59.24 Min. diameter of bolt for MMS connections shall be 10mm except for column-rafter connection where it shall not be less than 12mm (not less than 16mm in case of single bolt connection)
- 59.25 Modules shall be clamped & bolted with the structure properly. The material of clamps shall be Al / SS – 316 having weather resistant properties. Clamp – bolt shall use EPDM rubber and shall be designed in such a way so as not to cast any shadow on the active part of a module.
- 59.26 MMS column post supported with base plate secured to foundation shall be fixed with galvanized high strength “J” bolts conforming to specifications of IS: 4000/ IS: 1367 and relevant IS code Installation of foundation bolts and embedment of column leg in foundation concrete shall be done by using template to ensure proper alignment. The underside of base plate shall be provided with anti- shrink grout.
- 59.27 In case the contractor proposes to extend the column leg to embed it in the pile as an alternate fixing arrangement, the column member shall be extended for full depth of the pile (100mm cover at tip of the pile) with an end plate of min. 4mm thickness to be fixed at the bottom of column leg. (However, for plants in coastal area or in case of marshy soil the column post shall be supported only with base secured to foundation through base plate and anchor bolt assembly and no embedment of column leg in foundation is permitted)
- 59.28 The area of c/s of embedded leg shall not be less than 0.8% of pile cross sectional area.
- 59.29 The array structure shall be grounded properly using maintenance free earthing kit.



- 59.30 The bidder/manufacture shall specify installation details of the PV modules and the support structures with appropriate diagram and drawings.
- 59.31 The Bidder should design the structure height considering highest flood level at the site and the finished grade level. The minimum clearance between the lower edge of the module and the finished grade shall be the higher of (i) Highest flood level + 100mm and (ii) 500 mm, as applicable
- 59.32 The length of one unit (Table) of MMS shall not generally be more than 20m.
- 59.33 The contractor shall submit the detailed design calculations and drawings for MMS structure, bill of materials and their specifications/ standards to the Engineer for approval before start of fabrication work.

60 Concrete Works

- 60.1 Construction of all RCC works shall be done with approved design mix as per IS 456 and the materials used viz. Cement, coarse & fine aggregate, Reinforcement steel etc. shall conform to relevant BIS standards.
- 60.2 Unless otherwise specified elsewhere, PCC shall be of min. grade M10 (nominal mix 1:3:6) except for mud mat, back filling of ground pockets or levelling course which shall be of grade M7.5 (nominal mix 1:4:8).
- 60.3 Reinforcement steel shall be of high strength TMT bars of grade Fe500 D conforming to IS: 1786. Ductile detailing in accordance with IS: 13920 shall be adopted for superstructure and sub-structure of all RCC buildings and structures.
- 60.4 Unless specified otherwise for grouting works anti shrink ready mix grout of approved make or cement mortar (CM) grout with non-shrink compound shall be used. The grout shall be high strength grout having min. characteristic strength of 35 N/mm² at 28 days.

61 Miscellaneous Steel Works

- 61.1 Unless otherwise specified elsewhere, all structural steel work shall be designed as per provisions of IS: 800 with working stress method of design (WSD).
- 61.2 Structural steel hot rolled sections, flats and plates shall conform IS: 2062, structural Pipes shall be medium (M)/ high (H) grade conforming to IS: 1161, chequered plate shall conform to IS: 3502 and Hollow steel sections for structural purposes shall conform to IS: 4923.

62 Buildings

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General Requirement

- 62.1.1 Plant buildings/ open installations are required to be constructed for housing the electrical equipment/ panel (Local Control Room Building - LCR) for operation and maintenance of Photovoltaic Solar Power Plant. Security room at main gate & Security cabin(s) (at strategic locations) shall also be provided to secure the plant from any theft/ burglary/unauthorized entry.
- 62.1.2 Unless otherwise specified elsewhere, all buildings except Security room/ cabin shall have RCC framed structure. The equipment area shall be designed with OEM requirements to ensure all satisfactory operations. The security room/ cabin(s) shall be of prefabricated structure.
- 62.1.3 All buildings shall have provision of adequate windows for natural light & ventilation, fire safety provisions and shall be designed as per provisions of National building code (NBC).
- 62.1.4 The contractor shall submit the proposed equipment layout drawings to the Engineer for approval before development of Architectural drawings. The building layout, exterior elevations shall be aesthetically designed following good architectural practices to get a pleasant look. Horizontal/ vertical bands through projections/ grooves in external plaster may be provided to break the monotony. Roof slab shall have projection of 450mm beyond external walls with RCC parapet wall of 450 mm clear height all-around which shall form a projected band at roof level. For weather protection all doors and windows shall be provided with 450mm wide RCC chajja. However, chajja for rolling shutter shall be 750mm wide.

Functional requirements

-
- 62.1.5 LCR/ Inverter Building
 - Unless otherwise specified elsewhere, Inverter room/ LCR consists of data loggers, battery, Inverter, Electrical panels etc. as per requirement. There shall be suitable provision for easy/ smooth passage for O & M personnel, cable trench, operating area etc.
 - The size of LCR/ Inverter room shall be provided as per OEM requirements.
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62.1.6 Security Room/ Cabin

- 62.1.6.1 Contractor shall provide required number of security cabins at strategic locations & at corners of the plot and 1 nos. security room at Main entry gate.
- 62.1.6.2 The Security room shall be of min. size 4m x 4m x 2.75m height The Security cabin shall be of min. size 1.2 x 1.8m x 2.5m height.
- 62.1.6.3 Security room/ cabin shall be a pre-engineered & pre-fabricated structure. The walls and roof of the building shall be fabricated with double skin insulated sandwiched Al-Zn alloy coated high tensile steel metal panels (BMT- 0.5mm, Al-Zn alloy coating -150 GSM total on both sides). The insulation shall be of PUF with min. density 40 kg/ cum and adequate thickness. Roof shall be provided with suitable slope, not less than 100 to the horizontal (approx. 1V:6H) for proper drainage of rain water and shall project 300mm beyond the walls. The make and (color) shade of pre- coated metal panels shall be subject to approval by the Engineer. Min. thickness of color coating shall be 20 micron (DFT) excluding prime coat 5 micron (DFT). The coating system shall confirm to IS; 15965.
- 62.1.6.4 The Main security room shall be provided with one Aluminum (AL) glazed door (0.75m wide x 2.1m height) on one face and AL glazed sliding windows (1.2m width x 1.0 m height) with AL grill on remaining three sides. Security cabin shall have one AL glazed door (0.75m wide x 2.1m height) and 1 no. AL sliding window (0.8m width x 1.0 m height) with AL (anodized) grill on one side. All glazing shall be of clear float glass with thickness of 4mm for window and 6 mm for door panel.
- 62.1.6.5 The door and windows shall be provided with all necessary fitting and fixtures like handles, tower bolts, mortise lock for door, stays, door stopper etc. All AL sections for doors and windows shall be anodized (min. average thickness 25 microns) or polyester powder coated (min. DFT 50 microns) with approved color shade for protection against weather.
- 62.1.6.6 Specially coated/ SS self-drilling screws/ fasteners conforming to class 3 as per ASTM: 3566.1 and 3566.2 shall only be used for all connections.
- 62.1.6.7 Anchor/ foundation bolts shall conform to IS: 5624 and IS 800.
- 62.1.6.8 The Security Cabin may be installed on concrete M15 skid platform (min. 350 thick) with skin reinforcement shrinkage or shall be supported on RCC pedestal & foundations. The concrete platform shall project 200mm beyond the walls.



62.1.6.9 The Security Room shall be supported on RCC pedestal & foundations.

62.2 The Design and drawings shall be submitted for approval prior to fabrication and installation.

63 Flooring, Skirting and Dado

Store area, Equipment Room

40 mm thick Cement concrete (IPS) flooring (1:2:4), aggregate size 10 mm down, conforming to IS 2571 with 2mm thick Heavy-duty epoxy coating (Industrial grade) of approved make on top as per manufacturer specifications and 10mm thick matching skirting of 100mm height.

Steps

Kota stone (20 thick) or 50 thick cement concrete (IPS) flooring conforming to IS 2571.

63.1 All items shall be of reputed make. Only Items with approved samples by the Engineer shall be used.

64 Doors and Windows

64.1 Doors, windows, louvers and ventilators shall be made of AL sections (minimum average thickness 2.5mm), industrial grade, anodized (grade AC25, min. thickness 25 micron conforming to IS: 1868) or with polyester powder coating (Total DFT 50 microns conforming to IS: 13871) and shall be of approved make & colour shade. All sections, fittings and fixtures shall be anodized (min. thickness of coating 20 micron). The window and door shutters shall be of clear float/ wired/ ground glass as per design/ functional requirements.

64.2 AL Louvers, duct/ ventilation openings shall be provided as per functional requirement.

64.3 All doors, windows and ventilators shall be provided with all necessary fittings and fixtures like handles, tower bolts, wind stays, hinges etc. of heavy duty anodized AL. All doors shall be provided with hydraulic door closure of required capacity.

64.4 All windows shall be provided with suitable AL grill of anodized sections with adequate thickness for security purposes.

64.5 Clear float glass for window and door shutter shall be of min 4mm and 6mm thickness



respectively. Wired/ ground glass where provided shall be of min thickness 6mm.

64.6 Entrance door shall be min. 1.5m wide (double leaf) x 2.1 m height..

64.7

65 Roofing

65.1 The roof of all RCC buildings shall be provided with min. slope of 1:100 for effective drainage of rain water. The slope shall be achieved either by application of screed concrete of grade 1:2:4 (with 12.5mm down coarse aggregate) with min. 25mm thick CM 1:4 layer on top to achieve smooth surface to facilitate application of water proofing treatment.

65.2 The water proofing treatment shall be in situ five course water proofing treatment with APP (Atactic Polypropylene) modified Polymeric membrane over roof consisting of first coat of bitumen primer @ 0.40Kg per sqm, 2nd & 4th courses of bonding material @ 1.20 kg/sqm, which shall consist of blown type bitumen of grade 85/25 conforming to IS : 702, 3rd layer of roofing membrane APP modified Polymeric membrane 2.0 mm thick of 3.00 Kg/sqm weight consisting of five layers prefabricated with centre core as 100 micron HMHDPE film sandwiched on both sides with polymeric mix and the polymeric mix is protected on both sides with 20 micron HMHDPE film. The top most layer (5th layer) shall be finished with brick tiles of class designation 10 grouted with cement mortar 1:3 (1 cement: 3 fine sand) mixed with 2% integral water proofing compound by weight of cement over a 12 mm layer of cement mortar 1:3 (1 cement: 3 fine sand) and finished neat. The water proofing treatment shall be extended over golla/ fillet and inner face of the parapet up to 450mm height.

65.3 The corners at parapet wall and slab shall be provided with 50 thick fillet/ golla in CM 1:3 with neat finish.

65.4 Required no. of rain water down take pipes min. 100mm dia. PVC pipes (UV resistant), with 450x450mmx15mm deep khurra and MS grill at inlet shall be provided for rain water disposal.

66 Plinth protection and drain

66.1 750mm wide plinth protection with min. 75mm thickness of PCC (1:3:6) over 75 mm thick bed of dry brick ballast, 40mm nominal size well rammed and consolidated and grouted with fine sand, shall be provided around all the buildings.

66.2 A peripheral drain (except for Security room/ cabin) of min. internal size 250mm x 250mm

with brick walls in CM 1:6 over 75mm thick PCC (1:3:6) bedding with 12mm thick plaster in CM 1:5 and 25thk PCC (1:3:6) coping at top shall be provided along the periphery of the plinth protection for collection and disposal of rain water from building roof.

67 Plinth filling for buildings

Plinth beam, when provided, shall be taken minimum 200mm below FGL. The plinth filling below Ground floor (GF) for all buildings shall be provided with following specifications.

- (xxvii) Well compacted sub-grade
- (xxviii) Well compacted boulder soling with interstices filled with sand over compacted sub-grade.
- (xxix) 75mm thick PCC 1:3:6 over (ii)
- (xxx) 100mm thick PCC 1:2:4 over (iii)
- (xxxi) 40mm thick floor finish over (iv)

68 Anti- termite Treatment

- 68.1 In case of presence of termites at the project site, an anti-termite treatment shall be provided for all foundation pits and building plinth in MCR building conforming to IS: 6313 to control entry of termites.

69 Painting & Other Finishes

Painting and white wash/ colour wash for the buildings shall conform to relevant BIS standards. The make and colour shade of the finish shall be as advised and approved by the Engineer.

Internal Walls	Oil bound distemper (for LCR/ Security Room)
External Walls	All weather proof cement based acrylic emulsion paint, exterior grade
Underside of roof slab	White wash
Structural steel work	2 coats of synthetic enamel paint over 2 coats of suitable primer

70 Air conditioning & Ventilation for LCR Buildings

- 70.1 All buildings shall be equipped with appropriate numbers of fans for effective heat dissipation.

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71 Fire Extinguishers

- 71.1 All buildings shall be installed with required no. of fire extinguishers as per relevant BIS standard and NBC. LiquefiedCO₂/ foam/ ABC type fire extinguisher shall be upright type of capacity 10kg conforming to IS: 2171, IS: 10658.
- 71.2 The fire extinguisher shall be suitable for fighting fire of Oils, Solvents, Gases, Paints, Varnishes, Electrical Wiring, Live Machinery Fires, and all Flammable Liquid & Gas.

72 Sand buckets

- 72.1 Sand buckets shall be wall mounted made from at least 24SWG sheet with bracket fixing on wall conforming to IS: 2546.
- 72.2 All buildings shall be provided with required no. of sand buckets as per relevant BIS standard and NBC. 4 No. of Bucket stands with four buckets on each stand shall be provided in the Transformer Yard.

73 Sign Boards and Danger Boards

- 73.1 The sign board containing brief description of major components of the power plant as well as the complete power plant in general shall be installed at appropriate locations of the power plant as approved by Engineer
- 73.2 The Signboard shall be made of steel plate of not less than 3 mm. Letters on the board shall be with appropriate illumination arrangements.
- 73.3 Safety signs, building evacuation plan and direction signs, assembly points shall also be placed at strategic locations.
- 73.4 The Contractor shall provide to the Engineer, detailed specifications of the sign boards.

74 Masonry Work

- 74.1 The masonry work shall be of bricks, laterite blocks (as per site conditions) or concrete blocks.
- 74.2 All external walls of buildings shall be 230mm and internal walls shall be 230mm or 115mm as per requirements.
- 74.3 All concrete block masonry walls shall be min. 200mm thick.
- 74.4 Brick work shall be in cement mortar (CM) 1:6 & 1:4 for 230 mm and 115 mm thick brick wall respectively unless specified.
- 74.5 Unless otherwise specified elsewhere, Bricks shall be of class designation 7.5 conforming



to IS: 1077, IS: 2212 & IS: 3495.

- 74.6 All concrete blocks shall be of min. compressive strength of 7.5 N/mm² and shall be of Grade-A conforming to IS: 2185.
- 74.7 The laterite blocks shall conform to IS: 3620.
- 74.8 All buildings shall be provided with suitable damp-proof course (DPC). The DPC shall be with PCC (1:2:4) using 6 down coarse aggregate and water proofing admixture. The min. thickness of DPC shall be 40mm.
- 74.9 The construction of brick masonry shall conform to IS: 2212. Construction of Concrete block masonry shall conform to IS: 2572.

75 Plastering, Pointing & Coping Works

- 75.1 All brick masonry work shall be provided with plaster.
- 75.2 Wall and ceiling plaster shall be in cement mortar (CM) 1:6 and 1:3 respectively.
- 75.3 Thickness of plaster shall be 18mm and 12mm respectively for rough and smooth surface of the masonry wall. The ceiling plaster shall be 6mm thick.
- 75.4 All joints in stone masonry shall be raked and pointed in cement mortar (CM) 1:3 except specified otherwise.
- 75.5 Exposed top surface of brick or stone masonry shall be provided with 25 mm thick plain cement concrete (PCC) coping (1:2:4) with trawl finish. All exposed coping shall be provided with suitable slope and projection for easy drainage of water.
- 75.6 All door and window chajja shall be provided with 10mm wide drip course.

76 Pipe & Cable Trenches

- 76.1 All trenches inside the building and transformer area shall be of RCC. The min. wall and base slab thickness shall be 100mm for depth $\leq$ 850mm and 150mm for depths $>$ 850mm.
- 76.2 The trench shall be designed for lateral load due to external soil fill, ground water table at FGL and 5.0 KN/ Sqm surcharge. External trenches shall be kept min. 100mm above FGL to avoid entry of rain water. In case of straight length of the trench being more than 40m, suitable expansion joints with PVC water stop shall be provided.
- 76.3 Internal trenches (inside buildings) shall be provided with chequered plate (min. 8mm thick with angle stiffeners as required) covers while external trench shall have precast concrete covers.
- 76.4 Min. thickness of precast cover shall be 80mm. Both bearing edges of the cable trench and



- all edges of pre-cast concrete covers shall be provided with min. 50x50x6 mm edge protection angle with lugs.
- 76.5 The trench cover (chequered or pre – cast both) shall be provided with suitable lifting hooks.
- 76.6 As required suitable MS insert plates shall be provided on trench wall to support the cable rack/ pipe.
- 76.7 The trench bed shall have a slope of approx. 1(V):250(H) along and 1(V):50(H) across the length of the trench. The cable trench shall have a dewatering sump (s) of size 450x450x450 mm depth at suitable location to facilitate collection & pumping out of rain water from the trench.
- 76.8 The external buried cables shall be laid in excavated trench as specified under specifications for Electrical works. The sand for filling shall be of Grade – IV conforming to IS: 383.

77 Transformer Yard Civil Works

- 77.1 Transformer and equipment foundations shall be founded on piles/isolated spread footings or block foundation depending on the final geotechnical investigation report and functional requirements.
- 77.2 Transformer foundation shall have its own pit which would cover the area of the transformer and cooler banks, so as to collect any spillage of oil in case of emergency. The retention capacity of the transformer pit shall be min. 1/3 volume of the transformer oil and it shall be filled with granite stone gravel of size 40mm, uniformly graded, with 250 mm free space above gravel fill.
- 77.3 In case of transformer oil tank capacity more $\geq$ 2000 litres, the transformer pit shall be connected to a separate oil collection pit through discharge pipe and shall be suitably sized to accommodate full oil volume of the transformer connected to it, without backflow. The oil collection pit shall be further connected to oily water drainage system. The water shall be discharged into the nearest drain by gravity flow or pumping after suitable treatment as per statutory and code provisions.
- 77.4 Both, the transformer pit including side walls and the oil collection pit shall be of RCC. The oil collection pit shall be provided with 20mm dia. MS rung ladder with 2 coats of epoxy paint over 2 coats of primer, a manhole & removable RCC cover. The inside of oil collection



- pit shall be plastered with 6 mm thick CM 1:6 and painted with 2 coats of epoxy paint over 2 coats of primer.
- 77.5 The area around the transformer and equipment shall be covered with uniformly graded granite stone gravel of size 40mm.
- 77.6 The area shall be provided with galvanized chain link fence of height min 1.8m with 3.5m wide gate. The specifications for fencing shall be similar to those specified under Cl. No. 31.3 except fence post which shall be of MS angle (ISA 50x50x6)
- 77.7 The Gate of size 3.5m shall be of MS pipe (medium class conforming to IS: 1161) frame with hard drawn steel wire fabric mesh (50x50mmx3mm thick conforming to IS: 1566) including all accessories and fittings.
- 77.8 In addition to main gate a wicket gate of MS pipe (medium class conforming to IS: 1161) frame with 1.0 m width with hard drawn steel wire fabric (50x50x3mm thick conforming to IS: 1566) shall be provided for man entry for maintenance purpose.
- 77.9 The transformer yard fencing work shall conform to CEIG requirements.
- 77.10 The requirement of fire barrier wall between transformers shall be as per Electricity Rules and IS: 1646 recommendations. Minimum wall thickness shall be 230mm for RCC wall and 300mm for masonry wall.

78 Water Supply & Cleaning of Modules

- 78.1 The contractor shall design and install the effective module cleaning system.
- 78.2 A regular supply of suitable quantity of water shall be ensured by the contractor to cater day-to-day requirement of drinking water and for cleaning of PV modules during entire O&M period.
- 78.3 The Contractor shall estimate the water requirements for cleaning the photovoltaic modules at least once in two week or at closer frequency as per the soiling conditions prevailing at site, in order to operate the plant at its guaranteed plant performance. Also, the contractor is required to plan the water storage accordingly with provision of a tank of suitable capacity for this purpose. However, min. consumption of 2 Ltr / Sqm of surface area of SPV module shall be considered in estimation of required quantity of water storage.
- 78.4 Water used for drinking & PV module cleaning purpose shall generally be of potable quality and fit for cleaning the modules with TDS generally not more than 75 PPM. In case of higher salt contents, the water shall be thoroughly squeezed off to prevent salt deposition



over module surface. However, water with TDS more than 200 PPM shall not be used directly for module cleaning without suitable treatment to control the TDS within acceptable limits. The water must be free from any grit and any physical contaminants that could damage the panel surface.

- 78.5 If required, for settlement of any grit/ unacceptable suspended particles in the water a settling tank shall be installed before the inlet of the storage tank. Suitable arrangement for discharge/ disposal of sediment/ slush shall be provided in silting chamber by gravity disposal in surface drain or with provision of sludge sump and pump of adequate capacity.
- 78.6 The module cleaning system shall include construction of RCC tank or supply and installation of Ground mounted PVC tank (s) of required storage capacity, pumps (including 1 No. standby pump), water supply mains and flexible hose pipes, taps, valves (NRV, Butterfly valve, Ball valve, Gate valve, PRV, scour valve etc.), Water hammer arrester(s), pressure gauge, flow meter etc. as per the planning & design.
- 78.7 In case of over ground water storage tank, the contractor shall check its effect on plant performance through shadow analysis. The PVC storage tank shall conform to IS: 12701. The valves shall conform to IS: 778. A suitable metal sheet canopy for protection from direct sunlight shall be provided over the tank area.
- 78.8 The water supply mains could be either of GI, uPVC or HDPE, however, the vertical pipe connecting supply main to the discharge point shall be of GI.
- 78.9 Masonry chamber shall be provided for Main gate valve at pump end. Whereas, as per requirements, at other locations either a masonry or GI/ HDPE pipe chamber may be provided.
- 78.10 Module cleaning procedure and pressure requirement at discharge point shall be as per the recommendation of PV module manufacturer. However, discharge pressure at outlet shall not be less than 50kg/cm² (5 MPa)
- 78.11 All the pipes thus laid shall be buried in ground at least 150mm below FGL or laid above ground clamping on suitable concrete support blocks. In case of above ground piping only GI pipes shall be used.

79 Underground Water Tank

- 79.1 The top of the UG tank shall be 250 mm above FGL.

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- 79.2 The tank shall have clear free board of 300mm above MWL.
- 79.3 The tank bottom shall have a slope of 1:100 towards drainage sump (500x500x500 mm deep). The slope shall be provided either in structural slab or in screed concrete (1:2:4) trowel finished. 1000x1000 mm size Manhole in roof slab and 20 mm MS rung ladder shall be provided for easy access to the storage tank and silting chamber for periodic cleaning. The manhole shall be covered with RCC precast cover. 50x50x6 mm MS angle with lugs shall be provided around precast cover and tank slab opening for edge protection. Rungs shall be painted with 2 coats of epoxy paint over 2 coats of primer.
- 79.4 The underground RCC tank shall be designed for following load conditions:
- External earth pressure + hydrostatic pressure due to ground water table (to be considered at FGL for design purposes) + Surcharge of 20 kN/ Sqm and Tank Empty.
 - Tank full up to MWL and no external loads
- 79.5 The design shall conform to IS: 3370 with maximum crack width of 0.1mm for wall, bottom slab and roof slab. Min. grade of concrete shall be M30 (M35 in coastal areas, marshy and saturated soils) conforming to IS: 456. Suitable construction joints shall be provided as per provisions of IS: 3370 (Part 1). Water proofing admixture conforming to relevant BIS standard and of approved make shall be added to concrete as per manufacturer's recommendations.
- 79.6 The underground water tank shall be tested for water tightness as per the provisions of IS 3370 (Part-4). In case any leakage is noticed the same shall be repaired by injection of cement grout installing suitable nozzles around affected areas. Outside face of water tank in contact with water and soil and underside of roof slab shall be painted with 2 coats of epoxy paint

80 Miscellaneous structures

- 80.1 Support structure for weather monitoring device
- 80.1.1 Weather monitoring device shall be mounted on tubular steel pole of required height. The pole shall conform to IS: 2713.
- 80.1.2 The pole shall be secured to an independent RCC foundation structure through Base plate and Anchor bolt assembly.
- 80.1.3 200 long 20 dia. rods shall be welded to the pole at 300 mm C/c for access to the device for maintenance purpose.



80.1.4 The support structure shall be hot dip galvanized.

Support structures for SMU

80.1.5 SMU shall not be supported from MMS and shall have an independent structural steel supporting frame of ISMC 75, secured to an independent RCC foundation structure.

80.1.6 The support structure shall be of adequate height to ensure either min. ground clearance of 1.2m to SMU unit or HFL + 100mm, whichever is higher.

B WTGs Foundation and Other Civil Works

81 General Requirement

81.1 This section of Technical Specifications describes detailed technical and functional requirements of all civil, & structural works included in the scope for Wind Power plant.

81.2 This excludes design, supply and installation of 33 kV transmission poles & accessories which shall be designed following latest guidelines of respective SEB (State electricity board)/ STU (State transmission utility) and got approved from them before execution. In absence of SEB/ STU guidelines REC (Rural electrification corporation) standards may be followed. Approved copies of these designs & drawings shall be submitted to the employer for reference and record.

81.3 All design and construction of civil works shall conform to relevant Indian standards such as BIS, IRC, MORTH, NBC etc.

82 Scope of Work

82.1 The scope of work under civil work shall include:

- a. Land development for the wind farm
- b. Detailed contour survey and soil investigation
- c. Foundation of WTGs
- d. Foundation for WTG step up transformer & HT switchgear kiosk
- e. Room for housing WTG local control panel (applicable for WTGs with lattice type tower)
- f. Wind farm approach road and internal roads.
- g. Wind farm fencing (Fencing of Unit Switchyard of the WTGs).
- h. Indoor Lighting



83 Design Criteria

- 83.1 All civil, structural and architectural work shall be designed, supplied and constructed as per latest editions of Indian Codes and Standards with addendum's and supplements issued by IS. Wherever Indian Standards are not available / formulated, applicable BS or International Standards shall be used. In case of ambiguity between codes, specifications and drawings, the most stringent of them shall govern.
- 83.2 The contractor has to conduct Geo-technical investigation and decide on the various design parameters he proposes to adopt for foundation design. No commercial implications for any variations in this regard during execution shall be entertained.
- 83.3 All structures and portions thereof shall be analyzed and designed to sustain various loads and combinations thereof, conforming to the latest revision of applicable Indian Standards, specifications, engineering practice and other technical requirements. All structures shall be designed to sustain worst combination of dead loads plus assigned live loads, equipment, wind, seismic, temperature or other loads it is being subjected to.
- 83.4 The minimum factors of safety against overturning, sliding and hydrostatic uplift shall be 1.5; 1.5: 1.25 respectively.
- 83.5 Stability of structures shall be investigated for loading conditions during construction. However, the factors of safety given in relevant IS codes shall also be taken care of.

84 Materials & Job Specifications

- 84.1 All materials which may be used in the work shall be of standard quality manufactured by renowned concerns conforming to Indian Standards or equivalent shall have IS mark as far as possible, unless otherwise approved by Engineer, the contractor shall get all the materials approved by Engineer prior to procurement and use. The Engineer shall have right to determine whether all or any of the materials are suitable. Any materials procured or brought to site and not conforming to specifications and satisfaction of the engineer shall be rejected and the contractor shall have to remove the same immediately from site at his own expense and without any claim for compensation due to such rejection.
- 84.2 Providing & operating necessary measuring and testing devices and materials including all consumables are included in the scope of work. No separate measurement or payment for testing the work shall be made. The rates quoted for various items shall be deemed to



include the cost of such tests which are required to ensure achievement of specified qualities.

85 Detailed Contour Survey & Soil Investigation of the Site

- 85.1 A detailed contour survey with minimum 2 m contour interval of the identified land shall be carried out and drawings prepared by the contractor. Contour survey map already available with Employer may be shared with the Contractor however it will be the whole responsibility of the Contractor to ensure adequateness of the contour map for carrying out the final plant design and construction work. The contractor shall also be responsible for detailed soil investigation at all WTG locations to provide adequate information on sub-surface and surface conditions for the foundations and other sub-structures for the proposed wind project, leading to their economical and safe foundation design.
- 85.2 Field investigation shall be carried out by drilling & sampling boreholes and performing in-situ tests such as Standard Penetration Tests, Dynamic Penetration Tests-Lightweight (i.e. Cross Hole Test), and Density Tests. The CBR test to be conducted for design of roads within wind farm.
- 85.3 The location of bore holes related to Pooling Substation, roads points and other structures will be decided by Engineer In charge during actual investigation period. Drilling and sampling in boreholes up to 20 / 30 m depth each in case of soil or coring to maximum 10 m into rock, whichever is shallower. Where weak soils are encountered (SPT<50 blows/30cm), boreholes shall be continued down to a load bearing stratum with a minimum proven thickness of 5.0m in this stratum.
- 85.4 The scope of work includes execution of complete soil exploration including boring and drilling, standard penetration test (SPT), Cross Hole Test, Dynamic Cone Penetration test (if required), index properties of soil i.e. Moisture content, Dry unit weight, Specific Gravity, Atterberg Limits for Engineering classification of soil and Structural Properties testing i.e. Unconfined compression, Triaxial Compression, Direct shear, Dynamic shear Modulus of foundation strata, Elastic Moduli of rock and chemical analysis, collecting disturbed samples (DS) and undisturbed samples (UDS), collecting ground water samples, trial pits, electrical resistivity tests (ERT), field & laboratory CBR tests, conducting laboratory tests on collected samples of soil & ground water and preparation and submission of report. SPT shall be carried out in all types of soil deposits and in all rock formations with core recovery



up to 20% met within a borehole. SPT test shall be conducted at every 1.5m interval or at change of strata. The starting depth of SPT shall be 0.5m from ground level. UDS shall be collected at every 1.5m interval or at change of strata.

85.5 A minimum of one bore hole at or near about centre of WTG with SPT test at every 1.5 m interval for first 6 m stretch & 3m interval afterwards is recommended at each WTG foundation. In case of ordinary soil three borehole have to be located evenly radial distributed around the borehole to carry out SPT test radial distributed around the borehole. Minimum one number of bore hole in transformer area and one number in equipment foundation area as per the location plan.

85.6 In case of ordinary soils, cross hole test shall be carried out. Test nos shall be determined with variation in soil profile in consultation with Owner or Owner's Engineer. However, minimum 3 no's of cross hole test shall be carried out to ascertain the dynamic properties of foundation strata. For Hard Soil, SPT value $N > 100$. Nos of boreholes and number of cross hole test will vary as per the site conditions and as directed by Engineer In-Charge at site.

86 Land Development for site activities

86.1 The contractor is responsible for making the site ready by clearing of bushes, felling of trees (if required), leveling of ground (wherever required), internal roads etc. for commencing the project.

87 WTG Tower Foundation

87.1 General Requirement

87.1.1 The work shall comprise of design and construction of wind turbine foundations as per locations indicated on the final layout drawings prepared based on the micro-siting.

87.1.2 Contractor shall design WTG Tower foundation, Switchyard Civil Works (Transformer, DP & other structures) as per relevant BIS standards and recommendations of Geotechnical investigation report.

87.1.3 The foundation design shall suit the local soil conditions and the materials used, viz. cement, reinforcement steel etc. shall conform to relevant standards. The contractor shall furnish the safe bearing capacity of soil, design data and detailed construction drawing for the foundation for the WTGs to Engineer for approval before proceeding with the work.



87.2 Load Condition: The WTG Tower foundation shall be designed for the following loading conditions:

1. Extreme Loads
2. Lift-off Under Normal Operating Condition
3. Overturning of Foundation
4. Sliding of Foundation
5. Shear Failure of the Soil
6. Dynamic Stiffness
7. Fatigue Load

87.2.1 The sizing of foundation is done based on various parameters namely Bearing Pressure, Lift off of the foundation, Stability, Shear failure of soil, Dynamic stiffness etc.

87.2.2 The plan dimension of the foundation is selected so as to limit the maximum soil bearing pressure induced below the foundation will be within safe limit. The main considerations in determining the allowable soil pressure are that the soil does not fail under the applied loads and the settlements are within the permissible limits. The calculation for the required area of foundation is based on the service loads. The prescribed allowable soil pressure at a given depth is checked against gross soil bearing pressure, which includes the pressure due to the existing overburden (soil up to the founding depth).

87.2.3 The foundation is sized such that the following two conditions are to be satisfied for the lift off of the foundation.

1. Under extreme loading condition the lift off of the foundation should not be more than 50% i.e. the contact area (positive pressure) should be more than 50% of the foundation area.
- 2.. The foundation should maintain 100% contact (positive soil pressure) under normal operating condition.

87.2.4 Adequate stability of the foundation as a whole has been ensured at the founding level against the possibilities of overturning and sliding.

87.3 Excavation and Back Filling

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- 87.3.1 The Contractor shall carry out all excavation works in accordance with the dimensions and levels indicated on the drawings. The excavated material under above categories shall be kept separately, so that good quality material can be used, as required.
- 87.3.2 Excavation shall be carried out in accordance with the guidelines given in IS: 3764-1992 "Safety code for excavation work". Blasting, if required, shall be carried out in strict accordance with IS: 4081-1986 "Safety code for blasting and related drilling operations" and the latest state laws, regulations and rules. Blasting shall at all times be carried out under the supervision of fully qualified, experienced and licensed supervisors.
- 87.3.3 If any damage of any kind occurs, the contractor shall be solely responsible for such damages or any claims that may arise therefrom, and shall, at his own expense, carry out repairs or restoration as the Engineer may direct.
- 87.3.4 The contractor shall obtain written permission of the Engineer for each location where the contractor wants to use explosives.
- 87.3.5 Backfilling of foundation shall be carried out as shown on the drawings or directed by the Engineer with suitable materials. Filling materials shall be spread, levelled and thoroughly compacted in layers not more than 200 mm thick or as directed by Engineer. Each layer shall be separately compacted to achieve the required state of compaction.

87.4 Reinforced Concrete & Plain Cement Concrete Works:

- 87.4.1 Construction of all RCC works shall be done with approved design mix as per IS 456 and the materials used viz. Cement, coarse & fine aggregate, Reinforcement steel etc. shall conform to relevant BIS standards.
- 87.4.2 Unless otherwise specified elsewhere, PCC shall be of min. grade M10 (nominal mix 1:3:6) except for mud mat, back filling of ground pockets or leveling course which shall be of grade M7.5 (nominal mix 1:4:8).
- 87.4.3 Reinforcement steel shall be of high strength TMT bars of grade Fe500 D or higher conforming to IS: 1786. The contractor shall furnish test documents of steel reinforcements to be used in the works or get required tests done at an accredited approved laboratory.
- 87.4.4 The works shall consist of making and placing concrete for reinforced concrete works in conformity with the drawings or in accordance with the written instructions of the Site Engineer.



- 87.4.5 All materials, workmanship and testing shall comply with the latest revisions of the relevant Indian Standards Codes of Practices referred to in these specifications and notes given on the drawings.
- 87.4.6 The water used for all purposes throughout the works shall be according to IS:456.
- 87.4.7 Single sized coarse aggregates shall be graded as specified in IS: 383. Maximum size of coarse aggregate shall be 40 mm for Plain Cement Concrete and 20 mm for Reinforced Cement Concrete.
- 87.4.8 Fine aggregates shall be sampled and tested according to IS: 456 and IS:2386(part 1 to 8). To be acceptable the results shall fall within the grading zones I-III laid down in IS:383.
- 87.4.9 Fine aggregates shall be hard, durable, clean and free from adherent coating and organic matter and shall not contain clay. Sand shall not contain harmful impurities such as iron, pyrites, coal particles, lignite, mica shell or similar laminated and other impurities which might affect the durability of concrete or attack the reinforcement.
- 87.4.10 When tested as per IS: 2386 (part 1 to 8) fine aggregate shall not exceed the permissible quantities of deleterious materials outlined in IS: 383. It shall be obtained from natural sources such as Natural River or pit sand, crushed stone sand or mixture of these alternatives.
- 87.4.11 The contractor shall perform trial mixes and preliminary tests of each class of concrete. The selection criteria will be compressive strength, workability and surface finish and shall follow the procedures outlined in IS:456. The concrete shall be mixed in a mechanical mixer. The mixing shall be according to IS:4926.

87.5 Shuttering

- 87.5.1 The works shall consist of the supply, fabricating, placing and removing all temporary forms for the shaping of concrete, together with all temporary construction required to support such forms. The contractor shall be responsible for the correct dimensions, alignment, levelling, cleaning and oiling. All shuttering shall be approved by Engineer but it will not reduce in any way contractor's responsibility.
- 87.5.2 Shuttering shall not be removed before the concrete is sufficiently set and hardened.

87.6 Anchor Plates/Anchor Bolts/Stubs

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87.6.1 Template for fixation of Anchor plates/Anchor Bolts/stubs during casting will be arranged by the wind electric generator supplier. He shall be responsible for correct placing and fixation in accordance with dimensions, levels and specifications and tolerances given on the drawings.

87.7 P.V.C Tubing

87.7.1 P.V.C tubing for laying of cables shall be provided, as per diameters shown on the drawings. P.V.C tubing shall be, of Class-3 and suitable for a working pressure of 6kg/cm². The P.V.C tubing shall comply IS:4985 and IS:7834. Solvent cement shall be used for jointing of P.V.C. tubing.

87.8 Control Cabin

87.8.1 In case of Lattice Towers for the WTGs, it is essential to provide control cabin for housing the switchboard and local control panels. The control cabin shall be designed to suit the soil conditions. The size of the cabin shall be adequate to house the equipment with required clearances and operating space as required by CEA/CEIG. Cabin shall be constructed by using good quality stones/bricks. The wall thickness shall be minimum 200 mm. Roof slab shall be of RCC as per standard practice. Door, Window, Ventilators shall be metal construction and painted with 2 coats of paint over two coats of suitable primer. Cable trench as required shall be provided. The contractor shall furnish the plan and construction details of the control cabin for WTGs with Lattice Towers.

87.9 Switch Yard Civil Works

87.9.1 Switchyard civil work includes step up transformer plinth. HT Switchgear kiosk plinth, two pole 4 pole structure foundation, earth pits, metal spreading curb wall in and around switchyard and fencing. The transformer/HT switchgear kiosk plinth shall be made of concrete or dressed stones masonry conforming to relevant standards. The height of transformer/HT Switchgear kiosk plinth shall be decided based on 33 kV ground clearance. Earth pit construction shall be of brick masonry with precast RCC (1:2:4) cover. The fencing of the switchyard shall be with GI chain link of 2500 mm height with MS Angle posts. The gate shall be made of steel of the same height as that of the fencing.



C Civil Work for BESS

88 General Requirement

- 88.1 This section of Technical Specification covers Design, Supply and Construction etc. including all type of Civil Works for completing the facility of BESS.
- 88.2 Standards & Codes
- 88.2.1 All design and construction of civil works shall conform to relevant Indian standards such as BIS, IRC, MORTH, NBC etc.
- 88.2.2 Design of steel structures shall conform to IS: 800, 801 or 802 as applicable. Design of concrete structures shall conform to IS: 456.
- 88.2.3 All the design/ drawings shall be prepared/ approved either by in-house Engineering Team of the contractor (or by his Engineering Consultant) with qualified engineering staff with relevant experience in successful design of BESS.
- 88.2.4 The design calculations and drawings for RCC structure, Steel structure, foundation system, road work, drainage shall be submitted for prior approval of Engineer before commencement of construction.
- 88.2.5 The design calculations shall be supplemented with a neat sketch showing the structure geometry, node and member nos., lengths of various typical members, support points and type of supports, types of materials & type of sections with properties considered in analysis & design. The report shall also include back-up calculations for various loads adopted in design, brief write-up on primary load cases and design load combinations considered and conclusions on design results (with supporting sketches) for easy reference and clarity. Where a computer program (other than STAAD) is used for analysis and design, the contractor shall include a write-up on the computer program used along with examples for validation check. Design Input (format suitable to the programme used and also in STAAD format) and output file shall also be given in the design report and in soft copy to facilitate its review and approval by the Engineer.
- 88.2.6 The scope of work comprises of but not limited to the following: Site preparation, Construction of Storage yard for battery energy storage systems, Construction of RCC Foundation for Battery Energy Storage System Equipments, transformer yard, construction of roads, drainage, fencing & gates. Construction of cable trenches. Providing and laying RCC Hume pipe/trench as per site requirement.



88.3 Design Consideration

88.3.1 BESS yard shall be as per recommendation of Battery energy storage manufacturer. Layout of yards shall be such that crane movements for placing, lifting of battery units, transformer, etc. shall not disturb the adjacent facility.

88.3.2 BESS Foundation, Transformer Yard, other foundation for BESS facility

88.3.2.1 Transformer supporting structure & foundations shall be founded on piles/block/isolated spread footings depending on the geotechnical investigation report.

89 DETAILED CONTOUR SURVEY & SOIL INVESTIGATION OF THE SITE

89.1 The contractor shall be responsible for detailed soil investigation and contour survey at required locations for the purposes of foundation design and other design/ planning required for the BESS facility of the project. The Contractor must submit the detailed soil investigation report, bore log records, ERT reports and contour survey to Engineer.

89.2 Geotechnical Investigations

89.2.1 The contractor shall be responsible for detailed Geotechnical investigations for BESS facility at the proposed location of the project site for the purpose of foundation design for various equipment foundations, structures etc. and other design/ planning requirements. The investigation work shall be carried out through any Govt. approved/ NABL accredited agency. The contractor shall submit the credentials of the proposed agency along with relevant certificates in support thereof for verification/ approval of the Investigation Agency by the Engineer.

89.2.2 The field investigations shall mainly include drilling of min. 10m deep boreholes, conducting SPT and collecting Disturbed (DS) and Undisturbed samples (UDS), Trial pits if specified (min 2mx2mx2.5m deep). Number and location of bore holes, CBR tests and Trial pits shall be decided as per the BESS facility layout, site topography and soil conditions in consultation with the Employer. There shall be minimum 2 nos. of Borehole for each structure. For other details, refer section 49 of this specification.

89.2.3 Other investigations



89.2.4 The contractor shall also obtain and study other input data at proposed project site for design of the project from metrological department/ local govt. authorities. This shall include data related to Rainfall, Maximum & Minimum ambient Temperature, Humidity, HFL etc.

90 Land Development for site activities

90.1 The Finished Grade Level (FGL) of the proposed BESS facility area shall be fixed with reference to the highest flood level (HFL) and surrounding ground profile at proposed site to avoid flooding of plant site. The area at and around all equipment of BESS facility, transformer yard etc. shall be uniformly levelled at suitable RL to be finalized considering topography and HFL at site.

91 Roads

91.1 Suitable approach road (as applicable) from the nearest internal road of the Plant Facility site office as well as stock yard up to BESS facility shall be provided for safe and easy transportation of men, material and equipment during construction and maintenance. The Approach road shall be of 3.5m wide carriage way with 0.5m wide shoulders on either side. The roads shall be provided with alongside drains as per design requirements of drainage system to avoid flow of storm water over the road. The roads shall be designed and constructed as per IRC SP-20 corresponding to design vehicular traffic of minimum - 150 Commercial vehicles per day and critical field CBR value of the subgrade. Shoulder shall be of min. 150mm thickness.

91.2 However, following minimum road section details shall be followed:

(xxxii) Topping: surface dressing, compacted 75 mm thick, murrum blended with WBM Grade -III

(xxxiii) WBM (CBR>100%): compacted 75 mm thick, Grade III

(xxxiv) WBM (CBR>100%): compacted 75 mm thick, Grade II

(xxxv) Granular sub-base (CBR>15%): compacted 150 mm thick in two layers of 75mm thickness each,

(xxxvi) Compacted subgrade: top 300mm thick, compacted up to 98% of standard proctor density

(xxxvii) Shoulders : compacted 150mm thick, murrum blended with WBM Grade-III



For other details, refer section 52 of this specification

92 Surface/ Area drainage

92.1 The contractor shall design and construct storm water drainage network for BESS facility inside plant area for smooth disposal of storm water. Drainage system shall be designed considering “maximum hourly rainfall intensity”. The drainage system shall be designed as per the IRC specifications and prevailing industry practices. For other details, refer section 53 of this specification.

93 Fencing

93.1 The BESS transformer yard shall be provided with either Chain link or barbed wire fencing or masonry boundary wall as specified. For other details, refer section 54 of this specification.

94 Foundations

94.1 Soil bearing stresses shall not exceed the allowable stresses for the soil parameters as per the approved Geotechnical Investigation report or Good Industry Practices as recommended by the Owner/ Owner`s representative. A minimum safety factor of 1.5 shall be provided against uplift, sliding, and overturning loads and only 90% of dead load to be considered for these stability checks. Soil stresses shall be calculated using unfactored loads.

94.2 All structures and foundation designs must include suitable evidence to show that their design is commensurate with a minimum of 25-year life.

94.3 Unless specifically stated otherwise, the design of all structures, equipment, and foundations shall be based on applicable portions of IS codes, these specifications, and industry standards.

94.4 All components shall be painted, coated, or otherwise protected in a manner commensurate with at least 25-year design life. Particular attention shall be given to prevention of corrosion at the connections between dissimilar materials such as aluminium and steel, and steel and concrete.

94.5 All structures and foundations shall be designed to resist dead, live, wind, and seismic loads.

94.6 Contractor shall design all foundations for equipment, Transformer & other structures as



per relevant BIS standards and recommendations of Geotechnical investigation report. The minimum plinth level of all equipment / open installations shall be 450mm above FGL.

94.7 All design & drawings shall be submitted to the Engineer for approval before execution.

95 Concrete Works

95.1 Construction of all RCC works of grade M 25 shall be done with approved design mix as per IS 456 and the materials used viz. Cement, coarse & fine aggregate, Reinforcement steel etc. shall conform to relevant BIS standards. In case Geotechnical investigations requires any special kind of cement or higher grade of concrete, the same shall be provided.

95.2 Unless otherwise specified elsewhere, PCC shall be of min. grade M10 (nominal mix 1:3:6) except for mud mat, back filling of ground pockets or leveling course which shall be of grade M7.5 (nominal mix 1:4:8). A minimum 100 mm thick PCC shall be provided below RCC wherever RCC is laid over the ground. Proper and sufficient formwork/shuttering shall be provided for the required period as per IS: 456.

95.3 Finished level of the top of RCC Concrete shall be min 450mm from the existing ground level

95.4 Reinforcement steel shall be of high strength TMT bars of grade Fe500 D conforming to IS: 1786.

95.5 RCC Trenches shall be constructed in reinforced cement concrete of M-20 grade of wall thickness min 125 mm. Trench walls shall not foul with the foundations. The trench bed shall have a slope of approx. 1/500 along the run & 1/250 perpendicular to the run.

95.6 Coarse aggregate for concrete shall be crushed stones chemically inert, hard, strong, durable against weathering of limited porosity and free from deleterious materials. It shall be properly graded. It shall meet the requirements of IS: 383.

95.7 Sand shall be hard, durable, clean and free from adherent coatings of organic matter and clay balls or pellets. Sand, when used as fine aggregate in concrete shall conform to IS: 383.

95.8 Unless specified otherwise for grouting works anti shrink ready mix grout of approved make or cement mortar (CM) grout with non-shrink compound shall be used. The grout shall be high strength grout having min. characteristic strength of 35 N/mm² at 28 days.

96 Buildings

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- 96.1 Security room at gate & security cabin (at strategic locations) shall also be provided to secure the BESS facility from any theft/ burglary/unauthorized entry. The security room/ cabin(s) may be of prefabricated structure. The Security room shall be of min. size 4m x 4m x 2.75m height and security cabin shall be of min. size 1.2 x 1.8m x 2.5m height. The walls and roof of the building shall be fabricated with double skin insulated sandwiched Al-Zn alloy coated high tensile steel metal panels (BMT- 0.5mm, Al-Zn alloy coating -150 GSM total on both sides). The insulation shall be of PUF with min. density 40 kg/ cum and adequate thickness. Roof shall be provided with suitable slope, not less than 100 to the horizontal (approx. 1V:6H) for proper drainage of rain water and shall project 300mm beyond the walls. The make and (color) shade of pre- coated metal panels shall be subject to approval by the Engineer. Min. thickness of color coating shall be 20 micron (DFT) excluding prime coat 5 micron (DFT). The coating system shall confirm to IS; 15965.

D Common Infrastructure Works:

For the operation & maintenance of Plant Facility the common infrastructure Building have been proposed.

97 Building

97.1 General Requirement

- 97.1.1 For Hybrid Solar Wind Plant one (1) common building is required to be constructed for housing the electrical equipment/ panel and Energy Management System and SCADA / Control room cum office cum store, (Main Control Room Building - MCR) for operation and maintenance of the Plant Facility (Wind Plant, Solar PV Plant, BESS and other Infrastructure).
- 97.1.2 Unless otherwise specified elsewhere, building shall have RCC framed structure. Brick partition walls shall be provided for Kitchen, Pantry, Battery room and Toilet units. For other rooms AL Glass partitions shall be provided. The equipment area shall be designed with OEM requirements and to accommodate all facilities required in the Control Room Building to ensure all satisfactory operations.



97.1.3 All buildings shall have provision of adequate windows for natural light & ventilation, fire safety provisions and shall be designed as per provisions of National building code (NBC).

97.1.4 The contractor shall submit the proposed equipment layout drawings to the Engineer for approval before development of Architectural drawings. The building layout, exterior elevations shall be aesthetically designed following good architectural practices to get a pleasant look. Horizontal/ vertical bands through projections/ grooves in external plaster may be provided to break the monotony. Roof slab shall have projection of 450mm beyond external walls with RCC parapet wall of 450 mm clear height all-around which shall form a projected band at roof level. For weather protection all doors and windows shall be provided with 450mm wide RCC chajja. However, chajja for rolling shutter shall be 750mm wide.

97.2 Functional requirements

97.2.1 Control Room Building

For operation & maintenance of SPV Plant, Wind Farm & BESS facility unless otherwise specified elsewhere, Control room cum office area of Control Room building shall provide following facilities.

- Air-conditioned area (with provision of split A/C unit of adequate capacity) for SCADA room (min. carpet area 12m²) & Conference room (min. carpet area 20 m²)
- Switchgear equipment room(s) as per OEM requirements
- Supervisor cabin and office area (min. carpet area 20 m²)
- Store cum record room (min. carpet area 15 m²)
- Battery room as per requirement
- Toilet block with separate gents and ladies wash room facilities (min. total carpet area 12 m²)
- Pantry with service platform and utensil washing facilities (min. carpet area 5 m²)
- Suitable provision for passage (for smooth movement of O & M personnel), cable trenches, operating area etc. (min. clear width 1500mm)
- Control Room building shall have separate main entry to office area plus a provision of fire exit door.

98 Flooring, Skirting and Dado

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98.1 Store area, Equipment Room

98.1.1 40 mm thick Cement concrete (IPS) flooring (1:2:4), aggregate size 10 mm down, conforming to IS 2571 with 2mm thick Heavy-duty epoxy coating (Industrial grade) of approved make on top as per manufacturer specifications and 10mm thick matching skirting of 100mm height.

98.2 EMS / SCADA Room, Control cum Office Room, Supervisor Room and Lobby

98.2.1 40 mm thick Heavy duty vitrified tile (8mm thick) flooring with matching skirting of 100mm height.

98.3 Battery Room

98.3.1 Acid/ Alkali resistant tile flooring and 2100 height dado, Floor and dado tiles - 20mm and 12 mm thick respectively. However, in case of maintenance free batteries, vitrified tile (8mm thick) flooring and dado shall be provided.

98.4 Toilet

98.4.1 40 mm thick Ceramic tile (8mm thick) flooring and glazed tile (6mm thick) 2100 height dado.

98.4.2 20mm thick Granite stone finish over platform for wash basin.

98.5 Pantry

98.5.1 40 mm thick heavy duty vitrified tile (8 mm thick) flooring and glazed tile (6mm thick) 2100 mm height dado, 20mm thick Granite stone finish over service platform.

98.6 Passage/ Corridor

98.6.1 40 mm thick Heavy duty vitrified tile (8mm thick) flooring with matching skirting of 100mm height.

98.7 Steps

98.7.1 Kota stone (20 thick) or 50 thick cement concrete (IPS) flooring conforming to IS 2571.

98.8 All items shall be of reputed make. Only Items with approved samples by the Engineer shall be used.

99 Doors and Windows

99.1 Doors, windows, louvers and ventilators shall be made of AL sections (minimum average thickness 2.5mm), industrial grade, anodized (grade AC25, min. thickness 25 micron



conforming to IS: 1868) or with polyester powder coating (Total DFT 50 microns conforming to IS: 13871) and shall be of approved make & colour shade. All sections, fittings and fixtures shall be anodized (min. thickness of coating 20 micron). The window and door shutters shall be of clear float/ wired/ ground glass as per design/ functional requirements. The doors in toile area shall be of steel frame with solid core (MDF) flush shutter, 35mm thick, with laminated finish on both sides conforming to IS: 2202.

99.2 AL Louvers, duct/ ventilation openings shall be provided as per functional requirement.

99.3 All doors, windows and ventilators shall be provided with all necessary fittings and fixtures like handles, tower bolts, wind stays, hinges etc. of heavy duty anodized AL. All doors shall be provided with hydraulic door closure of required capacity.

99.4 All windows shall be provided with suitable AL grill of anodized sections with adequate thickness for security purposes.

99.5 Clear float glass for window and door shutter shall be of min 4mm and 6mm thickness respectively. Wired/ ground glass where provided shall be of min thickness 6mm.

99.6 Entrance door and door in passage shall be min. 1.5m wide (double leaf) x 2.1 m height while door for Conference room and Store room shall be min. 1.2m wide x 2.1m height. All other doors shall be min. 1.0m wide x 2.1m height except for WC which may be of 0.8m width.

99.7 Rolling shutters shall be of required size and shall be made of cold rolled steel strips with adequate gauge thickness (min. 18 gauge) and shall conform to IS 6248. Rolling shutter shall be provided with all fixture, accessories, paintings etc. all complete and shall be mechanically operated type.

100 Roofing

100.1 The roof of all RCC buildings shall be provided with min. slope of 1:100 for effective drainage of rain water. The slope shall be achieved either by application of screed concrete of grade 1:2:4 (with 12.5mm down coarse aggregate) with min. 25mm thick CM 1:4 layer on top to achieve smooth surface to facilitate application of water proofing treatment.

100.2 The water proofing treatment shall be in situ five course water proofing treatment with APP (Atactic Polypropylene) modified Polymeric membrane over roof consisting of first coat of bitumen primer @ 0.40Kg per sqm, 2nd & 4th courses of bonding material @ 1.20 kg/sqm, which shall consist of blown type bitumen of grade 85/25 conforming to IS : 702, 3rd layer

of roofing membrane APP modified Polymeric membrane 2.0 mm thick of 3.00 Kg/sqm weight consisting of five layers prefabricated with centre core as 100 micron HMHDPE film sandwiched on both sides with polymeric mix and the polymeric mix is protected on both sides with 20 micron HMHDPE film. The top most layer (5th layer) shall be finished with brick tiles of class designation 10 grouted with cement mortar 1:3 (1 cement: 3 fine sand) mixed with 2% integral water proofing compound by weight of cement over a 12 mm layer of cement mortar 1:3 (1 cement: 3 fine sand) and finished neat. The water proofing treatment shall be extended over golla/ fillet and inner face of the parapet up to 450mm height.

100.3 The corners at parapet wall and slab shall be provided with 50 thick fillet/ golla in CM 1:3 with neat finish.

100.4 Required no. of rain water down take pipes min. 100mm dia. PVC pipes (UV resistant), with 450x450mmx15mm deep khurra and MS grill at inlet shall be provided for rain water disposal.

101 Plinth protection and drain

101.1 750mm wide plinth protection with min. 75mm thickness of PCC (1:3:6) over 75 mm thick bed of dry brick ballast, 40mm nominal size well rammed and consolidated and grouted with fine sand, shall be provided around all the buildings.

101.2 A peripheral drain (except for Security room/ cabin) of min. internal size 250mm x 250mm with brick walls in CM 1:6 over 75mm thick PCC (1:3:6) bedding with 12mm thick plaster in CM 1:5 and 25thk PCC (1:3:6) coping at top shall be provided along the periphery of the plinth protection for collection and disposal of rain water from building roof.

102 Plinth filling for buildings

102.1 Plinth beam, when provided, shall be taken minimum 200mm below FGL. The plinth filling below Ground floor (GF) for all buildings shall be provided with following specifications.

(xxxviii) Well compacted sub-grade

(xxxix) Well compacted boulder soling with interstices filled with sand over compacted sub-grade.

(xl) 75mm thick PCC 1:3:6 over (ii)

(xli) 100mm thick PCC 1:2:4 over (iii)

(xlii) 40mm thick floor finish over (iv)



103 Anti- termite Treatment

103.1 In case of presence of termites at the project site, an anti-termite treatment shall be provided for all foundation pits and building plinth in MCR building conforming to IS: 6313 to control entry of termites

104 Plumbing & Sanitary Works

104.1 Toilet block shall have following min. fittings:

- Wall mounted WC (Western type) 390 mm high with toilet paper roll holder, low height flushing tank and all fittings
- A set of 2 wall mounted Urinals (430 x 260 x 350 mm size) with flushing tank and all fittings (Gent's wash room only)
- Wash basin (550 x 400 mm) over concrete platform with all fittings including 2-pillar cocks
- Bathroom mirror (600 x 450 x 6 mm thick clear float glass) with hard board backing
- CP brass towel rail (600 x 20 mm) with C.P. brass brackets
- Soap holder and liquid soap dispenser
- Ventilators – Mechanical exhaust facility of adequate capacity
- Overhead PVC water storage tank – Capacity 1000 litres (common for both wash rooms)

104.2 Pantry room shall be provided with kitchen sink cum drain board and provision for installation of Water Cooler.

104.3 One toilet room with provision of WC and Wash basin shall be provided at Security Room near main gate.

104.4 Necessary plumbing lines for MCR building and Security Room near main gate.

104.5 All sanitary ware, fittings and fixtures shall be of reputed Make and Type and approved by the Engineer. All fittings, fastener, grating shall be of CP brass conforming to relevant BIS standards.

105 Painting & Other Finishes

105.1 Painting and white wash/ colour wash for the buildings shall conform to relevant BIS standards. The make and colour shade of the finish shall be as advised and approved by the Engineer.



Design, Engineering, Supply, Construction, Erection, Testing & Commissioning of 160 MW Solar-Wind Hybrid Power Plant with BESS including 10 Years Plant O&M under International competitive bidding at Ramagiri, Anantapur district, Andhra Pradesh

Internal Walls except toilets & battery room	Acrylic emulsion (for MCR) & Oil bound distemper (for LCR/ Security Room)
Battery room	Acid/ Alkali resistant tiled dado of 2100 mm height & Acid resistant resin-based epoxy paint above dado (Vitrified tile flooring and dado with oil bound distemper in case of maintenance free batteries)
Toilet	Oil bound distemper
External Walls	All weather proof cement based acrylic emulsion paint, exterior grade
MMS foundations/ Earth pit Enclosure	Cement paint
Underside of roof slab	White wash
Air-conditioned areas	Underside of roof slab- Under deck insulation with 50mm thick mineral wool, min. density 45 kg/ m3 and Gypsum board false ceiling with GI grid/ Gypsum tile (600x600 mm x 12 thick) false ceiling with AL grid as per manufacturer's details
Structural steel work	2 coats of synthetic enamel paint over 2 coats of suitable primer

106 Air conditioning & Ventilation for MCR and Other Buildings

106.1 All buildings shall be equipped with appropriate numbers of fans for effective heat dissipation.

106.2 In MCR building, the supervisor room, Conference room and SCADA room shall have split type air conditioning units.

107 Fire Extinguishers

107.1 All buildings shall be installed with required no. of fire extinguishers as per relevant BIS standard and NBC. LiquefiedCO₂/ foam/ ABC type fire extinguisher shall be upright type of capacity 10kg conforming to IS: 2171, IS: 10658.

107.2 The fire extinguisher shall be suitable for fighting fire of Oils, Solvents, Gases, Paints, Varnishes, Electrical Wiring, Live Machinery Fires, and all Flammable Liquid & Gas.

108 Sand buckets

108.1 Sand buckets shall be wall mounted made from at least 24SWG sheet with bracket fixing

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on wall conforming to IS: 2546.

108.2 All buildings shall be provided with required no. of sand buckets as per relevant BIS standard and NBC. 4 No. of Bucket stands with four buckets on each stand shall be provided in the Transformer Yard.

109 Sign Boards and Danger Boards

109.1 The sign board containing brief description of major components of the power plant facility as well as the complete power plant facility in general shall be installed at appropriate locations of the power plant as approved by Engineer

109.2 The Signboard shall be made of steel plate of not less than 3 mm. Letters on the board shall be with appropriate illumination arrangements.

109.3 Safety signs, building evacuation plan and direction signs, assembly points shall also be placed at strategic locations.

109.4 The Contractor shall provide to the Engineer, detailed specifications of the sign boards.

110 Masonry Work

110.1 The masonry work shall be of bricks, laterite blocks (as per site conditions) or concrete blocks.

110.2 All external walls of buildings shall be 230mm and internal walls shall be 230mm or 115mm as per requirements.

110.3 All concrete block masonry walls shall be min. 200mm thick.

110.4 Brick work shall be in cement mortar (CM) 1:6 & 1:4 for 230 mm and 115 mm thick brick wall respectively unless specified.

110.5 Unless otherwise specified elsewhere, Bricks shall be of class designation 7.5 conforming to IS: 1077, IS: 2212 & IS: 3495.

110.6 All concrete blocks shall be of min. compressive strength of 7.5 N/mm² and shall be of Grade-A conforming to IS: 2185.

110.7 The laterite blocks shall conform to IS: 3620.

110.8 All buildings shall be provided with suitable damp-proof course (DPC). The DPC shall be with PCC (1:2:4) using 6 down coarse aggregate and water proofing admixture. The min. thickness of DPC shall be 40mm.

110.9 The construction of brick masonry shall conform to IS: 2212. Construction of Concrete block masonry shall conform to IS: 2572.



111 Plastering, Pointing & Coping Works

- 111.1 All brick masonry work shall be provided with plaster.
- 111.2 Wall and ceiling plaster shall be in cement mortar (CM) 1:6 and 1:3 respectively.
- 111.3 Thickness of plaster shall be 18mm and 12mm respectively for rough and smooth surface of the masonry wall. The ceiling plaster shall be 6mm thick.
- 111.4 All joints in stone masonry shall be raked and pointed in cement mortar (CM) 1:3 except specified otherwise.
- 111.5 Exposed top surface of brick or stone masonry shall be provided with 25 mm thick plain cement concrete (PCC) coping (1:2:4) with trawl finish. All exposed coping shall be provided with suitable slope and projection for easy drainage of water.
- 111.6 All door and window chajja shall be provided with 10mm wide drip course.

112 Building Water Supply & Plumbing Works

- 112.1 C-PVC pipes shall be used for all internal building water supply works while all external water supply pipes shall be uPVC conforming to relevant BIS standard.
- 112.2 Rain water pipe shall be of PVC conforming to relevant BIS standard.
- 112.3 All sewerage, waste water and ventilation pipes shall be of HDPE conforming to relevant BIS standard.
- 112.4 Control Room building shall be connected to Sewage treatment facility including all associated works like Manholes etc.

113 Sewage Treatment facility

- 113.1 The Contractor shall design & provide soak pit and RCC Septic tank for treatment of sewage and waste water from Control Room building. However, in case of ground water within 1.5m of finished grade level or the soil strata being of low permeability (permeability $\leq 10^{-6}$ m/s) where septic tank and soak pit arrangement is not effective, suitable packaged sewage treatment plant of reputed make/manufacture shall be provided. The sewage treatment facility shall be of required capacity and of proven design suitable for total of 15 people.
- 113.2 The design and drawings shall be submitted for approval prior to execution.



E Quality Assurance and Inspection of Civil Works

114 Introduction

- 114.1 This part of the specification covers the sampling, testing and quality assurance requirement (including construction tolerances and acceptance criteria) for all civil and structural works covered in this specification.
- 114.2 This part of the technical specification shall be read in conjunction with other parts of the technical specifications, general technical requirements & erection conditions of the contract which covers common QA requirements. Wherever IS code or standards have been referred they shall be the latest revisions.
- 114.3 The rate for respective items of work or price shall include the cost for all works, activities, equipment, instrument, personnel, material etc. whatsoever associated to comply with sampling, testing and quality assurance requirement including construction tolerances and acceptance criteria and as specified in subsequent clauses of this part of the technical specifications.
- 114.4 The QA and QC activities in all respects as specified in the technical specifications/ drawings / data sheets / quality plans / contract documents shall be carried out at no extra cost.
- 114.5 The contractor shall prepare detailed construction and erection methodology scheme which shall be compatible to the requirements of the desired progress of work execution, quality measures, prior approvals from statutory authorities etc. if any and the same shall be got approved from the Engineer.
- 114.6 If required, work methodology may be revised/ reviewed at every stage of execution of work at site, to suit the site conditions, work progress commensurate with project schedule by the contractor at no extra cost to the Engineer

115 QA and QC Manpower

- 115.1 The contractor shall nominate one overall QA coordinator for the contract detailing the name, designation, contact details and address at the time of post bid discussions.
- 115.2 All correspondence related to Quality Assurance shall be addressed by the contractor's QA coordinator to the Engineer.
- 115.3 Employer/ Consultant shall address all correspondence related to Quality issues to the



contractor's QA coordinator. The contractor's QA coordinator shall be responsible for co-ordination of Quality activities between various divisions of the contractor and their sub-vendors on one hand & with Engineer on the other hand.

115.4 The contractor shall appoint a dedicated, experienced and competent QA & QC in-charge at site, preferably directly reporting to the Project Manager, supported as necessary by experienced personnel, to ensure the effective implementation of the approved QAP.

115.5 The contractor shall finalize and submit a deployment schedule of QA & QC personnel along with their details to Engineer for approval/ acceptance and further shall ensure their availability well before the start of the concern activity.

116 Laboratory and Field Testing

116.1 The contractor shall make necessary provisions to provide all facilities required for QA & QC activities by setting up a field laboratory for QA and QC activities in line with the indicative field QA & QC laboratory set-up.

116.2 The Laboratory building shall be constructed and installed with adequate facilities to meet the requirement of envisaged test setup. Temperature and humidity controls shall be available wherever necessary during testing of samples.

116.3 The quality plan shall identify the testing equipment/ instrument, which the contractor shall deploy and equip the field quality laboratory for meeting the field quality plan requirements.

116.4 The contractor shall furnish a comprehensive list of testing equipment/ instrument required to meet the planned/scheduled tests for the execution of works for Engineer's acceptance/ approval.

116.5 The contractor shall mobilize the requisite laboratory equipment and QA & QC manpower at least 15 days prior to the planned test activity as per the schedule of tests.

116.6 In case contractor desires to hire the services of any established laboratory nearby for any field tests then he shall ensure that the subject laboratory is well equipped with all requisite testing facilities and qualified QA & QC staff and this shall not affect in anyway the work progress.

116.7 All equipment and instruments in the laboratory/ field shall be calibrated before the commencement of tests and then at regular intervals, as per the manufacturer's recommendation and as directed by the Engineer. The calibration certificates shall specify the fitness of the equipment and instruments within the limit of tolerance for use. Contractor



shall arrange for calibration of equipment and instruments by an NABL / NPL accredited agency and the calibration report shall be submitted to Engineer.

116.8 The tests which cannot be carried out in the field laboratory shall be done at a laboratory of repute. This includes selected IITs, NCB, CSMRS, reputed government / autonomous laboratories / organizations, NITs and other reputed testing laboratories. The test samples for such test shall be jointly selected and sealed by the engineer and thereafter these shall be sent to the concerned laboratory through the covering letter signed by Engineer. Test report along with the recommendations shall be obtained from the laboratories without delay and submitted to Engineer.

116.9 Based on the schedule of work agreed with the Engineer and the approved FQP, the contractor shall prepare a schedule of tests and submit them to the Engineer and organize to carry out the tests as scheduled/agreed.

117 Sampling and Testing of Construction Materials

117.1 The method of sampling for testing of construction materials and work / job samples shall be as per the relevant BIS / standards / codes and in line with the requirements of the technical specifications / quality plans.

117.2 All samples shall be jointly drawn, signed and sealed wherever required, by the contractor and the engineer or his authorized representative.

117.3 The contractor shall carry out testing in accordance with the relevant IS standards/ codes and in line with the requirements of the technical specifications / quality plans. Where no specific testing procedure is mentioned, the tests shall be carried out as per the best prevalent engineering practices and to the directions of the Engineer.

117.4 All testing shall be done in the presence of Engineer or his authorized representative in a NABL accredited / Govt. Laboratory acceptable to Engineer.

117.5 The test samples shall be jointly selected and sealed and signed by the Site-in-charge and thereafter these shall be sent to the concerned laboratory.

117.6 The test report along with the recommendations shall be obtained from the laboratory without delay and submitted to Engineer.

118 Purchase and Service

118.1 All structural steel shall be procured only from main steel producers In case of non-availability of some of the sections with main steel producers, the contractor may propose

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to procure the sections from the re-rollers of the main steel producers, the name of such re-rollers will have to be cleared by the Engineer for which details such as BIS approval, main steel producer's approval, past experience for production of sections of specified material, details of machines, plant, testing facilities etc.

118.2 Confirmation that the process control and manufacturing of steel sections by re-rollers shall be same as that of main steel producers, that billets for re-rolling will only be sourced from main steel producers shall be furnished with regard to re-roller.

118.3 For Module Mounting Structures (MMS) civil works the sources of steel other than those specified under this clause may also be used subject to the condition that they otherwise meet the requirements of the Technical Specifications / Bid documents. Even after clearance of re-rollers, induction of billets with identified and correlated Mill test certificates (MTC) in the process of re-rolling, sampling of steel, quality checks thereof and stamping of final product for further identification and correlation with MTC prior to dispatch shall be the responsibility of the contractor and these shall be performed in presence of the authorized representative of the main Contractor.

118.4 Reinforcement steel shall be procured only from main steel producers and Mill test certificates (MTC) shall be obtained and submitted to the Engineer for correlation.

119 Field Quality Plan

119.1 Well before the start of the work, the contractor shall prepare and submit the Field Quality Plans to Employer for approval, which shall detail out for all the works, equipment, services, quality practices and procedures etc. in line with the requirement of the technical specifications to be followed by the contractor at site.

119.2 This FQP shall cover all the items / activities covered in the contract / schedule of items required, right from material procurement to completion of the work at site.

120 General QA Requirements

120.1 The contractor shall ensure that the works, BOIs and services under the scope of Contract, whether manufactured or performed within contractor's works or at his subcontractor's premises or at the project site or at any other place of work, are in accordance with Technical specification, applicable standards / codes, approved drawings / data sheets / quality plans and BOQ. All the works, BOIs and services shall be carried out as per the best prevalent engineering practices and to the directions of the Engineer.



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Equipment	UOM	Approx. Qty.
Cube moulds for cement testing	nos.	4
Sieve shaker	nos.	1
Sieve for sand, coarse and fine aggregate	set	1
Sieve for coarse aggregate	set	1
Slump testing equipment	nos.	6
Oven	nos.	2
Physical balance	nos.	1
Thermometer	nos.	4
Burret	nos.	2
Measuring cylinder	nos.	9
Measuring flask	nos.	3
Compression testing machine	set	1
Cube mould for concrete	nos.	10
Mechanical weighing machine	nos.	1 (100kg capacity)
Drum type concrete mixer (for trial mixes)	nos.	1
Proctor testing equipment	set	1

Notes

- 120.2 The equipment listed above is indicative and minimum required. Additional equipment, if any, required for successful completion of work shall be provided /arranged by the contractor.
- 120.3 All test reports/ inspection reports shall be submitted in soft copy also and shall be available at site for easy access to the Engineer.
- 120.4 Based on the schedule (L2/L3 Network), Quality control & Quality Assurance Work plan shall be finalized by the contractor and the same shall be submitted to Engineer for acceptance/approval.

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EMPLOYER'S REQUIREMENT

Annexure – A

PART IV

SCOPE OF WORKS

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1 Project particulars

Particulars	Description
Design & Engineering	
Proposed capacity of the hybrid power plant	Solar PV 120 MW (AC)
	Wind 40 MW
	BESS 10 MW & 20 MWh
PV Technology	Mono/ Multi crystalline / Thin film
PV Origin of manufacturer	Open
O&M period	10 (Ten) Years
Design life of Hybrid Power plant	25 Years
Site location and land details	
Latitude	14°21'29.7" N
Longitude	77°31'18.9" E
Village	Ramagiri
District	Anantapur
State	Andhra Pradesh
Type of Land	Assigned, Govt & Private land
Owner of Project	Solar Energy Corporation of India Limited.
Owner of land	Solar Power Park Developer (SPPD)
Electrical Interconnection Details	
Substation Details	33 kV/220 kV proposed sub-station, Ramagiri
Distance to connecting substation	Within the identified land
Access	
Nearest Urban Area	Anantapur ()
Nearest Highway	NH7- Bangalore – Hyderabad Highway (AH43) – 12 km
Nearest Railway Station	Dharmavaram (30 km)
Nearest Airport	Kempagowda International Airport, Bangalore (163 km)
Performance Parameters	
<u>Solar PV Plant</u>	
Performance Ratio	79%
Capacity Utilization Factor	22%

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Wind Plant Average Machine Availability	98% (1 st May to 31 st October) 96% (1 st November to 30 th April)
Other Details	
Water and Power for Construction	To be arranged by the Contractor

2 Brief Scope of Works

Scope of Supply & Work includes all design & engineering, procurement & supply of equipment and materials, testing at manufacturers works, multi – level inspections, packing and forwarding, supply, receipt, unloading and storage at site, associated civil works, services, permits, licences, installation and incidentals, insurance at all stages, erection, testing and commissioning of 160 MW Solar-Wind Hybrid Power Plant and performance demonstration with associated equipment and materials on turnkey basis at Ramagiri, Anantapur District, Andhra Pradesh and 10 (ten) years comprehensive operation and maintenance from the date of Operational Acceptance.

3 Design and Engineering

3.1 The Contractor shall prepare the detailed design basis report (DBR) along with relevant standards (with respective clause description), PERT Chart and MDL. The Contractor shall submit a copy to Employer for review and approval prior to detail engineering.

3.2 Submission of basic design data, design documents, drawings and engineering information including GTP and test reports to Employer or its authorized representative for review and approval in hard copy and soft copy from time to time as per project schedule. The documents typically include, but not limited to, the following:

- Solar insolation data and basis for generation
- Detailed technical specifications (GTP) of all the equipment
- General arrangement and assembly drawings of all major equipment
- Schematic diagram for entire electrical system (DC, AC and auxiliary systems)
- GTP & G.A. drawings for all types of structures/ components, switchgears & other interfacing panels
- Test reports (for type, routine and acceptance tests)
- Relay setting charts
- Design calculations and sheets (licenced software as well as design templates)
- Geo-technical investigation data and Topographical survey report including

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topographical survey data in digital format (Excel file) and Contour plan of the area.

- GA drawings of the entire project including equipment rooms/ inverter control rooms, office cum control room, roads, storm water drainage, sewage networks, security gate, fire protection system, perimeter fencing, transformer yard fencing etc.
- Transmission line drawings and erection plans as per DISCOM/ STU guidelines
- Quality assurance plans for manufacturing (MQP), Standard Operating procedure (SOP) and field activities (FQP)
- Detailed site EHS plan, fire safety & evacuation plan and disaster management plan.
- Detailed risk assessment and mitigation plan.
- O&M Instruction's and maintenance manuals for major equipment
- As-built drawings / documents and deviation list from good for construction (GFC)

3.3 Estimation of the plant generation based on Solar Radiation, Wind Speed and other climatic conditions prevailing at site.

3.4 Design of associated civil, structural, electrical & mechanical auxiliary systems includes preparation of single line diagrams and installation drawings, manuals, electrical layouts, erection key diagrams, electrical and physical clearance diagrams, design calculations for Earth- mat, Bus Bar & Spacers indoor and outdoor lighting/ illumination etc., GTP and GA drawings for the major equipment including transmission line, design basis & calculation sheets, and other relevant drawings and documents required for engineering of all facilities within the periphery to be provided under this contract.

3.5 All drawings shall be fully corrected to match with the actual "as – built" site conditions and submitted to Employer after commissioning of the project for record purpose. All as-built drawings must include the Good for Construction deviation list.

4 Supply

The scope of supply shall include design, engineering, manufacture, testing at works, dispatch, transportation, transit insurance, receipt, unloading, and storage of all equipment/materials, not limited to, those mentioned in the following.

4.1 Solar PV

4.1.1 Adequate capacity of Solar PV modules of suitable rating

4.1.2 Module Mounting Structures (MMS)

4.1.3 String Monitoring Unit (SMU) along with mounting structure

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- 4.1.4 Solar cables along with lugs, glands, ferrules, straight/Y-connectors and other materials required proper cable termination at both the ends
- 4.1.5 Power Conditioning Units of suitable rating
- 4.1.6 Step-up transformers (inverter duty) as per inverter manufacturer requirements
- 4.1.7 Indoor/Outdoor 33 kV switchgear panels including Vacuum Circuit Breakers, Current Transformers, Voltage Transformers, Relays and other accessories for complete protection
- 4.1.8 Auxiliary transformers of adequate rating for plant internal consumption
- 4.1.9 AC distribution panels with sufficient number of output feeders required for auxiliary power distribution
- 4.1.10 DC and AC power cables of appropriate sizes with cable termination kits
- 4.1.11 LT Power and Control Cables including end terminations and other required accessories for both AC & DC power
- 4.1.12 Supervisory Control and Data Acquisition (SCADA) system for remote monitoring/control of plant facilities along with communication cables
- 4.1.13 Uninterrupted Power Supply (UPS) with battery bank of sufficient capacity for critical loads as specified
- 4.1.14 Earth strip/cables, earth electrodes, earth enhancing compound and all other associated materials for complete earthing of the plant as per the relevant standards
- 4.1.15 Weather monitoring station shall include but not be limited to the following:
- Pyranometers – for horizontal and tilted plane
 - Ultrasonic Anemometer (wind speed and direction)
 - Temperature Sensor – Ambient and module surface
 - Power source to the all sensors wherever required
 - Data Logger
 - Interface cables from sensors to data logger
- 4.1.16 Testing instruments
- 4.1.17 Spares & consumables, as required or recommended, for the complete O&M period
- 4.1.18 Overhead transmission line/cable from 33 kV switchgear panel at solar array field to 33 kV switchgear panel at pooling sub-station along with towers, insulators, cable termination kits, earth electrodes and other associated accessories
- 4.1.19 Materials and accessories, which are required for satisfactory and trouble-free operation and maintenance of the above equipment like module cleaning system, supply of spares



for all equipment, supply of tools and tackles etc.

4.1.20 Any other equipment / material, not mentioned but required to complete the Solar Power Plant facilities in all respect.

4.2 Wind

4.2.1 Horizontal axis, 3-blade, upwind/downwind Wind Turbine Generators (WTGs) with rating of minimum 2 MW and total capacity of 40 MW (may be up to 50 MW but not less than 40 MW in any case) complete with accessories as may be required for erection, commissioning and successful continuous operation. The WTGs shall be equipped with current limiting devices and capacitors (in case of induction generators) so as to maintain power factor conforming to the requirement of state grid. WTGs shall have the LVRT and HVRT capability including all other functional capabilities as per the requirement under the CEA Regulations for grid connectivity.

Only the makes and models approved under Revised List of Models and Manufacturers (RLMM list) of MNRE as on the date of bid submission should be offered.

4.2.2 Towers, Blades, Hub, Nacelle, Foundation Base and other major components suitable for offered WTGs.

4.2.3 Wind farm internal electrical system including the Equipment at Unit Substation of each WTG, materials for 33 kV Overhead Transmission lines.

4.2.4 Grid interfacing equipment including transformers, HT lines, panels, kiosks, protection equipment, metering equipment for evacuation of power from the wind power plant to the pooling sub-station.

4.2.5 Tri-vector type energy meter(s) for recording data regarding export and import of power to/from grid on real time basis.

4.2.6 VAR drawl compensation system, if required.

4.2.7 Control system to give command to WTGs, receive data, processing and getting required report on energy generation, wind speed etc.

4.2.8 Supervisory Control and Data Acquisition (SCADA) system for remote monitoring/control of plant facilities along with communication cables

4.2.9 Any item not specified but essential for the wind plant.

4.2.10 Stocking of adequate spares at site for operation & maintenance of wind energy project.

Supply and stocking of all the necessary tools and tackles for carrying out all the maintenance work. List of such spares to be provided.

4.2.11 Wind Monitoring Mast: The bid should include supply, installation and maintenance of one

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wind monitoring mast at offered site till the power curve testing is carried out. The height of the wind mast should be close to the hub height of the WTGs installed therein. Numbers and specifications of the equipment and sensors (anemometers, wind vanes, temperature and pressure sensors and dataloggers etc.) shall be as per the requirement set under the IEC-61400-12-1:2017 edition that defines the standard for power performance measurement of electricity producing wind turbines. In any case the numbers of anemometers shall not be less than two. The Wind Mast may be dismantled and taken back by bidder after successful Power Curve test. This shall include all required data loggers, sensors etc. capable of recording data for a minimum of 10-minute average intervals to ensure correct and reliable data collection and its computation for analysis, for verification of generation with reference to the actual wind conditions at hub height.

N.B.: The bidder must quote this item separately in the price bid.

4.3 Battery Energy Management System

- 4.3.1 Modular batteries of required power and energy ratings along with Battery Management System (BMS) in dedicated container with fire protection and required auxiliary system (HVAC, lighting, etc.).
- 4.3.2 Power Conditioning System (PCS) of suitable rating in dedicated container with fire protection and required auxiliary system (HVAC, lighting, etc.).
- 4.3.3 Transformer(s) (Inverter AC voltage/33 kV) of required capacity
- 4.3.4 Indoor/Outdoor 33 kV switchgear panels including Vacuum Circuit Breakers, Current Transformers, Voltage Transformers, Relays and other accessories for complete protection
- 4.3.5 DC/AC power cables of appropriate sizes along with cable termination kits
- 4.3.6 Supervisory Control and Data Acquisition (SCADA) system for remote monitoring/control of plant facilities along with communication cables
- 4.3.7 Uninterrupted Power Supply (UPS) with battery bank of sufficient capacity for critical loads
- 4.3.8 Filter devices (If applicable)
- 4.3.9 Fire detection and protection system
- 4.3.10 Cooling installation
- 4.3.11 AC/DC auxiliary supply system
- 4.3.12 Spares and consumables
- 4.3.13 Any other equipment/ component required for functional operation of BESS

4.4 General

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- 4.4.1 Supervisory Control and Data Acquisition (SCADA) system for remote monitoring/control of entire plant facilities along with communication cables
- 4.4.2 Energy Management System (EMS) along with required accessories and cables
- 4.4.3 LED luminaries with diffuser for indoor/outdoor illumination, lighting poles, distribution boxes and power supply cables along with required conduits, fittings, etc.
- 4.4.4 CCTV cameras with monitoring station along with mounting poles, power supply cables, communication cables, conduits, fittings, etc.
- 4.4.5 Fire detection and fire protection system in buildings, transformer yard and switchyard
- 4.4.6 Lightning protection system for entire plant area

5 Installation, Testing and Commissioning

The scope of installation, testing and commissioning for the plant facilities shall include, but not limited, to the following.

5.1 Solar PV

- 5.1.1 Installation of PV Modules on Module Mounting Structures
- 5.1.2 Laying of solar cables through HDPE conduits from PV Modules to SMU along with termination at both the ends
- 5.1.3 Installation of SMU on Mounting Structure
- 5.1.4 Laying of DC cables underground/along cable trays from SMU to inverter along with termination at both the ends
- 5.1.5 Installation, testing and commissioning of inverters
- 5.1.6 Installation, testing and commissioning of inverter-duty transformers
- 5.1.7 Installation, testing and commissioning of HT switchgear panels
- 5.1.8 Laying of AC LT cables along cable trays from inverter to inverter-duty transformer along with termination at both the ends
- 5.1.9 Laying of AC HT cables underground/along cable trays from inverter-duty transformer to HT switchgear panel along with termination at both the ends
- 5.1.10 Laying of AC HT cables underground/along cable trays from HT switchgear panel at solar PV field to HT switchgear panel at pooling sub-station including right of way (ROW) along with termination at both the ends
- 5.1.11 Installation, Testing and Commissioning of Auxiliary Transformer
- 5.1.12 Installation, Testing and Commissioning of Weather Monitoring Station
- 5.1.13 Installation of suitable communication system for interfacing SMU, inverter, HT switchgear panel, WMS with SCADA at MCR

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5.1.14 Earthing of PV array field equipment

5.2 Wind

The scope of installation, testing and commissioning for Wind Plant shall include, but not limited, to the following.

5.2.1 Erection of WTG tower on foundation

5.2.2 Installation of WTG (Nacelle, Hub Rotor Assemblies and other components) on erected tower

5.2.3 Testing and Commissioning of WTGs

5.2.4 Installation, Testing and Commissioning of unit sub-station for each WTG and adequate internal evacuation system for the wind farm

5.2.5 Installation, Testing and Commissioning of grid interfacing equipment including transformers, 33 kV feeders from WTGs up to the Point of Common Coupling, panels, kiosks, protection equipment, metering equipment for evacuation of power from the wind power plant to the Pooling sub-station including right of way (ROW)

5.2.6 Installation, Testing and Commissioning of tri-vector type energy meter(s) for recording data regarding export and import of power to/from grid on real time basis.

5.2.7 Installation, Testing and Commissioning VAR drawl compensation system, if required.

5.2.8 Installation of suitable communication system for interfacing each WTG to SCADA system at MCR

5.2.9 The proposed land area for each WTG locations is about 135mx135m and location coordinates of each WTG's along with tentative elevation is given below :

WTG loc.	X-location [m]	Y-location [m]	GPS Elevation (m)
1	771101	1584722	540
2	771153	1585066	537
3	771200	1585509	529
4	771449	1585797	527
5	771707	1586953	525
6	769780	1587949	511



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7	769835	1588325	507
8	770625	1588371	515
9	770571	1588755	512
10	771877	1589358	510
11	771494	1589632	507
12	770945	1590143	509
13	771277	1590535	516
14	771114	1590940	513
15	771565	1591317	505
16	771887	1591624	507
17	771961	1592078	512
18	772231	1592305	508
19	772340	1590471	521
20	773039	1590085	541

5.3 BESS

5.3.1 Installation, testing and commissioning of batteries along with BMS

5.3.2 Installation, testing and commissioning of battery inverter, step-up transformer, HT switchgear panel and associated grid interface equipment

5.3.3 Laying of AC HT cables underground/along cable trays from BESS to pooling sub-station along with termination at both the ends

5.3.4 Installation of suitable communication system for interfacing BESS with SCADA at MCR

5.4 General

5.4.1 Installation, Testing and Commissioning of SCADA and EMS

5.4.2 Installation of CCTV cameras on strategic locations including all required accessories, laying of power/communication cables and installation of monitoring station at MCR

5.4.3 Installation of indoor & outdoor illumination system including all required accessories and laying of power supply cables

5.4.4 Installation of lightning protection system for entire plant facilities

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5.4.5 Installation of fire detection and fire protection system for buildings, transformer yard and switchyard.

5.5 Any other works related to installation, testing and commissioning not mentioned but required to complete the plant facilities in all respect

6 Civil Works

The scope of civil design and construction work shall include all works required for the project and should be performed specifically with respect to following (but not limited to).

6.1 General

6.1.1 Conducting geotechnical investigation and topographical survey of the plant area

6.1.2 Earthwork for site grading, cutting, filling, levelling & compaction of land

6.1.3 Construction and erection of perimeter fence/ boundary wall and main/ security gate(s)

6.1.4 Construction of Main Control Room (MCR)

6.1.5 Construction of Storm water drainage & sewage network including rain water harvesting mechanism

6.1.6 Security room/cabins at strategic locations inside the boundary of the plant

6.1.7 Suitable arrangement for water shall be ensured to cater day-to-day requirement of drinking water and permanent water supply for module cleaning and other needs of the hybrid power plant during entire O&M period

6.2 Solar PV

6.2.1 Construction of foundation for Module Mounting Structure (MMS) and erection of MMS

6.2.2 Foundation for String Monitoring Unit

6.2.3 Construction of inverter rooms (in case of indoor inverter)

6.2.4 Foundation for inverter (in case of outdoor inverter)

6.2.5 Foundation for inverter-duty transformer and associated civil works

6.2.6 Foundation for HT switchgear panel (in case of outdoor panel)

6.2.7 Foundation for Lightning Arrestor, Weather Monitoring Station, Auxiliary Transformer and other equipment

6.2.8 Construction of internal roads and peripheral roads with WBM base

6.2.9 Construction of underground tanks and plumbing network for cleaning of PV Modules

6.3 Wind

6.3.1 Foundation for Wind Turbine Generators (WTG)

6.3.2 Foundation for WTG step-up transformer and HT switchgear panel

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6.3.3 Fencing of Unit Switchyard of the WTGs

6.3.4 Construction/Strengthening of WTG access road: The Contractor shall assess the suitability of internal roads with respect to the requirement for WTG transport and arrange construction/ strengthening as desired.

6.4 BESS

6.4.1 Construction of foundation for BESS containers

6.4.2 Foundation for transformer and HT switchgear panel

6.4.3 Approach road to BESS

7 Statutory Approvals

7.1 Obtaining statutory approvals /clearances/ compliances on behalf of the Employer from various Government Departments, not limited to, the following: -

- Pollution control board clearance, if required
- Mining Department, if required
- Forest Department, if required
- All other approval as and when, as necessary for setting up of a solar power plant including CEIG/ CEA, connectivity, power evacuation, railways, PTCC power line crossing, panchayat, BBMP, NHAI etc. as per the suggested guidelines

7.1.1 All statutory approvals/permissions and/or No Objection Certificates (NoC) etc. from the DISCOM for obtaining connectivity at the substation as per Project Particulars provided above.

7.1.2 All other statutory approvals and permissions and their respective compliances, not mentioned specifically but are required to carry out hassle free Construction and O&M of the plant.

7.1.3 Adequate and seamless insurance coverage during EPC and O&M period to mitigate all risks related to construction and O&M of the plant to indemnify the Employer.

7.2 The Contractor shall comply with the provision of all relevant acts of Central or State Governments including payment of Wages Act 1936, Minimum Wages Act 1948, Employer's Liability Act 1938, Workmen's Compensation Act 1923, Industrial Dispute Act 1947, Maturity Benefit Act 1961, Mines Act 1952, Employees State Insurance Act 1948, Contract Labour (Regulations & Abolishment) Act 1970, Electricity Act 2003, Grid Code, Metering Code, MNRE guidelines or any modification thereof or any other law relating

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whereto and rules made there under or amended from time to time.

8 Operation and Maintenance

- 8.1 Total Operation & Maintenance of the hybrid plant shall be with the Contractor, after operational acceptance of the plant till culmination of the O&M period shall include deployment of engineering personnel, technicians and security personnel.
- 8.2 To provide a detailed training plan for all O&M procedures to Employer's nominated staff, which shall have prior approval from the Employer.
- 8.3 Employ and coordinate the training of contractors' personnel who will be qualified and experienced to operate and monitor the facility and to coordinate operations of the facility with the grid system.
- 8.4 Discharge obligations relating to retirement/ Superannuating benefits to employees or any other benefit accruing to them in the nature of compensation, profit in lieu / in addition to salary, etc. for the period of service with the contractor, irrespective continuance of employees with the project as employees of Contractor, after conclusion of O&M period.
- 8.5 To maintain accurate and up-to-date operating logs, records and monthly Operation & Maintenance reports at the facility. Contractor shall keep the measured daily data at regular intervals and provide the same to Employer in electronic form, compatible in CSV format. The right to use the data shall remain with the Employer.
- 8.6 Contractor shall prepare and send Forecasting and Scheduling generation reports as per extant regulations (SERC/CERC) for Forecasting, Scheduling, Deviation Settlement Mechanism and related matters. The scope under this Clause shall also include establishing and maintaining forecasting tools and appointment of QCA/Aggregator, if required. % Error (Deviation) shall be calculated as per the said regulations and DSM Charges in case of deviation beyond the permissible limits shall be borne by the Contractor.
- 8.7 Procurement of spare parts, overhaul parts, tools & tackles, equipment, consumables, etc. required for smooth operation and maintenance of the plant as per prudent/ standard utility practices, OEM recommendations and warranty clauses for the entire O&M period
- 8.8 To upkeep all administrative offices, roads, tool room, stores room, equipment in clean, green and workable conditions.
- 8.9 To carry out periodic overhauls or maintenance required as per the recommendations of the original equipment manufacturer (OEM) and to furnish all such periodic maintenance schedules at the time of plant commissioning/ start of O&M contract.

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- 8.10 Handover the system to maintain an inventory of spare parts, tools, equipment, consumables and supplies for the facility's operation along-with required details of recommended spares list with all associated information regarding replacement records, supplier details, tentative cost, storage details, specifications on the basis of replacement frequency and mean time between failures and mean time to restore at the culmination of penultimate year under O&M period.
- 8.11 Availability of vehicles for Employer staff during construction and O&M period as per requirement may be ensured, failing which Employer shall have full right for alternate arrangement at the risk & cost of the contractor.
- 8.12 The contractor shall be responsible for all the required activities for the successful running, committed energy generation & maintenance of the Hybrid Plant covering:
- Deputation of qualified and experienced engineers and technicians at the facility.
 - Deputation of Security personnel for the complete security of plant.
 - Successful running of Solar Power Plant for committed energy generation.
 - Co-ordination with STU/SLDC/other statutory organizations as per the requirement on behalf of Employer for Joint Metering Report (JMR), furnishing generations schedules as per requirement, revising schedules as necessary and complying with grid requirements.
 - Monitoring, controlling, troubleshooting maintaining of logs & records, registers.
 - Furnishing generation data monthly to Employer by 1st week of every month for the previous month to enable Employer raise commercial bills on consumers.
 - Periodic cleaning of solar modules as approved by the Employer and water quality as per the recommendations of OEM
 - Replacement of Modules, Inverters/PCU's and other equipment as and when required during the O&M period without additional cost to Employer
- 8.13 Continuous monitoring the performance of the Hybridr Power Plant and regular maintenance of the whole system including Modules, PCUs, WTGs, BESS, transformers, overhead line, outdoor/indoor panels/ kiosks etc. are necessary for extracting and maintaining the maximum energy output from the Hybrid Power Plant.
- 8.14 Preventive and corrective O&M of the Hybrid Power Plant including supply of spares, consumables, wear and tear, overhauling, replacement of damaged modules, invertors, PCUs, WTGs, BESS and insurance covering all risks (Fire & allied perils, earth quake, terrorists, burglary and others) as required.

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- 8.15 The period of Operation and Maintenance will be deemed to commence from the date of Operational acceptance and successively the complete Hybrid Power Plant to be handed over to the O&M contractor for operation and maintenance of the same. O&M contract shall further be extended on the mutually agreed terms and conditions for the mutually agreed period.
- 8.16 All the equipment required for Testing, Commissioning and O&M for the healthy operation of the Plant must be calibrated, time to time, from the NABL accredited labs and the certificate of calibration must be provided prior to its deployment.
- 8.17 The Contractor shall ensure that all safety measures are taken at the site to avoid accidents to his or his sub-contractor or Employer's Workmen. This will include procurement of all safety gadgets during Construction and O&M period including but not limited to, rubber mats of appropriate grade, PPE, rubber gloves and suitable shoes etc.

9 Operation and Performance Monitoring

- 9.1 Operation part consists of deputing necessary manpower necessary to operate the Hybrid Power Plant at the full capacity. Operation procedures such as preparation to starting, running, routine operations with safety precautions, monitoring etc., shall be carried out as per the manufacturer's instructions to have trouble free operation of the complete system.
- 9.2 Daily work of the operation and maintenance in the Hybrid Power Plant involves periodic cleaning of Modules, logging the voltage, current, power factor, power and energy output of the Plant at different levels. The operator shall also note down time/ failures, interruption in supply and tripping of different relays, reason for such tripping, duration of such interruption etc. The other task of the operators is to check battery voltage-specific gravity and temperature. The operator shall record monthly energy output, down time, etc.
- 9.3 Earth resistance of Plant as well as individual earth pit is to be measured and recorded every month. If the earth resistance is high suitable action is to be taken to bring down the same.
- 9.4 A maintenance record is to be maintained by the operator/ O&M-in-charge to record the regular maintenance work carried out as well as any breakdown maintenance along with the reasons for the breakdowns and steps taken to attend the breakdown, duration of the breakdown etc.
- 9.5 The Preventive Maintenance Schedules will be drawn such that some of the jobs other than breakdown, which may require comparatively long stoppage of the Power Plant, shall be carried out preferably during the non-sunny days or evenings. Prior information shall be

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provided to the Employer for such preventive maintenance prior to start.

- 9.6 The Contractor will attend to any breakdown jobs immediately for repair/ replacement/ adjustments and complete at the earliest working round the clock. During breakdowns (not attributable to normal wear and tear) in O&M period, the Contractor shall immediately report the accidents, if any, to the Employer showing the circumstances under which it happened and the extent of damage and/or injury caused.
- 9.7 The contractor shall at his own expense provide all amenities to his workmen as per applicable laws and rules.
- 9.8 If negligence / mal operation of the contractor's operator results in failure of equipment, such equipment should be repaired/replaced by the contractor free of cost.

10 Security services

- 10.1 The contractor has to arrange proper security system including deputation of security personnel at his own cost for the check vigil for the Solar Power Plant for the complete scope of works including complete O&M period.
- 10.2 The security staff may be organized to work on suitable shift system; proper checking & recording of all incoming & outgoing materials vehicles shall be maintained. Any occurrence of unlawful activities shall be informed to Employer immediately. A monthly report shall be sent to Employer on the security aspects.
- 10.3 Any other activities required for completion of project, but not specified in the above shall be in the scope of contractor. The Contractor must provide the BOM of the plant as per the design during the time of submission of design basis report. The detailed technical specifications of major equipment to be followed strictly and are described in the technical specification section.

Environmental and Social Management plan

1.1 Introduction

The Environmental and Social Management Plan (ESMP) consists of the set of mitigation, monitoring and institutional measures to be taken during the different stages of the project to eliminate adverse environmental impacts, to offset them, or to reduce them to acceptable levels. The plan also includes the actions needed for the implementation of these measures.

The major components of the Environmental and Social Management Plan are:

- Mitigation of potentially adverse impacts
- Monitoring during project implementation and operation
- Institutional Capacity Building and Training
- Implementation Schedule and Environmental Cost Estimates
- Integration of ESMP with Project planning, design, construction and operation.

1.2 Objective of ESMP

The purpose of the Environmental and Social Management Plan (ESMP) is to ensure that Environmental and Social impacts identified during the ESA process are effectively managed during the construction, operation and closure of the project. The ESMP specifies the mitigation and management measures to which the Proponent is committed and shows how the Project will mobilize organizational capacity and resources to implement these measures.

The key objectives of the ESMP are to:

- Formalize and disclose the program for environmental and social management;
- Provide a framework for the implementation of environmental and social management initiatives.

The ESMP describes the mitigation measures for all the identified potential impacts associated with the proposed project during its construction and operation phases. The environment and social management plan (ESMP) delineate the monitoring and management measures to avoid and/or minimize such impacts by allocating management responsibility and suggesting skill requirement for implementation of these measures.

1.3 Implementation of ESMP

Government of India has given its approval to the proposal "Investment for innovation in solar power and Hybrid technologies". Under the proposal, the World Bank would finance USD 200 million (50% of project cost) for projects with innovative technologies, such as solar-wind hybrid, floating solar etc. to be developed by SECI. The counterpart 50% funding would be met by SECI through its equity and/or through domestic commercial borrowings.

As the first project under this proposal, a 160 MW solar-wind hybrid project with battery storage is being developed. SECI is the Project Implementation Agency (PIA) for the project. Other project options are being explored.

The solar-wind hybrid with storage project would be under the ownership of SECI. It would be set up on a land-lease basis inside a hybrid power park being developed by NREDCAP. Project would be set up in a turnkey EPC mode, with EPC contractor being determined through a transparent international competitive bidding process. The implementation arrangement of the project is given **Figure 1-1**.

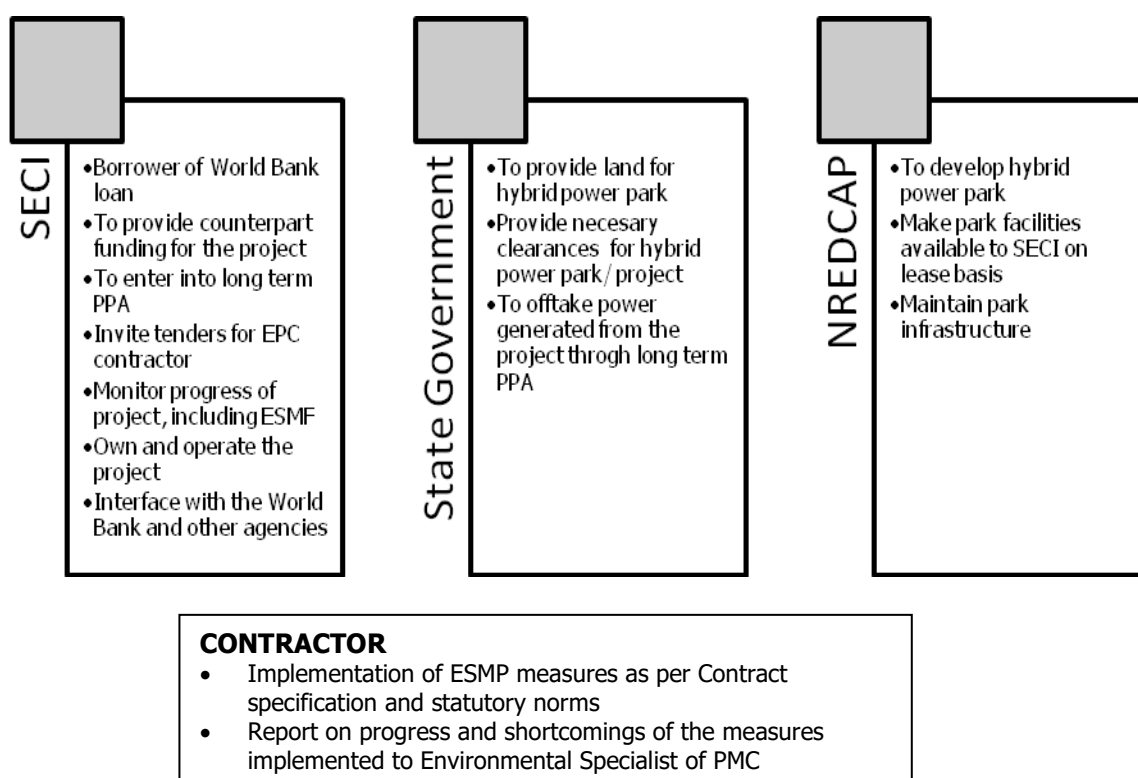


Figure 1-1:: Implementation Arrangement for the project

Role of SECI

- SECI is the PIA for the project. It would develop the project under its ownership. SECI is the borrower of World Bank loan. Counterpart funding to the tune of 50% of project cost would be provided by SECI.
- As project developer, SECI would get the necessary due-diligence done before project set-up. SECI would enter into long term power purchase agreements with Discoms/bulk consumers for ensuring offtake of power from the project.

-
- SECI would invite tenders for EPC contractor through international competitive bidding process. SECI would enter into contract with the selected bidder. During execution phase, SECI would monitor progress of project and ensure compliance with World Bank norms.
 - SECI would own the project assets and operate it for the project life time. During operation phase, SECI would ensure compliance with World Bank norms.

Role of State Government

- The State Government would provide land and necessary clearances for setting up of the project.
- The State Government would have to agree to offtake power generated from the project.

Role of Hybrid Power Park Developer / NREDCAP

- NREDCAP would obtain necessary approvals for developing the hybrid power park at the designated site.
- As park developer, NREDCAP would develop the land and infrastructure for the hybrid power park and make the facilities available for the project on lease basis.
- NREDCAP would be responsible for maintaining the hybrid park infrastructure.

The above-mentioned activities related to hybrid park development and project development are likely to have some adverse impacts on the environment which need to be mitigated and ensured that the appropriate mitigation measures are included as part of the EPC contract and O&M processes.

SECI, being the PIA for the project, would be overall responsible for monitoring the compliance of environmental and social norms for the project-related activities. SECI would designate Social & Environmental Officer(s) for the project.

Roles and responsibility of Environment and Social Officer (ESO), SECI

Proposed organization structure for RAP/EMP implementation is presented in **Figure 1-2**.

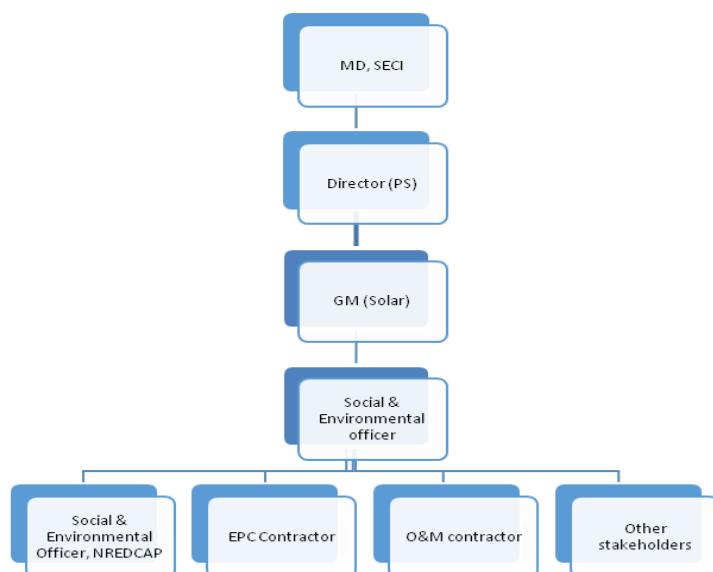


Figure 1-2: Organisation structure for EMP / RAP Implementation

Managing Director, SECI will have overall responsibility for implementation of the project. Environmental and Social development expert(s) would be engaged by SECI as part of project development and will report to GM (Solar), SECI.

The Environmental & Social Development Officer(s) are overall responsible for EMP and RAP implementation, coordinating and liaising with NREDCAP, contractors and other agencies, as well as the World Bank, with respect to different social and environmental issues. The expert(s) will also be responsible for progress monitoring of Environmental and social safeguards during project construction and execution stage and submission of monthly report (during construction stage) and quarterly report (during operations stage) on EMP compliance to the World Bank.

The roles and responsibilities of the Social and Environmental Officer(s) shall be:

- Prepare TOR for any studies required and qualitative dimensions to the implementation of RAP/ ESMP;
- Participate in and facilitate consultations with stakeholders;
- Participate in project meetings and report on the issues related to environmental management and social safeguards to provide for any mid-course corrections that may be required based on situation on the ground;
- Assist PAPs to resolve their grievances;
- Coordinate on the training and capacity building initiatives;
- Review contract documents to ensure that EMP provisions related to works are included in the contract documents;
- Act as a resource person in trainings based on experience on implementing this project and previous relevant work;
- Oversee and report to CEO on implementation of EMP provisions included in the works contract for each sub-project in the state;

- Liaison with state administration for land acquisition/procurement and implementation of RAP;
- Report progress, highlighting social issues not addressed, to provide for mid-course correction;
- Assist PAFs in approaching the grievance redressal mechanism;
- Carry out other responsibilities as required from time to time.

1.4 Critical Issues

The critical environmental components were identified on the basis of the assessment of the potential impacts. These issues need to be addressed carefully in the Environmental Management Plan. The most critical issues identified at various locations are described in the following **Table 1-1**.

Table 1-1: Critical Environmental and Social Issues to be Addressed

Sl. No.	Critical Environmental Issues	Location
1	Resettlement and Rehabilitation Issue	Hybrid Park
2.	Natural drainage	Natural drainage conversing Muthuvakuntla Water Tank
3.	Water Tanks	Muthuvakuntla Water Tank in Hybrid Park
4.	Ambient Air Quality	Hybrid Park
5.	Water Contamination	Near water bodies
6.	Occupational Health & Safety	Work Sites
7.	Labour Standards	Camp

1.5 Proposed Environment and Social Management Plan

This section describes the Environmental Social Management Action Plan for the proposed project during different stages of project. An Environment and Social Management Plan has been developed following the delineation of impacts and mitigation measures. These measures will be adopted by the project proponent and imposed as conditions of contract of the sub-contractor employed for respective phases of the power project. The Management Plan has been formulated for implementation of environmental and social mitigation measures to be carried out by the Contractor and to ensure that the provisions of the ESMP are strictly followed and implemented by strengthening implementation arrangements to prevent and minimize the adverse impacts during Construction phase of the project. ESMP has also addressed certain measures to be taken to prevent further deterioration of environment and social components for various stages of the project.

The measures identified for different phases, are tabulated in **Table 1-2 & 1-3** which describes the nature of the potential environmental impact, the measures, which have or will be taken, the implementing agency and responsible organization.

Table 1-2: Environmental and Social Management Plan (ESMP) for Infrastructure Development and Hybrid Park

Environmental component / Issues	Potential Impact	Mitigation Measures	Location	Time Frame	Institutional Responsibility	
					Implementation	Supervision
Design and Pre-Construction Phase						
Land Environment	Loss of land / properties and livelihood due to land acquisition for development of Solar/wind/Hybrid park and associated sites	- Identify appropriate government site to avoid land acquisition and resettlement impacts. - All the affected person will be identified in advance prior to commencement of construction works. - The R&R Plan will be prepared for affected person - All the affected persons will be suitably compensated as per prevailing rules and policy of the state government and the World Bank.	Ramagiri & Muthavakuntla Villages	Design and Pre-Construction Stage	NREDCAP	SECI
Drainage Pattern and Water Bodies	The blocking of water course will in turn affect the water tank/Storage.	- The Solar panels, building and wind turbines should be constructed away from these natural drains. - For road network balancing culverts of sufficient capacity should be provided across these drains to allow free flow of water.	Drainage converging into Muthuvukuntla Water Tank on Western Side	Design & Preconstruction Construction Stage	Contractor	SECI
Construction Phase						
Land Resources	Loss of Vegetation	Vegetation will be removed from the construction zone before commencement of construction. All works will be carried out such that the damage or disruption to flora other than those identified for	Road network, drainage, building etc within Hybrid park	Construction stage	Contractor	SECI

Environmental component / Issues	Potential Impact	Mitigation Measures	Location	Time Frame	Institutional Responsibility	
					Implementation	Supervision
		cutting is minimum. - Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval from the Environmental Expert. - The Contractor, under any circumstances will not cut or damage trees. - Trees identified under the project will be cut only after receiving clearance from the Forest Department and after the receipt of written permission from Engineer. - Access to areas of the natural vegetation that are to be considered must be prohibited. A temporary fence should remain on site until all construction activities have completed. - Construction vehicles, machinery and equipment will move or be stationed in the designated area only to prevent compaction of vegetation outside the construction area. - Collection of firewood is prohibited. - No fires may be ignited with the intent to destroy the flora on the site and surrounding				

Environmental component / Issues	Potential Impact	Mitigation Measures	Location	Time Frame	Institutional Responsibility	
					Implementation	Supervision
	Site Clearance	- The earth material generated due to excavation will be used to optimum quantity to reduce impact on land resources. - Road layout will ensure that as much as possible avoidance of disturbance of natural drainage. - The proposed access roads inside project area do cut cross several non-perennial drainage channels and would require construction of adequate number of cross-drainage structures to mitigate the adverse impacts on the surface runoff - It should be ensured that no additional access roads other than those proposed as per the layout plan are created. - It will be ensured that no trees are required to be cut while installation of solar PV panels. If any tree is still required to be cut, permission from the state forest department need to be obtain along with compensatory plantation as per the guidelines issued by the state forest department. - The Construction camps will be located preferably on barren land and sufficiently away from settlements and water bodies.	Hybrid Park	Construction Phase	Contractor	SECI

Environmental component / Issues	Potential Impact	Mitigation Measures	Location	Time Frame	Institutional Responsibility	
					Implementation	Supervision
		- The Construction camp will be provided with necessary sanitation arrangements and basic facilities. - After dismantling of Camp, the natural condition of the land will be restored. - No scare will be left unattended after excavation activity.				
Soil	Loss of Top soil	- In case of good quality topsoil comes under the construction area it should be preserved with utmost care and need to be used for gardening or agricultural area. - No construction materials should be stacked in the agriculture field.	Within the Hybrid Park	Construction Phase	Contractor	SECI
	Contamination of soil	- The earth material generated due to excavation will be used to optimum quantity to reduce impact on soil environment. - Proper Stripping and stockpiling of soil layers to reduce dust pollution. - The Construction camp will be provided with necessary sanitation arrangements and basic facilities to avoid soil contamination	Within the Hybrid Park	Construction Phase	Contractor	SECI
	Soil Compaction	- The excavation activities and vegetation clearance will strictly be limited to the pegged area, road and drains formation and other construction area. - All the usable excavated materials	Within Hybrid Park	Construction Phase	Contractor	SECI

Environmental component / Issues	Potential Impact	Mitigation Measures	Location	Time Frame	Institutional Responsibility	
					Implementation	Supervision
		will be re-used as fill materials and aggregates. - The movement of construction vehicles and equipment's will be restricted to only designated route. - It should be ensured that no additional access roads other than those proposed as per the layout plan are created.				
	Soil Erosion	- Designated storage site for fill materials and adequate stockpiling to prevent erosion and runoff related problem. - Garland drains around excavated soil will trap silt. Silt trap will reduce siltation load in the nearby drainage and surface water body.	Within Hybrid Park	Construction Phase	Contractor	SECI
Water	Water Requirement for Construction	- Building artificial ground water recharge structures through rain water harvesting. - Lined drains will be provided with cut in between to facilitate ground water recharging. The cut will be made of granular coarse material, which will increase the infiltration rate. - Rainwater Harvesting pits will be provided in consultation with Ground Water Boards in the project area. - The Contractor will arrange separate water supply arrangement	Hybrid park	Construction Phase	Contractor	SECI

Environmental component / Issues	Potential Impact	Mitigation Measures	Location	Time Frame	Institutional Responsibility	
					Implementation	Supervision
		for construction work and will not interfere with the normal public water supply. Requisite permissions need to be obtained before withdrawing ground water from bore well s/ tube wells from the competent authority.				
	Water Quality	- All water and liquid wastes arising from construction activities will be properly disposed off and will not be discharged into any water body/ stream course without adequate treatment. - Littering or unauthorized discharge will not be permitted. - Permission of the engineer and the concern regulatory authorities will be obtained for disposal of the waste as the designated disposal point. - The stream course and drain will be kept free from dumping of solid wastes and earth materials. - The construction materials and debris will be stored away from water bodies or water ways and only on the designated sites along the construction zones.	Water Body, Local Stream, Drainage within the Hybrid Park	Construction Phase	Contractor	SECI
Air	Generation of Dust	Water will be sprayed during construction phase, in earth handling sites, other excavation	Within the Hybrid Park	Construction Phase	Contractor	SECI

Environmental component / Issues	Potential Impact	Mitigation Measures	Location	Time Frame	Institutional Responsibility	
					Implementation	Supervision
		areas for suppressing fugitive dust. • Water sprinkling and transporting construction materials with tarpaulin coverage during the construction stage. • During the sub-grade construction, sprinkling of water will be carried out on regular basis during the entire construction period especially in the winter and summer seasons. • Dust emission from stock piles of excavated material will be controlled either by covering the stockpiled materials or water spraying over it. • As soon as construction is over all the surplus earth will be utilized properly all loose earth will be removed from the site.				
	Plants and Equipments	• The emissions will be limited to the project area and dispersed rapidly as the activities will be confined to project area and which is away from the locality. • All the vehicles used during the construction stage to have valid PUC certificate • Provision of effective air pollution control systems in Batch mix plants such as dust containment cum suppression system for the	Plants and equipment area	Construction Phase	Contractor	SECI

Environmental component / Issues	Potential Impact	Mitigation Measures	Location	Time Frame	Institutional Responsibility	
					Implementation	Supervision
		equipment, Construction of wind breaking walls along periphery of plant sites, construction of the metalled roads within the premises, regular cleaning and wetting of the ground within the premises, etc.				
	Gaseous pollution	- All the Construction vehicles and machineries will be regularly maintained to conform to the emission standards stipulated under Environment (Protection) Rules, 1986. - All the DG sets will conform to the emission standards as stipulated under Environment (Protection) Rules, 1986. - The workers working at Batch mix plants will be provided masks.	Construction area	Construction Phase	Contractor	SECI
Noise	Noise Level	- The main stationary noise producing sources such as generator sets shall be provided with noise shields around them. - The plants and equipment used for construction will strictly conform to CPCB noise standards. - Vehicles and equipment's used will be fitted with silencer and maintained accordingly. - Noise to be monitored as per monitoring plan and if the noise	Construction Area	Construction Phase	Contractor	SECI

Environmental component / Issues	Potential Impact	Mitigation Measures	Location	Time Frame	Institutional Responsibility	
					Implementation	Supervision
		level at any time found to be higher than immediate measure to reduce noise in that area will be ensured. - Noise standards of industrial enterprises will be strictly enforced to protect construction workers from severe noise impacts. - All the workers working very close to the noise generating machinery shall be provided earplugs to avoid any ill impacts on their health. - An awareness programme will be organized for drivers and equipment operators to make them aware of the consequences of noise and to act properly at site.				
Biological Environment	Ecological Resources	- Stockpiling of the construction materials should be avoided in and arounds trees in the site. - The contractor shall ensure adequate measures to ensure that no illegal poaching of wild animals is being done by construction workers. - The developer shall ensure compliance to the EMP measures for setting up of the labour camp sites etc.	Within the Hybrid Park	Construction Phase	Contractor	SECI
Social	Aesthetics	The site will be cleaned	Hybrid Park	Construction	Contractor	SECI

Environmental component / Issues	Potential Impact	Mitigation Measures	Location	Time Frame	Institutional Responsibility	
					Implementation	Supervision
		immediately after the construction activity is over. The debris materials will be disposed off only at identified area for disposal and proper levelling will be done after disposing the materials and shall be covered with top soil and some Landscaping will be done at the disposal site		Phase		
	Public Health and Safety	- The project will comply with the requirements of the EHS Guidelines of the World Bank Group, 2007. The relevant ones are general guidelines available on the internet. - The plants and equipment's will be installed sufficiently away from the settlement. - All the construction equipment's and vehicles will conform with the emission standards stipulated by the CPCB. - Safe working techniques will be followed up and all the workers will be trained - All the workers will be provided with proper personal safety equipment's at construction as well as plant site - Proper caution signage, barricading, delineators etc. will be installed at Construction zone	Hybrid Park	Construction Phase	Contractor	SECI

Environmental component / Issues	Potential Impact	Mitigation Measures	Location	Time Frame	Institutional Responsibility	
					Implementation	Supervision
		- and temporary diversions • Proper traffic management will be ensured at the Construction zone as per IRC. • An Emergency Response system in case of any incidence will be developed and implemented • Periodical health check facility will be provided at camp sites.				
Other Environmental Concerns	Labour Camp	• Contractor will follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 as well as the guidelines of IFC and EBRD will be followed for construction and maintenance of labour camp throughout the construction period. • The Construction/labour camps will be established only on area approved by Supervision Consultant. • The labour camp will be located away from water bodies, schools and residential areas. The camp will be constructed with proper accommodation facilities. • The workers camp will be provided with drinking water supply system so that local water sources are not	Construction Camp	Construction Phase	Contractor	SECI

Environmental component / Issues	Potential Impact	Mitigation Measures	Location	Time Frame	Institutional Responsibility	
					Implementation	Supervision
		disturbed. - The camp should be provided with fuel for cooking like kerosene and /or LPG to avoid any cutting of trees for fuel wood. - All camps will be provided with proper sanitation facilities, separate toilets and bathrooms for female and male workers, septic tanks with soak pits of sufficient size, dust bins etc. - Waste water from domestic uses and solid wastes will be disposed of without violating environmental norms. The measures will be site specific. - The labour camps will be provided with crèche, first aid facilities, etc as required under Factory Act. - After completion of construction, the contractor will dismantle the camp and restore it to the original condition of the area before handing over the site to the land owner.				
	Waste generation	- Construction waste should be stored separately in a designate area. - The waste can be used as filler material. - The packing material will be segregate and stored for selling to	Hybrid Park	Construction Phase	Contractor	SECI

Environmental component / Issues	Potential Impact	Mitigation Measures	Location	Time Frame	Institutional Responsibility	
					Implementation	Supervision
		the authorized recycler • The plastic waste should be managed in accordance with Plastic Waste Management Rules 2016.				

Table 1-3: Environmental and Social Management Plan (ESMP) for Infrastructure Development and Hybrid Park for Operation and Decommissioning Phase

Environment Component / Issues	Potential Impact	Mitigation Measures	Time Frame	Institutional Responsibility	
				Implementation	Supervision
Operation Phase					
Water	Water Quality and resource	• Installation of alternative waterless cleaning technology for Solar PV • Used water should be properly channelled to settling tank for stabilization and treatment so that recycled water could be reused for PV washing which will reduce the load on ground water. • Adequate capacity of Rain Water storage will be built to harvest rain water which will be connected with drainage network. The stored water can be used for washing of Solar PV to promote optimal use of surface and ground water. • Building of artificial ground water recharge structures as per guideline of Ground Water Board to promote ground water level. • Requisite permissions need to be obtained before withdrawing ground water from bore wells/ tube wells from the competent authority.	Operation and Maintenance phase	EHS Engineer of O & M	SECI
Noise	Noise Level	• The siting of wind turbines to avoid locations in close proximity to sensitive noise receptors; • Adherence to national or international acoustic design standards for wind turbines;	Operation and Maintenance phase	EHS Engineer of O & M	SECI

Environment Component / Issues	Potential Impact	Mitigation Measures	Time Frame	Institutional Responsibility	
				Implementation	Supervision
		- Plantation of vegetation around the Grid substation; - The wind turbines shall be maintained in good running conditions throughout the operational life of the project through routine maintenance.			
Waste	Haz. Waste	- Storing area of such waste should be on an RCC platform. - The storing area should have the arrangement of arresting of spillage. - The waste should be stored separately and handed over to the authorized vender for proper disposal as per Hazardous and other waste Act 2016.	Operation and maintenance Phase	O&M engineers at site	SECI
	Generation of E-Waste	- E waste should be stored separately - Maintain records of e-waste generated - End-of-life electrical and electronic equipment are not admixed with e-waste containing radioactive material if any. - SECI should ensure that e-waste generated by them is channelized through collection centre or dealer of authorised producer or dismantler or recycler or through the designated take back service provider of the producer to authorised dismantler or recycler; - E waste should be managed in compliance of E-Waste (Management) Rules, 2016.	Operation and maintenance Phase	O&M engineers at site	SECI
	Battery Waste	- Batteries should be maintained properly so that any kind of leakage and spillage from batteries can be avoided. - Batteries should be disposed off by depositing with the dealer, manufacturer, importer, assembler, registered recycler, reconditioner or at the designated collection centres, - Batteries waste should be managed in compliance with the Batteries (Management and Handling) Rules,	Operation and maintenance Phase	O&M engineers at site	SECI

Environment Component / Issues	Potential Impact	Mitigation Measures	Time Frame	Institutional Responsibility	
				Implementation	Supervision
		2001 in case of lead acid battery.			
	Solid Waste	- Waste should be segregate at source. - Organic waste will be converted in to soil conditioner by composting. - Recyclable waste will be sold to the authorizes recycler. - Inert waste will be disposed off in to low lying area.	Operation and maintenance Phase	O&M engineers at site	SECI
Decommissioning Stage					
Air	Dust Generation	Proper handling, using of PPEs	Decommissioning Stage	SECI	SECI
Noise	Noise level	Use of PPEs	Decommissioning Stage	SECI	SECI
Land	Soil and land use	Parcels of land under permanent structures e.g. roads / buildings / warehouse etc. need to be restored to its near original state by re-laying of the topsoil	Decommissioning Stage	SECI	SECI
Social	Employment	Long term employment will be discontinued	Decommissioning Stage	SECI	SECI
	Aesthetics	Site to be restored in its original shape	Decommissioning Stage	SECI	SECI

1.6 Grievance Redressal Mechanism

Effective environmental and social grievance redressal mechanism gives an opportunity to the organization to implement a set of specific measures to ensure good governance accountability and transparency in managing and mitigation of environmental and social issue of a particular project. This consists of defining the process for recording/receiving complaints and their redressal in respect of environmental and social matters.

Three-tier appropriate grievance redressal mechanism would be established at project level to ensure speedy resolution of disputes. An integrated system will be established with Grievance Redressal Cell (GRCs), with necessary officers, officials and systems, at the state as well as SECI. Grievances if any, may be submitted through various mediums, including in person, in written form to a noted address, e-mail, or through direct calls to concerned officials. The Social and Environmental Expert in the concerned agency shall be responsible for coordination of grievance/complaints received.

Grievance redressal through web based mechanism

In case of grievances received through toll free number or web based system, a person will be made in-charge of screening and resolution of the same/communicating with the concerned divisions for resolution of the same. The person in-charge based on nature of complaint, will forward the same to the concerned official. A ticket or a unique number will be generated for all such complaints. The complainant will follow up based on that unique number. All calls and messages will be responded within two weeks. If response is not received within 15 days, the complaint will be escalated to project head.

Grievance Register: It is also recommended to maintain a grievance register on action taken and disposal of grievance.

Site level Grievance Redressal Cell

A site level GRC will be set up that is easily accessible to the affected community. The details of the system are given in **Table 1-4**

Table1-4: Details of GRM Committee

Tier	Representative	Roles and responsibility
I	Social Officer- Member Secretary	Overall responsibility is to convene and conduct the meeting monthly for the Grievance received from the local community
	Representatives from Community (Village Head)	Will assist the Social Officer- Member Secretary
	Representatives from Developers	Will collect the representation from the community
II	NREDCAP- Head	To resolve the issues if the it is not resolved through Tier I.
	SECI-Environment and Social Officer	
III	State Level / Judiciary	To resolve the issues if the it is not resolved through Tier I and Tier II.

1.7 Monitoring and Evaluation Framework

Environmental and Social safeguards monitoring provides an essential tool to make necessary recommendations and adopt suitable control strategies so that menace of rising environmental degradation could be minimized and a relief be extended to the people including labourers in case of any damage caused under occupational health hazards. The monitoring is necessary for the following reasons:

- To see what impacts have occurred;
- To evaluate the performance of mitigation measures;
- To ensure that the conditions of approval are adhered to;
- To suggest improvements in management plan, if required;
- To see that benefits expected from the implementation of safeguard measures are achieved as the project proceeds; and
- To satisfy the legal and community obligations

Monitoring and evaluation is primarily required to ensure proper and timely implementation of environmental and social mitigation measures. Monitoring at regular intervals during implementation and for a specified period in the post implementation stages is necessary to identify and implement any change / improvement needed in the execution of the activity or in the mitigation measures. A monitoring and evaluation cell may be created at State level under the supervision of an official familiar with environmental and social issues of the sub-projects. He may be given suitable training if needed. In specific situations, one may consider appointing external agencies to carry out the monitoring and evaluation activities and report to the supervising official.

1.8 Environmental Monitoring Programme

The objective of environmental monitoring during the construction and operation phases is to compare the monitored data against the baseline condition collected during the study period to assess the effectiveness of the mitigation measures and the protection of the ambient environment based on national standards. The objectives of the monitoring programme are:

- Provides information for documentation of monitoring of mitigation measures and impacts
- Tool for the statutory authority of unanticipated adverse impacts or sudden changes in the environmental condition due to the proposed project
- Provides information that could be used for evaluating the effectiveness of implemented mitigation measures
- Provides information that could be used to verify predicted impacts and thus validate impact prediction techniques
- The effectiveness of the mitigation measures being followed during construction and operational phases can be assessed and the measures can be revised, made more stringent and reinforced based on the monitoring results Environmental Monitoring can also serve a basic component of a periodic environmental regulatory auditing program for the proposed project

1.9 Environmental Performance Indicators

Monitoring indicators have been developed for each of the activity considering the mitigation measures proposed. Indicators have been developed for ascertaining the environmental quality and the performance of the EMP implementation through Environmental Quality Indicators (EQI's) and Environmental Performance Indicators (EPI's) respectively. This focuses not only on quantifying or indexing activity-environment interactions but also may potentially impact the environment. At the same time it also helps in comparing different components of environmental quality against previously established baseline status. The following environmental performance indicators (EPI's) to be monitored:

Construction Phase:

- Statutory Compliances
- Air and Noise emission from vehicles and machineries
- Generation of dust due to site clearances
- Gaseous pollution emission from DG sets
- Emission from handling and storage of raw material
- Source of water
- Community and occupational health and safety
- Sewage disposal from site and camp
- Surface run off discharge
- Domestic waste generation, storage, handling and disposal
- Hazardous chemical and waste storage, handling and disposal

Operation phase:

- Development of land
- Generation of noise due to the operation of wind turbine
- Water source and consumption
- Surface run-off discharge
- Domestic waste generation, storage, handling and disposal
- Hazardous chemical and waste storage, handling and disposal
- Community and occupation health and safety

Environmental Quality monitoring:

The environmental quality monitoring plan for construction and operation phase is given in **Table 1-5**.

Table 1-5: Environmental Quality Monitoring Plan for Construction and Operation Phase

S. No.	Environmental Quality Indicator	Parameter to be monitored	Location and frequency	Roles and Responsibility
Construction Phase				
1	Ambient Air Quality	PM _{2.5} , PM ₁₀ , SO _x , NO _x , CO	Nearest	Contractor, SECI

S. No.	Environmental Quality Indicator	Parameter to be monitored	Location and frequency	Roles and Responsibility
			Receptors Quarterly during construction	
2	Noise Level	Day time and night time noise level (max, min & Leq levels)	Nearest Receptors Quarterly during construction	Contractor, SECI
3	Ground / Drinking water quality	IS 10500	Nearby village Once during construction	Contractor, SECI
4	Surface water quality	IS 10500	Nearby water body Quarterly during construction	Contractor, SECI
5	Soil Quality	Soil parameters viz. pH, SAR, Water holding capacity, Conductivity, Organic Carbon, NPK	Project site Quarterly during construction	Contractor, SECI
Operation Phase				
1	Noise Level	Day time and night time noise level (max, min & Leq levels)	Nearby receptors Quarterly	SECI
2	Ground water	Level of ground water table	Project site, Once in year	SECI

Environmental Monitoring Budget:

A monitoring budget has been drawn up considering various environmental and social components. This provides cost for different mitigation measures of likely environmental/social impacts at sub-project level. Cost for environmental enhancement measures and monitoring has also been included. It also gives cost for plantation, enhancement of sites, and cost of monitoring. The detailed budget is provided in **Table 1-6**.

Table1-6: Environmental Monitoring Budget

S. No.	Environmental Quality Indicator	Parameter to be monitored	Unit	Unit Rate (Rs.)	Quantity
Construction Phase					
1	Ambient Air Quality	PM _{2.5} , PM ₁₀ , SO _x , NO _x , CO	Per Sample	12000	Site Specific
2	Noise Level	Day time and night time noise level (max, min & Leq levels)	Per Sample	4000	Site Specific
3	Ground / Drinking	IS 10500	Per	8000	Site specific

S. No.	Environmental Quality Indicator	Parameter to be monitored	Unit	Unit Rate (Rs.)	Quantity
	water quality		Sample		
4	Surface water quality	IS 10500	Per sample	8000	Site Specific
5	Soil Quality	Soil parameters viz. pH, SAR, Water holding capacity, Conductivity, Organic Carbon, NPK	Per sample	8000	Site Specific
6	Dust Suppression	Sprinkling of water during construction	Per tanker	1200-1600	Site specific
7	Training on ESMP	-	Lump sum	300000	Construction Site
Operation Phase					
1	Noise Level	Day time and night time noise level (max, min & Leq levels)	Per sample	4000	Site Specific
2	Ground water	Level of ground water table	Per Sample	500000	Project Site
3	Cleaning of Solar Panel	Water	-	Part of project cost	Project site

1.10 Socio-economic Performance Indicator

The socio-economic performance indicators are as follows:

- Employment of local population
- Labour standards at camp
- R&R Components
- Gender Issues:
 - Women employment (%)
 - Wages

Monitoring and evaluation:

Monitoring and evaluation is primarily required to ensure proper and timely implementation of environmental and social mitigation measures. Internal monitoring during implementation will be done monthly by SECI during the construction period (expected to be 15 month) to identify and implement any change / improvement needed in the execution of the activity or in the mitigation measures. One external evaluation will be done after end of implementation

- **Employment of local population:**

Percentage of local and migrant labour engaged for different works will be assessed by checklist method on monthly basis to indicate total employment generated verses local employment of labourers.

- **Labour standards at campsite:**

Labour camps are provided by the contractors for their migrant labourers including operators. The labour standards at campsite with respect to basic facilities provided to the labour at the labour camp and their maintenance will be checked visually on monthly basis through checklist method.

- **R & R components:**

SECI will properly implement the R & R components. The Social Field officer, who will be the representative of SECI will monitor the process.

- **Gender Issue:**

The Social Field officer, who will be the representative of SECI will monitor the process. He/ she will monitor the awareness programme, proper equal wages to the employee and other basic facilities.

1.11 Management of Labour Influx

Within 30 days from the appointed date, the Concessionaire/Contractor shall prepare and submit 4 hard copies and 1 soft copy of Labour Influx and Worker's Camp Management Plan to [Executing Agency] that addresses specific activities that will be undertaken to minimize the impact on the local community, including elements such as worker codes of conduct, training programs on HIV/AIDS, etc. A Workers' Camp Management Plan addresses specific aspects of the establishment and operation of workers' camps

This Labor Influx and Worker's Camp Management Plan will include:

- (i) mandatory and repeated training and awareness raising for the workforce about refraining from unacceptable conduct toward local community members, specifically women;
- (ii) informing workers about national laws that make sexual harassment and gender-based violence a punishable offence which is prosecuted;
- (iii) introducing a Worker Code of Conduct as part of the employment contract, and including sanctions for non-compliance (e.g., termination), manual scavenging, engagement with local residents, child labor, nondiscrimination, harassment of coworkers including women and those belonging to SC and STs and other minority social groups,
- (iv) contractors adopting a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence.
- (v) training programs on HIV/AIDS and other communicable diseases,
- (vi) workers' Camp Management Plan addressing specific aspects of the establishment and operation of workers' camps provided the ULB/ Executing Agency is unable to cater to the demand for affordable housing for this additional workforce in terms of rentals, hostels, apartments etc.; and
- (vii) compliant handling Mechanism at the project level

Additional measures that aim to reduce incentives to engage with the local community by providing workers with the opportunity to spend their time off away from the host community, where feasible with a small transport allowance, ideally allowing workers to regularly return for brief visits to their families, spouses and friends, or to visit nearby urban centers that provide a variety of legal social

opportunities. For workers who need to travel further it may be attractive to forego weekends off in exchange for longer breaks that would allow for such home leave travel.

While clear and decisive measures by the contractor are critically important, the effectiveness of these measures often depends on complementary actions by the Borrower. Those are typically focused on public administration and law enforcement, such as: (i) reinforcing local police in a remote setting, where services may not be sufficiently staffed or equipped to maintain public order after the influx, (ii) ensuring that complaints about gender-based violence are taken seriously by local law enforcement, which may be supported by (iii) deploying female officers to the project area, and (iv) participating in preventive training with workers to demonstrate the presence of government authority in the project area.

“Annexure C”

“10 Years Plant Operation & Maintenance of 160 MW Solar-Wind Hybrid Power Plant with BESS at Ramagiri, Andhra Pradesh”

1. CONTRACTOR'S OBLIGATIONS

1.1. Services

During the Term of the Contract, the Contractor shall perform the services in accordance with the Operation and Maintenance Scope of work as described in Annexure 1 (Scope of Work for Operation and Maintenance) (hereafter the "Services"), and also in accordance with the other conditions as prescribed related to the operational performance under Section - VII (Employer's Requirement) of the Bid Document:

- 1.2. The Contractor shall be deemed to have allowed correct and sufficient O&M Price to cover all its obligations under the Contract and to have allowed the necessary resources to enable it to perform the Services to the standards and in the manner required. The Contractor's failure to acquaint itself with or assess any applicable condition shall neither relieve it from the responsibility for performing its obligations under the Contract nor entitle the Contractor to any additional costs or any other relief.
- 1.3. To the extent the Contractor reasonably believes that it is necessary to enhance the overall performance or safety of the Plant, the Contractor may propose changes and improvements to the Plant [(including the software included with respect thereto)]. The Contractor shall ensure that no modification of any equipment, change of software settings or any other alteration of equipment shall:
- (i) cause a negative impact on the performance of the safety and reliability of the Plant;
 - (ii) adversely impact the Warranties;
 - (iii) adversely affect the warranties provided by the Contractors under the Contract;
 - (iv) conflict with the requirements under the contract; or
 - (v) bypass any protective equipment.
 - (vi) Violates any National/International Trade & IPR laws.
- 1.4. Any proposed modifications/changes shall not be carried out without the approval of the original equipment manufacturer and the Employer and in accordance with Performance Standards, and Technical Specifications. The Employer shall be notified of the proposed modifications along with reasons and technical note for such modifications, changes, alterations, etc., and after the modifications are carried out in accordance with the contract, an alterations activity report is to be shared with the Employer.
- 1.5. The Contractor shall while rendering the Services, observe and comply with all the Applicable Laws, Good Wind, Solar, BESS and Hybrid Industry Practices, Ministry of New & Renewable Energy (MNRE), Ministry of Power (MoP), CEA, CERC, POSOCO, SLDC, Local DISCOM & TRANSCO guidelines and Performance Standards pursuant to the contract. The Employer shall have the right to, to the extent applicable to Services rendered by the Contractor, conduct monthly audit on Applicable Laws, health, safety and environment and all other relevant compliances. The Contractor shall provide all necessary access and supporting documents during audit which are applicable to the same. However, such audits will be planned well in advance in coordination with the Contractor, without affecting the site operation plan.
- 1.6. The Contractor shall provide and make available as necessary, all such skilled, experienced and qualified labour and other competent personnel as are required to perform the Services the Contractor shall ensure that its Personnel hold and continue to maintain all qualifications

and licenses as required under Applicable Law to allow its Personnel to lawfully undertake performance of the Services and carry out the Contractor's other obligations under the contract. For works/services being performed on a continuous basis, the O&M Price shall be deemed to include and the Contractor shall obtain all required Government Approvals and bear any costs related thereto (including any shift or permitted overtime working, allowances, wage orders, night shift differentials, etc.).

- 1.7 The Contractor shall ensure that all its Personnel deployed for providing the Services have undergone adequate safety training and are appropriately skilled, qualified and experienced in performing the Services for wind farms of a similar size, scope and complexity as the Plant. The Contractor shall be responsible for all matters relating to labour relations, working conditions, training, employee benefits, safety programs and related matters pertaining to its Personnel. The Contractor shall at all times have full supervision and control over its Personnel and shall at all times maintain appropriate order and discipline among its Personnel.
- 1.8 Contractor shall be solely liable for and, at its sole cost and expense, arrange for the response, reporting, removal, transportation, disposal, investigation, cleanup or other remedial action (in all cases by licensed, insured, competent and professional contractors in a safe manner and in accordance with Applicable Laws) for any hazardous substances/waste existing at, in, on or under the Project.
- 1.9 The Contractor shall ensure availability of such Consumable Parts, Spare Parts, and Contractor's Equipment as may be necessary for the performance of the Services. The Contractor shall ensure that such Contractor's Equipment does not interfere with the operational or structural integrity of the Plant
- 1.10 The Contractor shall make available to the Employer the Reference Documents set forth in the Reference Documents and shall also provide the Employer with updates and revisions to the Reference Documents to the extent such updates and revisions are necessary and applicable to the performance of the Services. The Contractor shall provide the Employer with a latest version of update available of all the Reference Documents at the time of termination of the contract.
- 1.11 The Contractor acknowledges and agrees that other contractors of the Employer may be present at the Plant and it shall cooperate with such other contractors to allow the performance of its and their respective obligations to occur concurrently.
- 1.12 The Contractor shall through relevant agencies, if applicable, promptly investigate all accidents, damage or destruction, diagnosis, assessment of any potential consequential effects, estimating cost of repair, arranging for any remedial action required, making of any claims under the insurance policies and co-operating with and making reports required by the Employer or insurers.
- 1.13 The Contractor shall ensure that any Warranties provided under the Project Contracts are not invalidated or adversely affected by any act or omission of the Contractor during the period of such warranties.
- 1.14 The EMS and SCADA system shall be connected with the Plant and the Contractor shall make arrangements to provide monthly reports from the SCADA system. The Contractor shall arrange to connect the Plant to the SCADA system operating at the Site enabling the remote operation of the Plant by the Contractor and to provide access to information pertaining to the Plant to the Employer's Representative at Site and SLDC. The Employer may collect the

data generated by the SCADA system in respect of the Plant from the Contractor. And the Employer will facilitate such data transfer by installing an OPC server at site.

- 1.15 Upon the expiry or earlier termination of the contract, the Contractor shall arrange to provide and install an additionally extended terminal from the SCADA system at the Site to enable the Employer to continue to access data relating to the Plant, at no Additional Cost and upon such terms as may be mutually agreed between the Parties at such time of expiry or earlier termination of the contract as the case may be.

- 1.16 The Contractor shall further provide support for the operation and maintenance of any Employer installed scope including any third-party support as may be required by any relevant Government Authority.
- 1.17 The Contractor shall notify and communicate to the Employer about any condition which may cause any malfunction or failure in the Project.
2. **FUNCTIONAL GUARANTEES/WARRANTIES**
- 2.1. Technical and Functional Performance Guarantee
- 2.1.1 The Contractor shall be responsible for meeting the performance guarantee of the Plant Facility (Applicable Individual guarantees for Wind Plant, Solar PV Plant and BESS) as described in the contract.
- 2.1.2 In case of failure to meet the functional guarantees as described in section 2.1.1 above, the Contractor shall be liable to pay applicable Liquidated damages as described in the Bid Document and represented in Annexure-2 of this Annexure C.
- 2.2. General Repair Warranty
- 2.2.1. All repairs and replacements performed by the Contractor pursuant to the contract, shall cover a warranty for defects in materials and workmanship for the entire terms of O&M contract.
- 2.2.2. The Contractor shall disassemble, repair or, replace and reinstall any defective Equipment parts and/or re-perform any defective work covered by this warranty, at no cost or expense to the Employer.
- 2.2.3. In the event that Contractor replaces Parts that failed during the final year of the Term in accordance with its obligations under the Contract, Contractor hereby warrants to Employer that the replacement Parts installed in the Plant Equipment during such period shall not fail due to a defect for one (1) year following the date of installation of such replacement Parts; provided that in no event shall any such warranty extend beyond earlier of (i) the period that is one (1) year following the expiration of the Term or (ii) the date of any termination of the contract for reasons other than attributable to Contractor. During such period, if the contract is not in effect for any reason other than being terminated by Employer for cause, Contractor's obligation will be limited to supplying all needed Parts on to the Site delivered basis. For the avoidance of doubt, this Clause may survive the termination or expiry (as the case may be) of the contract for a period of one (1) year.
- 2.2.4. During Defect Liability Period if any repair and replacement are done, then the warrantee of the equipment shall be extended from the data of such repair and replacement to the period of original equipment warrantee w.r.t. that replaced component.
- 2.2.5 Any latent defect which may not come to knowledge or discovered in the course of normal inspection/operation during two years from the operational acceptance but, may arise within a period of 5(five) years from expiry of warranty period of two years, shall be under warranty by free replacement/rectification.
- 2.2.6 The acceptance of the equipment by employer shall in no way relieve contractor of his obligations under the contract.

2.3. Guarantee of compliance in relation to Curtailment Plans (acoustic or other curtailment plans)

The Employer may communicate to the Contractor some curtailment plans either linked to acoustic requirements; load management, or Applicable Law, the ("**Curtailment Plans**").

The Contractor shall ensure compliance with all Curtailment Plans provided by the Employer in accordance with Performance Standards and Technical Specifications. If either the Contractor or the Employer detects a variation with respect to the Curtailment Plans or in noise emission the Contractor will, at its own expense, characterise the problem, isolate the source of the problem and propose solutions to solve the problem to Employer (at the Employer' expenses in all cases other than cases where it's ascertained that the deviation was caused by a non-respect of the obligations under the contract).

2.4. Grid Connection and balance of electricity commitments

The Contractor acknowledges that to allow the Employer to inject the energy generated by the Plant Facility to the Grid and be eligible for the full tariff under the PPA, the Plant and the Contractor must comply with the requirements prescribed by Applicable Law, Good Wind/Solar/BESS/Hybrid Industry Practices, Performance Standards and the Grid documents and that failure to comply with such requirements may cause the Employer to either: (i) not be able to collect the tariff energy injected; and/or (ii) be subject to penalties payable to the Grid operator and/or the Discom and/or the power purchaser and/or any Government body. The Contractor therefore undertakes to diligently comply the requirements referred to Grid Connection and balance of electricity commitments, as prescribed under the Grid documents as provided by or on behalf of the Employer from time to time (or of which the Contractor otherwise becomes aware), and/or with the reasonable requests of the Employer associated with the compliance therewith.

3. **PERFORMANCE STANDARDS**

3.1 Contractor shall perform its obligations under the contract in compliance with the contract and otherwise, as applicable, in accordance with the following order of precedence (collectively, the "Performance Standards") as from time to time in force:

3.1.1 the Applicable Laws, and the requirements from the Grid Operator/SLDC;

3.1.2 the Permits and all the related documents;

3.1.3 the terms of the contract;

3.1.4 the functional Guarantee;

3.1.5 the Reference Documents including the manufacturers recommendations;

3.1.6 Employer's health and safety manuals and procedures and ESMP;

3.1.7 the Site Regulations;

3.1.8 environmental Social management plan as attached in the bidding document, provided by the Employer, as updated from time to time through the Employer's written notice to the Contractor;

3.1.9 the Equator Principles and the Equator Principles Requirements;

- 3.1.10 Good Wind/Solar/BESS/Hybrid Industry Practice;
- 3.1.11 Any relevant and reasonable instructions issued by the Employer, relevant to the scope of the contract, to the Contractor at least 15 days before the implementation of such instructions without any cost to the Contractor.
- 3.1.12 [The terms of insurances directly relating to the Project] and
- 3.1.13 [Comply with all operation and maintenance obligations as set out under the PPA or do anything which results in a breach of the Employer's obligations under the PPA.]
- 3.1.14 The World Banks applicable operational policies and procedures Performance Standards on Environmental and Social Sustainability, as published by the following link to be implemented by the contractor,

<https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES;>
<https://www.ifc.org/wps/wcm/connect/66b56e00488657eeb36af36a6515bb18/Final%2B-%2BElectric%2BTransmission%2Band%2BDistribution.pdf?MOD=AJPERES&id=1323162154847> and
<https://www.ifc.org/wps/wcm/connect/2c410700497a7933b04cf1ef20a40540/FINALAug+2015+Wind+Energy+EHS+Guideline.pdf?MOD=AJPERES>

- 3.2 If there is any inconsistency between the Performance Standards, [it shall be interpreted in the order of precedence listed above provided that(i) the application of a Performance Standard does not derogate, breach, contradict, obstacle or circumvent the application of a Performance Standards appearing above such standard in the above order of precedence, and, in addition, (ii) provided that this such application does not cause a breach of Performance Standards or the Parties shall discuss and agree upon the manner in which such conflict shall be resolved.
- 3.3 Notwithstanding any other provision in the contract, the Contractor shall have no responsibility or obligation:
- (a) to save and to the extent that the Contractor is required to do so pursuant to the provisions of Additional Services, to ensure that the Plant complies with the requirements of Applicable Law, Permits, if and to the extent that the same are introduced or amended following the Commencement Date; or
 - (b) subject to Additional Services, to ensure that the Plant or the Plant (as a whole or in part) complies with any noise or acoustic emissions requirements under Applicable Laws Permits.

Without prejudice to the foregoing, the Contractor is required to comply with the quality of supply limits determined in accordance with the Applicable Law and the Contractor will be deemed to have knowledge of its content.

- 3.4 The Contractor shall not do or omit to do anything in the performance or discharge of its obligations or the exercise of its rights under the contract or in breach of the contract, which would cause any breach of any of the terms of the Supply Contract, Works Contract, the Applicable Law, the Permits or the terms of any Permits or the Direct Contract, and should the Contractor be in breach of the Performance Standards, it shall, on demand of the Employer, indemnify the Employer against any direct Losses arising from a breach of this

Clause by the Contractor, always subject to the aggregate liability cap of the Contractor (except as otherwise agreed herein).

- 3.5 If the Contractor is aware of a conflict between any of the above requirements, it shall inform the Employer accordingly and the Parties shall discuss and agree upon the manner in which such conflict shall be resolved.

4. **EXCLUSIONS**

4.1. General

(a) Force Majeure events as per GCC clause 37 of the contract condition

- 4.2. The rights of the Contractor under Exclusions shall only apply to the extent that the Excluded Risk Event has caused actual delays or substantial interference to the performance of the Contractor's obligations under his Contract, which could not have been mitigated by the Contractor's best efforts, and to such portions of Contractor's obligations directly affected by such delays or interference.

4.3. Notification of Excluded Risk Event

To the extent Contractor has actual knowledge of any loss or damage to the Plant caused by or arising from an Excluded Risk Event, it shall give Employer immediate notice of the same and provide a written report to Employer within five (5) Business Days; and the employer and Contractor shall be mutually agreed upon within (30) business day. However, that any failure of Contractor to provide such notice shall not waive, prejudice or otherwise affect the other provisions in Exclusions, except to the extent that the failure to timely notify Employer results in any additional damage or loss to the Plant. Notwithstanding the foregoing, in case of delay to provide the aforementioned notice, the Contractor shall be liable towards the Employer for any additional damage or loss caused by the delay to notify the Employer.

5. **ADDITIONAL SERVICES**

- 5.1. Employer may, with respect to the Plant, request that Contractor perform work, provide services, or supply other equipment or parts, not included within Services for the successful operation of the plant for 10-year duration. Any such requested service or supply that the Parties mutually agree to in writing shall, subject to any specific terms and conditions agreed with respect to such service or supply, be an "**Additional Service**".

6. **SERVICE PERSONNEL**

- 6.1. Contractor shall provide the Services and any Additional Services to be performed on Site using a sufficient number of suitably skilled, qualified and experienced (including any licensing, certifications or training required by Applicable Laws or the local transmission system operator) and adequately equipped and properly trained Personnel and/or Subcontractors, all appropriately skilled and experienced in their respective trades or

occupations as may be reasonably necessary to fulfil its obligations hereunder in relation to the Services and Additional Services

- 6.2. The Employer may request the Contractor to remove (or cause to be removed) any Person or Subcontractor employed on the operation of the Plant, including the Contractor's Representative if applicable, who:
- (i) engages in material or persistent misconduct or lack of reasonable care;
 - (ii) carries out duties incompetently or negligently;
 - (iii) fails materially to conform with any provisions of the Contract;
 - (iv) engages in conduct which is prejudicial to safety, health or the protection of the environment or in violation of any related Performance Standards or Applicable Laws;
 - (v) engages in conduct which might reasonably result in a breach of any provision of the contract and threaten public health, safety or security.
- 6.3. The Employer shall give notice to the Contractor of the same giving reasons and request the Contractor to replace such Personnel with a suitable candidate. The Contractor shall then as soon as reasonably possible but no later than seven (7) days upon receiving such notice from the Employer, Contractor will look in to the facts and claims of the case in all sincerity and deploy the required actions with the notice to the Employer.
- 6.4. Contractor shall have full supervision and control over its Personnel at the Site and shall maintain appropriate order and discipline among such personnel and shall cause any Subcontractor to maintain similar standards with respect to such Subcontractor's personnel at the Site.
- 6.5. The Contractor shall be responsible for all matters relating to labour relations, working conditions, training, employee benefits, employee drug testing in accordance with the Contractor's standard drug testing policy, safety programs and related matters pertaining to its employees and other Personnel engaged by the Contractor. The Contractor shall at all times have full supervision and control over its employees and other personnel engaged by it and shall at all times maintain appropriate order and discipline among its Personnel and shall cause any Subcontractor (or any subcontractor appointed by such Subcontractor) to maintain similar standards with respect to such Subcontractor's or any subcontractor appointed by such Subcontractor) employees and Personnel.
- 6.6. The Employer shall have the right, acting reasonably and following prior notification, to require the Contractor to remove from the Site any employee or Personnel of the Contractor or any of its Subcontractors (or any subcontractor appointed by such Subcontractor) engaged in activity which presents a risk of injury to persons or property at the Site.

7. SAFETY PRECAUTION

- 7.1 During performance of the Services, Contractor shall:
- 7.1.1 comply with the safety standards and any safety procedures established by Contractor and same shall be approved by employer after the Commencement Date;
 - 7.1.2 take all precautions required by Applicable Laws or Site Regulations, or otherwise according to the Performance Standards, for the health and safety of Contractor, its Affiliates and Subcontractors in the performance of the Services and any other Persons with temporary or perpetual access to the Site; [provided that the foregoing shall not limit Employer's responsibility for the safety of the Site as provided in Safety Precautions.

8. CONSUMABLES, SPARE PARTS, TOOLS AND EQUIPMENT

8.1 During the Term, Contractor shall provide equipment Spare Parts and Consumables and Tools, all as part of the Services and without Additional Cost to the Employer in accordance with the contract. Unless otherwise specified in the contract, the Contractor shall provide the Employer with an initial Spare Parts inventory. At the end of the Term or upon termination of the contract, the Supplier will replenish the equal quantity of the Spare Parts and Consumables and Tools as provided during the start of Contract.

8.2 Consumables and Tools

Contractor shall supply Consumables and Tools to the extent required for performance of the Services. All Consumables provided by Contractor in the performance of its Services, shall be compatible with the applicable requirements of the Reference Documents and Applicable Laws.

8.3 Equipment and Spare Parts

Contractor shall supply Equipment and Spare Parts to the extent required for its performance of the Services and to maintain its obligations thereunder. The Contractor has the right to use renovated Equipment and Spare Parts. If the Contractor intends to use any refurbished Major Components, it will seek prior written approval from the Employer. Contractor's right to procure and use renovated / refurbished Spare Parts is subject to: (i) standards of good workmanship and Good Hybrid Industry Practice; (ii) compliance with the applicable requirements of the Reference Documents; (iii) the Spare Part(s) are of the type being replaced or of another type insofar as same does not invalidate any applicable Type Certification of the Equipment (iv) the same warranty as equivalent new parts in terms of scope, nature and duration, (v) being renovated in conformity with the original equipment manufacturer's standards, and (v) being listed in the monthly maintenance report when used (track record of the Part). All such renovated/refurbished parts will be allowed by Employer only for any long lead items and also considering uninterrupted generation from the Project. However, the contractor shall immediately reinstate and order new items in order to replace the refurbished items provided for emergency purposes.

8.4 Inspection of Replaced Parts

Contractor shall give to the Employer seven (7) days' notice of the time when the Replaced Part is being transported to the Site. Contractor shall permit Employer to inspect, at Employer's sole cost and expense, any Part which is removed and replaced by a Spare Part pursuant to Consumables, Spare Parts, Tools and Equipment (such Part, a "Replaced Part"); provided however, any such inspection:

- (i) must not include physical alteration or disassembly of such Replaced Part; and
- (ii) must not result in any material increased costs to Contractor or delay Contractor in the performance of its obligations under the contract or any Contract with, or warranty from, its Subcontractors, unless Employer agrees to cover such material increased cost.

8.5 Tools and Equipment

Contractor shall furnish its service personnel with such tools, instruments, or materials tools and equipment and equipment as are necessary to perform the Services (the "**Contractor's Equipment**").

8.6 Prices of Consumables, Spare Parts and Contractor's Equipment

Subject to GST, Taxation & Import Duties, the O&M Price payable to Contractor under the contract shall include (in addition to other components included in such Price) the Costs of any and all Equipment, Consumables, Spare Parts and Contractor's Equipment required in connection with the performance of the Services.

8.7 Risk of Loss or Damage to Consumables, Spare Parts and Contractor's Equipment

Contractor shall:

- (i) be responsible at its own cost for the safe transportation and delivery to Site and adequate storage; of all Consumables, Spare Parts, and Contractor's Equipment, in each case, required for the carrying out of the Services;
- (ii) bear the risk of loss and damage to all such Consumables and Spare Parts during transportation to the Site and, thereafter up to the date of their incorporation by Contractor into the Plant; and
- (iii) at all material times bear all risk in any and all Contractor's Equipment on or off the Site and whether remaining separate or temporarily attached to the Plant.

8.8 Title

Contractor shall retain title to any and all Contractor's Equipment on or off the Site and whether remaining separate or temporarily attached to the Plant until transfer of Title occurs. Title to any Spare Part (or other Part) or Consumables provided by Contractor pursuant to the contract shall pass to the Employer upon:

- (i) incorporation by Contractor in the Plant free and clear of any Lien; or

- (ii) in the case of Additional Services, the date (if later) on which payment is made in full for such Spare Part or Consumable.

Title to any Replaced Part shall vest in Contractor upon such replacement, except if the Parties agree differently from time to time. In case of Additional Services, Employer shall retain title to any Replaced Part.

9. COMMUNICATION AND REPORTING

During the Term, Contractor shall exchange information and reports on daily, weekly, monthly, quarterly and annual basis:

9.1 Monthly Reports

Contractor shall provide Employer with the Monthly Performance Report by no later than the fifth (5th) day from the end of each month.

9.2 Emergency Notices

Upon obtaining actual knowledge thereof, Contractor shall promptly notify Employer verbally (with written notice to follow within three (3) Days) of any emergency or other hazardous condition or occurrence that Contractor reasonable believes could cause an immediate threat to the safe operation of the Plant and/or the safety of Persons.

If, by reason of an emergency arising in the course of, as a result of or otherwise in connection with and during the performance of the Services, any protective or remedial work is necessary as a matter of urgency to prevent damage to the Plant, the Contractor must immediately perform that work, provided that, Contractor shall have no obligation to perform such portions of the protective or remedial work which would be in violation with the Performance Standards, be a material breach of the contract or would cause a threat to the safety of Persons or property or would otherwise not be reasonably practicable or possible; and provided further, that Contractor shall have no obligation to retrofit or upgrade the Plant except if otherwise agreed.

Without prejudicing the liability attributable to the Contractor for failure to comply with the provisions of the paragraph above, it is clarified that if the Contractor does not perform the protective or remedial works referred to above immediately, the Employer may appoint a Replacement Contractor to perform such works. If the work (or parts thereof) which were performed or caused to be performed by the Employer is work which the Contractor was liable to do at its own expense under the contract, the costs incurred by the Employer as a result of appointing a Replacement Contractor shall be [substantiated to the Contractor on an open book basis and be] considered due and payable to the Employer and Invoices and Payment and Set Off shall apply. It is further clarified that the impact of Replacement Contractor's actions shall not be considered as an Excluded Risk Event.

9.3 Meetings

A representative of each of Contractor and Employer (the "**Representatives**") shall meet (either at the Site or alternatively at such other location as may be agreed between the Parties) at quarterly intervals or such other period as is agreed especially for the purposes set forth below:

- (i) to discuss projected dates for performance of the Services and the Additional Services in the following quarter;

- (ii) to discuss, the calculated Measured Average Availability of the Plant Facility (Wind, Solar and BESS) for the past quarter under Annexure 2 [Functional Guarantees]; and
- (iii) to review the Services and Additional Services performed in the past quarter.

9.4 Visitors Log Book

Contractor shall provide Employer with a log book for Hybrid Plant to record the identity and activity of all visitors to site. Such log book will be kept at the entry Gate location of Plant. The Contractor shall cause that all personnel and representatives of each Party or any third parties visiting the [site] shall be required to record their identity, the date, time and purpose of any visit to site, the nature of any work performed thereon and such other details for which log books may reasonably be used. It is clarified that the Contractor shall not permit unauthorised third party access to the Site unless such third parties have been authorised by the Employer, are required to inspect or access the Site in accordance with Applicable Law or for performance of Services. Copies of these logs shall be provided to the Employer within ten (10) Business Days following its written request. Contractor shall create a digital back up of such logs at least every month. The log book shall be in English only.

9.5 Annual Calendar of Maintenance Services.

At the latest two (2) months after the beginning of commencement date, each year during the Term thereafter, the Contractor shall send to the Employer the projected dates and times for the immediately following period during which the Contractor shall perform the Maintenance/Preventive Services on the Plant, with the parties using reasonable efforts to minimize any Plant downtime during Operational Sunny/Wind periods (the “**Maintenance Services Calendar**”). Such Maintenance Services Calendar may be postponed by the Employer for 5 business days; provided, that the Maintenance Services Calendar shall be developed in accordance with the Operating Manual and the terms of the contract. The dates and times in the Maintenance Services Calendar may be amended thereafter by mutual Contract of the Parties. For clarity, the Maintenance Service Calendar shall include a maintenance plan established in accordance with the Maintenance Manual.

9.6 Status Reviews

As reasonably required, or requested by the Employer, the Representatives shall meet to discuss and review (i) the information contained in the Monthly Performance Reports, (ii) the availability of the Plant, (iii) any technical issues which may have arisen with respect to the performance, availability or maintenance and servicing of the Plant Equipment, (iv) Maintenance Services and Repair Services performed during the preceding calendar month, (v) any and all failures by a Plant equipment, and (vi) Maintenance Services to occur during the next following a calendar month.

10. **Contractor’s Permits**

Prior to the time in which such Permits are required in order to perform when the relevant Services and/or Additional Services, as applicable, are to be performed, Contractor shall obtain and maintain, as applicable, throughout the Term of the Contract all Permits (the “Contractor Permits”) required by the Applicable Law, Good Wind/Solar/BESS Industry Practices, Performance Standards and Technical Specifications which should be issued in the name of Contractor or are otherwise attributable or necessary to the provision of the Services and/or Additional Services, other than such Permits as are required to be obtained by Employer pursuant to *Employer Permits*.

11. Contractor's Manager

On or prior to the commencement of the Term, Contractor shall designate a duly qualified and experienced person to manage and administer the Contractor's activities and shall provide notice thereof to the Employer, to act as its manager and coordinator of the contract on Contractor's behalf (the "**Contractor's Manager**"). The Contractor's Manager shall not have authority to amend or modify the contract or accept any commitment which would have an effect on the contract. In case the manager is on leave with prior intimation to employer, the deputy manager with equivalent qualification shall be provided at site by the Contractor

12. Cooperation with other Subcontractors

Contractor acknowledges and agrees that the Employer or Other Subcontractors of Employer including NREDCAP personnel's may be present at the Site and agrees, at no cost or expense to the Employer, to reasonably cooperate with such Other Subcontractors to allow the performance of its and their respective obligations to occur concurrently. Employer shall inform the Other Subcontractors of the clear demarcation of Contractor's scope of work so as to ensure non-interference in such work and operations by Employer's Other Subcontractors.

13. Reserved Rights

13.1 Plant

To the extent Contractor believes, in its reasonable discretion, that it is necessary to enhance the overall performance or safety of the Plant, Contractor may propose to Employer changes and improvements to the Plant (including the software included with respect thereto) and implement such changes or improvements proposed after obtaining the prior written consent of the Employer; provided that such changes and/or improvements shall not (i) be in conflict with the Performance Standards; (ii) adversely impact the technical performance of the Plant or the safety of the Plant; (iii) adversely impact the Availability Warranty in Annexure 2 [Functional Guarantees] (iv) increase the cost of operating the Plant; (v) place the Employer in breach of the technical requirements of the Power Purchase Contract; (vi) impair or vitiate any obligations of the Contractor under the contract; (vii) adversely affect the Supply Contract Warranties and the Works Contract Warranties; or (viii) result in non-compliance with the Type Certificate.

- 13.2 The Contractor shall only have the right to implement such changes or improvements if it has received the prior written consent of the Employer and such changes and improvements are carried out at no cost to the Employer and in accordance with Reserved Rights.

14. CERTAIN NOTIFICATIONS BY CONTRACTOR

- 14.1 Contractor shall, upon obtaining actual knowledge thereof, promptly give the Employer notice of:

- (i) any events or facts or observations that the Contractor believes could be reasonably likely:
 - (a) to have a material adverse effect on the operation of any of the Plant or the performance of the Employer's obligations under the contract; or

- (b) to cause an immediate threat to the safe operation of the Plant (or any Plant therein) and/or the safety of Persons; provided that, in the case of this Clause, the Contractor shall provide immediate verbal notice of such event, fact or observation to the Employer with notice to follow within three (3) Business Days);
 - (ii) any actual or proposed event that the Contractor believes would be reasonably likely to have a material adverse effect on the operation of any of the Plant or the performance of either Party's obligations under the contract;
 - (iii) any (a) violation of Applicable Laws, or Permit, by the Contractor's agents, officers, directors, employees, representatives and Subcontractors, Employer or any Other Subcontractor; or (b) any notices of Liens (or claims of Liens) or investigations by Governmental Authorities related to the Plant;
 - (iv) any actual or contemplated change in Law that Contractor believes would be reasonably likely to have a material adverse effect on the operation of any of the Plant or the performance of either Party's obligations under the contract.
- 14.2 If the Contractor does not comply with its obligations under Certain Notifications by Contractor, the Contractor shall, subject to Limitations of Remedies and Liability, indemnify the Employer for any loss the Employer may suffer as a consequence, including, without limitation, compensation pursuant to Employer's Obligations.

15. ASSIGNMENT AND SUBCONTRACTING

- 15.1 The Contractor shall not sublet, transfer or assign the contract or any part thereof without the prior written permission of Employer. The Contractor shall not subcontract any of the Services having a value of more than 30% of the Annual O&M Price of the concerned year , except upon the Employer's advance written approval of the subcontracting of such works. Such approval shall refer to the specific identity of the Subcontractor and to the scope and terms of the subcontract. In any event, the Contractor shall not subcontract all, or materially all of the Operation and Maintenance Services or the ultimate supervision of the performance of such services.
- 15.2 The Contractor agrees and acknowledges that any review by, approval of or failure to approve, or rejection by the Employer as to any Subcontractor shall not relieve the Contractor of any of its obligations under the contract, and the Contractor shall be liable hereunder to the same extent as if any such Subcontract had not been entered into. The Contractor shall at all times ensure and cause the Subcontractors not to commit any act or omission which could release, void, impair or waive any guarantee or warranty on the Plant or any part thereof.
- 15.3 The Contractor shall supervise and direct the work of all Subcontractors and be fully responsible for the performance of the Subcontractors and to the methods, techniques, sequences and procedures of, and for coordinating the work of the Subcontractors and to the acts and omissions of all Subcontractors and their employees, directors, officers, advisors, agents and representatives, and those of their subcontractors ("Subcontractors' Parties). With regard to any Subcontract and Subcontractor's Parties, in particular, Contractor shall ensure that all wages, labor, health and safety and social related obligations are duly performed and timely discharged in accordance with Applicable Laws. It is agreed that if the responsibility of any such payments is transferred to the Employer pursuant to

Applicable Law, the Employer shall have the right to adjust all such payments against the dues to the Contractor under the contract or otherwise recover the same from the Contractor under any other Contract. It shall be at Contractor's sole responsibility to ensure the payment and discharge of all its obligations with regard to the Subcontracts and shall indemnify the Employer and any Employer Indemnified Parties for any losses incurred by such parties in relation to the Subcontracts or to Subcontractor's Parties.

16. Inspection and Testing

- 16.1 The Contractor must provide the Employer, independent engineer, Grid Operator, Grid Administrator, and any other Contractor or Contractors employed by the Employer and their respective nominees, or other inspectors where required under the Applicable Law, the Permits, the Finance Documents and/or the Grid documents (collectively hereinafter referred to as the "**Project Parties**"), with access at any time to any place where the Services are being performed in order to inspect the progress and the manner of the Services, provided that the Employer (or its designated representatives) gives the Contractor twenty four (24) hours prior written notice.
- 16.2 The Project Parties and their respective nominees will have the right to examine and have access to documents relating to the Services.
- 16.3 The Contractor must carry out all tests and/or inspections of the Plant or Spare Parts in a lawful, professional, timely, safe and environmentally responsible manner as may be necessary to ensure the safe, reliable, efficient, and optimal operation of the Plant and in accordance with the Performance Standards, Applicable Laws and Good Wind/Solar/BESS Industry Practice. All these tests and inspections are to be carried out at the Contractor's expense, as part of Services.
- 16.4 The Project Parties and their respective nominees are entitled to attend any test and/or inspection.
- 16.5 Whenever the Contractor is ready to carry out any test and/or inspection, the Contractor must give at least ten (10) days' advance notice to Employer of such test and/or inspection and of the place and time. The Contractor shall make its best efforts to obtain from any relevant third party or manufacturer any necessary permission or consent to enable the Project Parties to attend the test and/or inspection.
- 16.6 The Contractor must provide the Employer with a report of the results of such test and/or inspection within five (5) days after the completion of that test or inspection in question.
- 16.7 If the Employer and/or any of the Project Parties fail to attend the test and/or inspection, or if it is agreed between the Parties that the Employer and/or any of the Project Parties will not attend, then the Contractor may proceed with the test and/or inspection in the absence of the Employer's and/or any of the Project Parties' inspector and provide the Employer with a report in the approved form of the results.
- 16.8 If any Spare Parts or the Plant fails to pass any test and/or inspection, the Contractor must either rectify or replace those Spare Parts or repair the Plant and promptly repeat the test and/or inspection upon giving notice.
- 16.9 The Contractor agrees that neither the performance of a test and/or inspection of Spare Parts or the Plant, nor the attendance by the Employer's and/or any of the Parties' inspector nor the issue of any test report will release the Contractor from any of its obligations under the contract.

16.10 Inspection during the Term and at the End of the Term:

During the Term, the Plant may be submitted to a general inspection performed by a Contractor selected by Employer:

- 16.10.1. Inspection during the Term
From time to time during the Term, but not more than once every year (being specified that any additional tests and inspections instructed by the Employer under this Clause will be for the Employer's account unless the tests or inspections were necessary as a result of the failure of the Contractor to fulfil its obligations under the contract);
- 16.10.2. End of Contract inspection: six (6) to twelve (12) months before the end of the Term, at the convenience of the Employer.

Subject to the Employer's reasonable advance notice as to the date of such inspection, Contractor is required to attend and assist the Employer and the designated inspector in performing such tests, without additional cost.
- 16.10.3. The final report shall be sent to the Contractor by the Employer and if any defect or damage found, same shall be rectified/replaced.
- 16.10.4. Without relieving Contractor from its obligations and without limiting Employer's ability to reasonably pursue the reliefs available to it, if applicable:
 - (i) Contractor shall, promptly following receipt of the report, submit to the Employer (a) a recovery plan to remedy all breaches, defects and malfunctions detected in the report for which the Contractor is liable and shall perform such remedial actions without delay, and (b) provide detailed measures to be put in place to prevent such defaults from recurring;
 - (ii) if the Contractor fails to timely complete all remedial actions before the end of the Term, the Employer shall be entitled, at Contractor's cost and risk, to employ a Replacement Contractor to perform the works.

16.11 Employer Site Visit

- 16.11.1. If Employer decides to visit the Plant, Contractor shall provide personnel on the Site for mutual inspection with no additional cost to Employer. If the Contractor is reasonably unable to attend such visit for unexpected reasons and/or safety reasons, Contractor shall immediately inform the Employer. As the case may be, the Contractor shall reschedule a new visit within the next seven (7) days. Rescheduling of the visits thereof shall no occur more than once per year the Employer shall adhere to the HSE practices of the Contractor.
- 16.11.2. If, upon request of the Employer made in accordance with Employer Site Visit, the Contractor does not provide dedicated personnel for such visits, subject to the aforementioned rescheduling allowance, any downtime of Plant Equipment(s) to perform the inspections thereof shall be considered as unavailable for the purpose of availability calculation described in Annexure 2 [Functional Guarantees] [(however never exceeding eight (8) hours per given visit)]. Notwithstanding the foregoing, Employer may request that Contractor provide personnel on the Site for additional inspections as an Additional Service.

- 16.11.3. If, upon request of the Employer made in accordance with Inspection and Testing, for inspection of the Plant, the Contractor provides access to have services in the Plant Equipment examined available for inspection and Employer does not carry out such inspection, then any downtime of Plant Equipment(s) to perform the inspections thereof shall be considered as available for the purpose of availability calculation described in Annexure 2 [Functional Guarantees]

17. HAZARDOUS SUBSTANCES AND HAZARDOUS SITE CONDITIONS

- 17.1 Contractor shall not, nor shall it permit any other Person to bring any Hazardous Substances on the Site, other than Hazardous Substances to be used by Contractor or any Subcontractor in a manner that:

- (i) does not violate any Applicable Laws, or Permits; and
- (ii) is consistent in quantity and with Good Wind/Solar/BESS Industry Practices for operating and maintaining wind energy conversion plants, such as motor fuels, solvents and lubricants (collectively, "**Permissible Materials**").

- 17.2 Contractor shall bear all responsibility and liability for:

- (i) any Hazardous Substances that are not Permissible Materials belonging to the Contractor or present on site; or
- (ii) the handling of, or failure to handle, Permissible Materials in violation of Applicable Laws or otherwise in any manner that constitutes negligence or willful misconduct by Contractor or any Subcontractor.

- 17.3 Contractor shall use Hazardous Substances in performance of the Services in accordance with the Performance Standards, Applicable Laws and Good Wind/Solar/BESS Industry Practices and shall not:

- (i) utilize, or permit or cause any Subcontractor to utilize, on the Site such Hazardous Substances as are prohibited under Applicable Law from being used in India; or
- (ii) import or use at the Site such Hazardous Substances as are prohibited under Applicable Law.

- 17.4 Contractor shall maintain a regularly updated log of all material safety data sheets for all hazardous substances used in connection with performance of the Services at or near the Site, which shall be available for Employer to review upon reasonable request. Contractor shall maintain an accurate record and current inventory of all hazardous substances used in performance of the Services at or near the Site, which record shall identify quantities, location of storage, use and final disposition of such hazardous substances.

- 17.5 Contractor shall arrange and agree for the disposal, transportation, reporting and certification (including provision of waste disposal vouchers and other certificates as required by Applicable Law or Permits) of Hazardous Substances, including waste disposal vouchers, brought onto and released at the Site by Contractor or its Sub Contractors, which are expected to include but not be limited to used oil, grease and ethylene glycol, to the extent required by Laws, in each case, by licensed, insured, competent and professional Contractors in a safe manner and in accordance with Laws. As between the Parties, Contractor shall be solely liable for any response, removal, investigation, clean-up or other remedial action required by any Laws related to any Contractor,

17.6 In the event Contractor encounters any Hazardous Substance or other hazardous conditions at the Site that are inconsistent with the Performance Standard or would reasonably be expected to impact the performance of Contractor's obligations hereunder, Contractor shall promptly report the condition to Employer. In such event, Contractor shall stop work and remove, or take other actions necessary to remedy the hazards associated with, any Contractor Hazardous Substances such that Contractor can resume work.

17.7 The Contractor shall indemnify and hold harmless the Employer against any fine, penalty or third-party Claim incurred as a result of non-compliance by the Contractor with the terms of the contract, Applicable Laws, Good Wind Industry Practice and more specifically, with its obligations under Hazardous Substances and Hazardous Site Conditions.

18. **EMPLOYER'S OBLIGATIONS**

During the Term, Employer shall perform the following obligations:

18.1 Access

18.1.1. On and from the Commencement Date, Employer shall provide the Contractor (and its Subcontractors) full, free and safe Access to the Plant for the purpose of enabling Contractor to fulfil its obligations under the contract.

Notwithstanding the foregoing, the Contractor shall be required to perform any works (including obtaining permits for such works) related to the Access to the Site required for the delivery of any Spare Parts, if so requested by the Employer in writing, on the Time to time Basis.

18.1.2. The Employer shall give to the Contractor and the Contractor's personnel unrestricted Access to the Site to enable Contractor and the Contractor's personnel to carry out all elements of the Services at any time from the Commencement Date until the end of the Term. Such Access shall include the provision by the Employer of:

- (i) such keys or access codes as may be required by the Contractor to gain unhindered access to the Site and/or the Wind Turbines (as the case may be);
- (ii) Access to the access roads to and on the Site If there is any deviation, and such deviations are accepted by the transport contractor, then such deviations shall be accepted by the Contractor.

Notwithstanding anything else contained in the contract all Access to the Site and Plant is subject to the applicable site safety, security and environmental requirements and Applicable Law (and the Contractor should comply with the same). The Employer will have the right to limit Access or expel any Person off the Site in case of them not fulfilling the Emergency plan of the Site, the Emergency plan of the Plant Facility.

18.3 Employer's Permits

Contractor on behalf of employer shall obtain and maintain all Permits and any Permits required by Applicable Law to be obtained in the name of the Employer in order to (i)

perform Employer's obligations under the contract and (ii) enable Contractor to lawfully access the Site at the point of entry to the Site and the Plant].

19. SITE REGULATIONS

Employer shall (directly or through a Subcontractor, advisor or agent) provide the Site Regulations and revisions thereof from time to time, and shall require the Other Subcontractors and their respective agents and employees to, (i) comply with the Site Regulations; and (ii) take all necessary precautions (as required by Applicable Law or otherwise) for the health and safety of all Persons (including Contractor's personnel) at the Site.

20. CERTAIN NOTIFICATIONS BY EMPLOYER

20.1 Employer shall, upon obtaining actual knowledge thereof, promptly give the Contractor, as soon as practicable, notice of:

20.1.1. any events or facts or observations that the Employer believes has determined that would:

- (i) have a material adverse effect on the operation of any of the Plant or the performance of the Contractor's obligations under the contract; or
- (ii) to cause an immediate threat to the safe operation of the Project (or any Plant therein) and/or the safety of Persons; provided that, in the case of this current Sub-Clause, the Employer shall provide as soon as possible verbal notice of such event, fact or observation to the other;

20.1.2. any (a) violation of Applicable Laws, including environmental Laws or the terms of any Permit, by Contractor or any Other Subcontractor or (ii) any notices of Liens (or claims of Liens) or investigations by Governmental Authorities related to the Project.

20.2 Failure to furnish notice pursuant to Certain Notifications by Employer shall not affect the Contractor's obligations to perform its obligations. Contractor.

21. EMPLOYER 'S OWNERSHIP OF ENERGY, EQUIPMENT, SPARES AND PROJECT BENEFITS

21.1 The Contractor acknowledges that ownership of the Energy or any benefits arising out of the operation of the Plant remains at all times, and in all circumstances with the Employer at all times and the Contractor has no legal or equitable title to or interest in the Energy or other benefit.

21.2 The ownership of all item supplied by the Contractor, including under Additional Services shall be transferred to the Employer at the end of the term of the contract:

- (i) such items becoming a permanent part of the Plant against the mutually agreed payment by both the parties

21.3 The ownership of any item (not including Energy or benefits arising out of the operation of the Plant) supplied by the Contractor as part of the Services shall be transferred to the Employer upon such items becoming a permanent part of the Plant.

21.4 The Contractor agrees that any benefits, including any carbon credits, renewable energy certificates or similar royalty or credit that may arise as a result of having the Project

undertaken belong to the Employer and the Contractor shall provide all reasonable assistance requested by the Employer in order to obtain such rights and benefits.

22. PRICE AND PAYMENT

22.1 Total Annual O&M Cost

Commencing on the Commencement Date and for the remainder of the Term, Employer shall, in consideration of the Contractor providing the Services and its prior receipt of an invoice with respect thereto, pay in accordance with Invoices and Payment to Contractor an annual O&M cost in INR in equal quarterly instalments at the end of every quarter for each year till 10 (Ten) years in the amounts set forth in and payable in accordance with Price Schedule No 5/SOR-5 [Schedule of Rates] of the bidding documents for the plant facilities. Following is the yearly breakup of the Total O&M price in line with the Price Schedule No 5/SOR-5:

SCHEDULE OF RATES [SOR-5] [OPERATION AND MAINTENANCE]- PLANT FACILITIES								
Sl. No.	Description of Item	Year	PRICES					
			Yearly O&M Price (Excluding GST)				Total O&M Price (Excluding GST) in figures	Total value of Applicable GST (in absolute figures) [GST to be calculated on absolute O&M Price
			Solar PV - Part-A	Wind - Part-B	BESS - Part-C	Common Infra - Part-D		
			a	b	c	d	e=a+b+c+d	f = e*applicable GST/Taxation
OPERATION & MAINTENANCE								
1	Operation and Maintenance of the Plant Facility for FIRST YEAR	1	INR 0.00	INR 0.00	INR 0.00	INR 0.00	INR 0.00	
2	Operation and Maintenance of the Plant Facility for SECOND YEAR	2	INR 0.00	INR 0.00	INR 0.00	INR 0.00	INR 0.00	
3	Operation and Maintenance of the Plant Facility for THIRD YEAR	3	INR 0.00	INR 0.00	INR 0.00	INR 0.00	INR 0.00	
4	Operation and Maintenance of the Plant Facility for FOURTH YEAR	4	INR 0.00	INR 0.00	INR 0.00	INR 0.00	INR 0.00	
5	Operation and Maintenance of the Plant Facility for FIFTH YEAR	5	INR 0.00	INR 0.00	INR 0.00	INR 0.00	INR 0.00	
6	Operation and Maintenance of the Plant Facility for SIXTH YEAR	6	INR 0.00	INR 0.00	INR 0.00	INR 0.00	INR 0.00	
7	Operation and Maintenance of the Plant Facility for SEVENTH YEAR	7	INR 0.00	INR 0.00	INR 0.00	INR 0.00	INR 0.00	
8	Operation and Maintenance of the Plant Facility for EIGHTH YEAR	8	INR 0.00	INR 0.00	INR 0.00	INR 0.00	INR 0.00	
9	Operation and Maintenance of the Plant Facility for NINTH YEAR	9	INR 0.00	INR 0.00	INR 0.00	INR 0.00	INR 0.00	
10	Operation and Maintenance of the Plant Facility for TENTH YEAR	10	INR 0.00	INR 0.00	INR 0.00	INR 0.00	INR 0.00	
	TOTAL O&M PRICE FOR 10 YEARS (1+2+3+4+5+6+7+8+9+10)							

Against the successful Operation and Maintenance of the entire Plant Facility (Solar, Wind, BESS & Common Infrastructure) payment will be released on quarterly basis at the end of every quarter for each year till 10 (Ten) years.

The O&M of the plant will commence from the date of Operational Acceptance of the plants.

- (i) Year 1 : OM -1
- (ii) Year 2 : OM -2
- (iii) Year 3 : OM -3
- (iv) Year 4 : OM -4
- (v) Year 5 : OM -5
- (vi) Year 6 : OM -6
- (vii) Year 7 : OM -7
- (viii) Year 8 : OM -8
- (ix) Year 9 : OM -9
- (x) Year 10 : OM -10

The Contractor acknowledges that the Total Annual O&M cost forms the sole and exclusive consideration and reimbursement due to the Contractor for the performance of the services included under the Services and Spare Parts and that the Contractor shall not be entitled to any additional amount for their performance, for whatever reason, including, amount others due to increased costs, changes in applicable GST, customs or duties (including, without limitation those set forth in GST, Taxation and Import Duties below), and except as may be specifically provided in the contract.

Payment of amounts due to the Contractor:

Amount shall not be considered as due and payable and the period for the payment of any Price stipulated under the contract shall not commence until the Contractor has duly fulfilled and delivered all obligations and deliverables required from the Contractor until the date of submission of the invoice for the payment to the Employer with relation to such invoice and/or within the period for which the Price included in the invoice are due.

23. INVOICES AND PAYMENT

- 23.1 Contractor shall submit Goods & Service Tax (GST) compliant invoices to Employer for the amounts due under Total Annual O&M cost above and for any other amounts that may be due under the contract.
- 23.2 The Total Annual O&M Cost shall be invoiced by the Contractor quarterly against the completion of concerned quarter and each invoice may be submitted by Contractor no later than the day after the completion of the quarterly period in question and, subject to the terms of the contract, shall be paid by the Employer no later thirty (30) days from the date of submission of the invoice along with all other requisite documents (If so required). The Employer shall make payments by wire transfer to the bank account designated from time to time and owned by Contractor. The payment of any invoice shall be subject to the Contractor submitting to the Employer the Monthly Performance Reports.
- 23.3 Additional Services may, for purposes of this Invoices and Payment, be invoiced upon full and proper completion of each individual task and shall, subject to the terms of the contract be paid by the Employer within thirty (30) days from the date of submission of the invoice along with all other requisite documents (If so required).
- 23.4 In the event that the Employer fails to make any payment on its respective due date, the Employer shall pay to the Contractor interest on amount of such delayed payment at the rate as applicable for 46 days term deposit scheme as established by State Bank of India for Local currency payment and London Inter Bank Offered Rate (LIBOR) for Foreign currency payment, shall become payable as from the end of the 15 days period on certified amount due, but not paid, at the end of such period.
- 23.5 To the extent permitted by Applicable Laws, if the amount of an invoice is disputed by the Employer, the Employer shall be entitled to withhold payment of the disputed amount for the next invoice (or part thereof), until the dispute is resolved between the Parties under Law Dispute Resolution or otherwise. The Employer shall pay at the applicable time the undisputed amount of such invoice including any undisputed portion of the invoice item in dispute. Further, the Employer shall be entitled to withhold payment of any amount due to the Contractor, if, at the time, the Contractor is in breach of one or more of its material obligations in terms of the contract.
- 23.5.1. Subject to the provisions on the contract, the Contractor warrants that it has, and will be deemed to have, done everything that would be expected of a prudent, competent and experienced Contractor and in accordance with Good Wind/Solar/BESS Industry Practices in:
- (i) assessing all risks which it is assuming under the Contract; and
 - (ii) ensuring that the **O&M Price** contain allowances to protect it against any of these risks eventuating,
- and that it will not make a claim for an increase in the **O&M Price** if any of those risks eventuate.
- 23.5.2. Except for Liens arising out of a failure of the Employer to make any payment when due hereunder to Contractor or any other Person providing labour or services to the Project under Contract to the Employer, the Contractor acknowledges and agrees that it shall not file, claim or register any Liens and shall use its best efforts to prevent any Liens from being

filed, claimed or registered by any Subcontractor or by any employee, or agent of the Contractor or Subcontractor, against the Services, Additional Services, the Plant as a whole or any part thereof, or any real or other property of the Employer, for any works done or any Services and/or Additional Services rendered under the Contract or any subcontract let by the Contractor and shall procure that all subcontracts contain undertakings to the like effect.

23.5.3. The Contractor shall indemnify the Employer against any loss, damage, cost or expense (including legal fees) of the Employer arising out of or in connection with any Lien being filed, claimed or registered as referred to Invoices and Payment.

23.5.4. The delay or failure of a party to pay any amounts due hereunder, or the withholding of any amounts which are claimed by a party to be due, shall not release the other Party from any of its obligations or liabilities under the contract.

24. SCADA, EMS & BMS

Contractor shall be required from time to time to update the SCADA, EMS and BMS software, as required for the ongoing adequate operation of the Plant Facility. Such updates shall also be provided to the Employer at no additional costs.

25. INSURANCE

25.1 Contractor 's insurance

The Contractor, at his own cost and expense, shall take out and maintain in full force and effect and shall cause its Subcontractors to take out and maintain in full force and effect, throughout the Term of the Contract and any extensions thereof, the following insurance policies from reputable insurers and shall provide the Employer with copies of the corresponding insurance certificates:

- a) Covering physical loss or damage to the all plant facilities at the Site, with an extended maintenance coverage for the Contractor's liability in respect of any loss or damage for the entire term of the contract.
- b) Workers compensation insurance, as required by the Applicable Law and Contracts made with employees.
- c) Group Medical Claim, Group Term Policy & Group Personal Accident Insurances covering the financial consequences cause by damage and loss arising from sickness, disease, injury or death of any person employed by the Contractor in respect of the services performed Automobile Public Liability insurance, as required by the Applicable Laws, for all vehicles and automotive equipment owned hired, rented, leased and non-owned by the Contractor and used in the performance of the Services
- d) Comprehensive General third-party liability insurance including product and contractual liability covering the financial consequences of the liability arising out loss or damage caused to third parties or to the employer as consequence of the performance of the services.
- e) All other insurance like in-transit insurance (Marine/ Cargo/others as applicable) Contractor All Risk, Erection All Risk, work men compensation, third party liability, Insurance against theft, fire, act of God, and other required for O&M of

the plant to indemnify the Employer/equipment/material and resources shall be borne by the contractor.

The Service Provides shall ensure that under the aforementioned insurance policies, each of the insured has the ability to claim thereunder for a minimum period of three (3) months from the date of expiry of the insurance policies for any claims that arose prior to the expiry date.

The Employer shall be named as co-insured under all insurance policies taken out by the Contractor, except for the Third-Party Liability and Workers' Compensation Insurances, and the Contractor's Subcontractors shall be named as co-insureds under all insurance policies taken out by the Contractor, except for the Cargo, Workers' Compensation. All insurer's rights of subrogation against such co-insureds for losses or claims arising out of the performance of the Contract shall be waived under such policies.

25.2 Contractor's Insurance for the Plant Facility

The Contractor shall take out and maintain an insurance policy, seamlessly with CAR policy taken earlier during construction phase, preferably from same insurance company for the plant facility during the entire term of the contract

In the event of any incident or damage or loss that would be reasonably expected to result in an insurance claim, the Contractor shall:

- a) Notify without delay to the Employer
- b) Prepare and conduct all and any claims made under the policies effected by it, and all monies payable by any insurers shall be paid to the Contractor take all reasonable measures to mitigate the loss, its effects and to protect salvage.
- c) Collaborate with Employer and the insurer and provide them with all information and documents they may request.
- d) Arrange immediate reinstatement of the damage to the employer's satisfaction, without waiting for the settlement for the corresponding insurance claim.
- e) Claim in pursuant to the contract to the insurance agencies, if the claim is accepted or rejected or not accepted or partly accepted by the insurance agency then it will not limit the contractor obligation in any case and also if any losses on account of this shall be in the scope of contractor.

25.3 General Insurance Requirements

25.3.1 The Contractor shall, provide copies of the corresponding insurance certificates mentioned above.

25.3.2 If the Contractor fails to effect or maintain any insurance policy required hereunder, or fails to produce copy of the corresponding insurance certificates, the Employer may (but as no obligation), without prejudice to any other right or remedy available to it under the contract, procure the insurance for the relevant coverage and/or pay the premiums due. Such payments shall be recoverable and deducted from the payments to be made to the Contractor by the Employer under the Contract. In the event if Contractor does not pay the premium, then the Employer may pay the premium however in such case the obligations of

Contractor to undertake the coverage shall continue as envisaged, irrespective of premium being paid by Employer. The Premium if paid by the Employer shall be recovered from the Annual O&M Fees payable by the Employer to the Contractor.

- 25.3.3 The Contractor shall comply with the conditions stipulated in each of the insurance policies to be affected under the Contract and shall not make any alteration to the terms of any policy subscribed by it so it deviates from the requirements herein.
- 25.3.4 The Contractor must promptly notify to the Employer any notification received from an insurance company regarding any actual alteration to one of their policies.
- 25.3.5 On occurrence of any loss covered by an insurance policy contemplated under *Insurance*, the Contractor shall, as soon as reasonably possible, notify to insurance companies for the policy subscribed by it. The Contractor shall also take any appropriate measure to mitigate the effects to the loss to the maximum extent possible. The Contractor shall assist any assessment mandated by the insurance companies.
- 25.3.6 The required coverages referred to and set forth in this Article 33 (*Insurance*) shall in no way affect or limit the Contractor's liability with respect to its obligations under the Contract.

ANNEXURE 1:

Scope of Work for Operation and Maintenance

- i) The Contractor shall prepare the initial Annual Operating Plan for the Plant Facility and shall also indicate the proposed resources (manpower, material & machinery) that would be deployed for O&M.
- ii) The Contractor shall be responsible for the smooth day-to-day operation of the Plant Facility.
- iii) The Contractor shall provide necessary routine and preventive maintenance schedules of the plant for the Employer's approval and shall carry out all routine and preventive maintenance accordingly.
- iv) The Contractor shall perform periodic overhauls and preventive maintenance required for the Plant in accordance with the recommendations of equipment manufacturers and as per the O&M manuals.
- v) Contractor shall perform all break down maintenance and other maintenance in the Plant Facility. The Contractor shall be responsible for achieving the performance guarantee of the plant as indicated in the contract.
- vi) The Contractor shall operate and maintain fire protection system and safety equipment for the plant.
- vii) The Contractor shall do maintenance of Electricity system including overhead lines in the Plant Facility area up to the Point of Common Coupling (PCC) to the grid at the site. Necessary co-ordination shall be made by the Contractor with APTRANSCO/APSPDCL/NREDCAP/SLDC and other agencies as may be required during the Operation and Maintenance term for smooth operation of the plant.
- viii) Contractor shall work in coordination with the Employer or any Employer's designated party to optimize the Plant production.
- ix) The Contractor shall provide required spare plant Equipment, Spare Parts, tools and tackles, consumables required for comprehensive operation and maintenance of the plant facility. The Contractor shall make arrangement to procure required spare parts, or equipment/s as required, overhauling of parts, tools and equipment, required to operate and maintain the Plant in accordance with the recommendations of individual original equipment manufacturer at his own cost. Cost of imported Equipment & spare parts, if any, shall be included in the O&M quoted cost. The List of Consumables, Spare Parts, tools and equipment shall be finalised in consultation with the Employer or Employer's representative. List of recommended spare parts shall be submitted by the Contractor at the beginning of services, however the complete recommended spares will be in the scope of contractor only. In case any equipment or spares is not listed in the mandatory spares list but is required vitally for the operation of the plant, then the same shall be procured and provided by the contractor without any additional cost.
- x) It is the responsibility of the Service Provide to store the materials in appropriate stock yard or container at the site so as to ensure timely availability of the materials.

- xi) The Contractor shall employ only such personnel who are adequately qualified and experienced for operating and maintaining such power generating sets. The Contractor shall ensure that such personnel are on duty at the plant at all times, 24 (twenty-four) hours a day and 7 (seven) days a week commencing from the Date of Operational acceptance.
- xii) Contractor shall carry out all day-to-day operation and maintenance for the Plant Facility as set forth herein. Contractor shall perform the Work and supply all required spare parts in a prudent and efficient manner and in accordance with manufacturers and systems designers' specifications, the Annual Operating Plan for the Plant and all operation and maintenance manuals, all Indian applicable laws including environmental protection, pollution, sanitary, labour act, factory act, employment and safety laws, ("Government Rules") and Prudent Utility Practice. The contractor shall adhere to all labour laws which are applicable and as specified in the Design, supply and installation contract (DSI contract) document.
- xiii) Contractor shall arrange necessary security staff for watch and ward of the Plant Facility round the clock at his own cost, the details of which shall be furnished along with the bid.
- xiv) Contractor shall be responsible for:
- Maximizing plant capacity utilization,
 - Reducing plant downtime,
 - Optimizing the useful life of the equipment of the power plant.
- xv) The Contractor shall maintain all accounting records regarding the facility in accordance with the generally acceptable accounting principles under the Laws of India.
- xvi) The Contractor shall maintain accurate and up-to-date operating logs, records and monthly reports regarding operation and maintenance of the Plant facility (Such records shall be distinctly recorded for Wind Plant, Solar PV Plant and BESS Plant, in order to have clear data for assessment of any individual component of the Plant Facility) which shall include details of power output, other operating data, repairs performed and status of equipment. All such records to be maintained for a minimum of 60 (sixty) months after the creation of such record or data and for any additional length of time required by regulatory agencies with jurisdiction over the Parties. Upon expiry of term, the Contractor shall hand over all such records to EMPLOYER. However, EMPLOYER shall have access to all such records at any time. Generation and O&M reports should be made available to EMPLOYER on daily and monthly basis in required formats as well as the Quarterly and Annual Performance Reports shall be provided. Contractor shall provide communications as well as daily, weekly, monthly, quarterly and annual reports to the employer in the desired format as per the Contract with the Employer or Employer's Engineer.
- xvii) The Contractor shall develop and implement plans and procedures including those for fire fighting, maintenance planning, procuring and inventory control of stores and spares, plan to meet emergencies, plant safety and security; and such other facilities and systems as may be necessary to commence Contractor's ongoing responsibilities.

- xviii) The Contractor shall provide copies of all necessary documents including the following :
- Operation and maintenance manuals shall be prepared and approval shall be accorded from Employer within three months from the date of Operational acceptance.
 - Failure Analysis/history/trouble shooting details of all the Equipment
 - Identification of Equipment needing preventive maintenance
 - List of Vendors indicating name and addresses during operation and maintenance with credentials
 - root cause analysis report for any major failure.
 - Record of consumables / spare parts
- xix) The Contractor shall be responsible for conveying following details to the Employer on daily basis as well as on monthly basis (by the end of 5th day of each month) by fax/ e-mail giving the detail of plant performance during previous month.
- Power generated at all WTGs, Solar PV Plant, Utilisation of BESS
 - Power fed to the grid
 - Internal power loss and internal consumption
 - Power consumption for captive use (if any)
 - Reactive power consumption
 - Downtime of Plant Facilities including details for individual WTG, Solar PV Plant, BESS and other infrastructure of the Plant facility.
- xx) The Contractor shall be responsible for liaising with statutory authorities-and local authorities in order to ensure smooth operation of the Power Plant.
- xxi) Contractor shall provide constant remote surveillance to the Plant Facility
- xxii) Contractor shall provide updates and revisions to Reference Documents, as and when applicable.
- xxiii) Shall implement software updates to control and monitoring systems including EMS/SCADA/BESS in order to meet the plant facility operating requirement in consonance with the grid operations and in compliance with the grid codes as applicable during the operation.
- xxiv) Duly and timely provide the Employer (or parties designated by the Employer) with all notifications required under the Contract including in particular such notifications set forth in Certain Notifications by Contractor;
- xxv) Contractor shall provide access to the Employer to all data for the Plant Facility from the EMS including the SCADA system.

- xxvi)** Contractor shall at all times allow and provide Employer all necessary information for the operation of EMS including the SCADA system (with no notification or approval of access being required unless specifically and otherwise agreed to by the Parties) full, free, unconditional, safe and complete access to the EMS including the SCADA system. Contractor shall monitor and operate the Plant in accordance with the contract and shall ensure smooth operation of the plant.
- xxvii)** Provide the training to the Employer's personnel in relation to the operation of the complete plant facility. Training shall be provided to the employer within 190 days before end the contract.
- xxviii)** Contractor shall provide the insurances prescribed in insurance. The Contractor shall, with [prior intimation of 5 Business Days] at regular business hours, allow persons duly authorized by the Employer including but not limited to the officials of the insurance company of the Employer, to inspect the Project and provide to such personnel, access to all information which is necessary for their inspection, and is reasonably requested by the Employer. All representatives of the Employer shall strictly adhere to the Applicable Laws and the Health, Safety and Environmental (HSE) practices of the Contractor as provided in the Reference Documents;
- xxix)** Contractor shall provide for the watch and ward of the Plant at all times during the Term. The watch and ward deployment plan shall take care of comprehensive Project level security and the Contractor shall take necessary steps to prevent sabotage, theft, vandalism and malicious damage of the assets comprising the Plant, and shall also coordinate and liaison with law enforcement authorities. The Contractor shall take all possible measures to keep the plant operational and secure.
- xxx)** Contractor shall Coordinate with NREDCAP, APTRANSCO, Discom, SLDC and other related entities/departments/local Panchayats as required for proper operation of the Plant Facilities. Also coordinate with relevant agencies for monthly Joint Meter Readings, meter testing, and any other requirements such as any audit or inspection by the government agencies or authorities, financiers, any designated third-party agency etc. for the Project operations.
- xxxi)** Contractor shall be responsible for appointing a Qualified Coordinating Agency at the Pooling Substation Level and shall be responsible for carrying out the forecasting and scheduling of the energy generation from the plant facility (In accordance with the Deviation Settlement Mechanism Regulations of the Andhra Pradesh Electricity Regulatory Commission). Scheduling given by the Contractor is such that no penalty is levied on the Employer due to any deviation of actual generation from scheduling beyond the allowed limit. If any penalty is imposed on the Employer due to such deviations beyond allowed limit the same shall be passed on to the Contractor and the recovery of the same will be done from the O&M Price payable to the Contractor.
- xxxii)** The operation and maintenance of BESS shall be done in coordination with the use cases as defined in the Technical Specifications under Section VII of the Bid Document. In case any modification or any other requirement from the grid operator, then the same shall be discussed with Employer or Employer representative, and any such modification shall be done by the Contractor only on after Employer's approval.

- xxxiii) Contractor will be required to maintain the BESS rating (In MW as well as MWh) as specified in the Technical Specifications (Section VII, requirement of Bid Document) during the entire O&M period by means of replacement or augmentation of the Battery.
- xxxiv) Water requirement for module cleaning arrangement is arranged through NREDCAP under the Solar Park Scheme, and the cost for the same shall be borne by Contractor. However in case of any non-supply of water from NREDCAP arrangement, the Contractor shall arrange for water on it's own, by ensuring ESIA norms.
- xxxv) Contractor shall be responsible to comply with all applicable National and International Standards as well as local statutory provisions related to Environmental Protection Regulations, Health and Safety requirement and also follow the Environmental and Social Management Plan (ESMP) for the Project as developed under the Environmental and Social Impact Assessment Study.
- xxxvi) Contractor will be responsible for coordinating with the OEMs for securing warrantee conditions and services from OEMs as per the warrantee of each equipment, as well also for the Project insurance claims.
- xxxvii) Contractor shall carry out the performance monitoring for the Plant Facility (Solar, Wind and BESS) on continuous basis and in case of any deviation, the Contractor shall perform the due diligence appropriately to find out the actual root cause of such deviation. Any test or inspection required such as thermal imaging, IV characteristics test etc. to analyse such deviation will be the responsibility of the Contractor. Thereafter the corrective action required to mitigate such deviation shall be undertaken by the Contractor without any additional cost.
- xxxviii) Contractor shall be responsible for maintenance of all each and every civil infrastructures parts like Building, cable trench, fencing, drain, plumbing system fire-fighting system, CCTV system, security arrangement, road, earthing, any foundations, anti-weeding, clearing bushes in the solar field etc., as per the direction of employer's Engineering In-charge.

ANNEXURE 2

Functional Guarantees

I Solar PV Power Plant

1. Annual CUF Guarantee

- A. In consideration for the payment of the O&M Price , from the Commencement Date until the end of the Term, the Contractor grants to the Employer the CUF Guarantee on the terms and conditions set forth in the contract.
- B. The Contractor guarantees that the CUF shall be hundred percent (100%) of the total generated CUF for every Production Period ("**Annual CUF Guarantee**"). In the event the CUF is less than the Guaranteed CUF, the Contractor shall immediately upon demand, indemnify the Employer, as liquidated damages and not as penalty, amounts equivalent to remuneration of the equivalent Energy, subject to a maximum of hundred (100%) percent of the Total Annual O&M Price .
- C. The Procedure for measurement and verification of the CUF Guarantee is as per Annexure-B : Performance Guarantee Test procedure and as defined under the Section VII of the bid document.
- D. Liquidated Damages for Shortfall in Annual CUF for Solar PV Plant
 - (i) If the Contractor fails to achieve guaranteed annual CUF, then the Contractor shall pay compensation to the Employer an amount equal to the difference in units derived from guaranteed CUF and achieved CUF multiplied by the tariff of Rs.5 per unit.
 - (ii) If the Contractor fails to achieve the annual guaranteed CUF at the end of 10th year, then the Contractor shall pay compensation to the Employer an amount equal to the Net Present Value (NPV) of the revenue loss for 10th to 25th year calculated as below.
 - (a) % CUF drop i.e. $[(\text{Guaranteed CUF of } 10^{\text{th}} \text{ year} - \text{Actual CUF of } 10^{\text{th}} \text{ year}) / \text{Guaranteed CUF of } 10^{\text{th}} \text{ year}]$ in the 10th year shall be considered as the representative CUF drop for each subsequent year starting from 11th to 25th year.

- (b) Estimated revenue loss @ Tariff rate of Rs.5 per unit for each subsequent year will be calculated based on % CUF drop multiplied by the respective year estimated CUF.
 - (c) The Net Present Value (NPV) of the revenue loss for 10th to 25th year with discount factor of 9.08% will be considered as the LD payable by the Contractor.
- E. In case the Project fails to generate any power continuously for 1 month any time during the O&M period, apart from the force majeure and grid outages as certified by competent authority from STU/ CTU, it shall be considered as “an event of default”. In the case of default the entire Contract Performance Security will be forfeited.
- F. Penalty during O&M period against breakdown of other Infrastructure of Solar Power Plant which doesn't affect the generation of power, directly such as but not limited to civil infrastructure, water supply system/network, other Infrastructure developed by the Contractor as a Scope of Work for the Project (Section-VII: Scope of Works & Technical Specifications) shall be penalised @ Rs.1000/day, per incident of breakdown reported beyond 48 Hours of such reporting. Cumulative value of such penalty shall be limited to 50% of yearly O&M cost.
- G. The Penalty specified on account of delays, as specified in Liquidated Damages and Penalty specified on account of deviations in Functional Guarantees as above shall be assessed independent of each other. Above mentioned Penalties specified under this clause of SCC are independent of each other.

II Wind Power Plant

1. Machine Availability

- A. Machine Availability includes the availability of WTG as well as the power evacuation system for Wind energy up to interface with the system of power utility, i.e. till Pooling Substation.
- B. Machine Availability test shall start after stabilization period of 60 days from the date of commissioning and shall be continued till the end of O&M period.
- C. The Contractor shall maintain all WTGs so as to ensure average Machine Availability of the wind farm not less than
 - (i) 98% during high wind season i.e. 1st May to 31st October
 - (ii) 96% during low wind season i.e. 1st November to 30th April
- D. The formula for calculating average Machine Availability of the wind farm shall be as follows.
Average Machine Availability = (Sum of the MA calculated for each WTG) / (No. of WTGs installed at site)

$$\text{Machine Availability for each WTG, } MA = \frac{[D - (GF + FM + S + U)] \times 100}{[D - (GF + FM)]}$$

where,

D is total number of hours for a machine in the applicable period

GF is Grid Failure hours

FM is Force Majeure hours

S is Scheduled Maintenance hours

U is Unscheduled or Forced Maintenance hours

E. Liquidated Damages for Machine Availability Shortfall

If the Average Machine Availability of complete wind farm is less than the guaranteed value, then the Contractor shall compensate the Employer an amount calculated as the following formula.

$$COM = \left(\frac{GMA - AMA}{AMA} \right) \times C \times E$$

where,

COM is Compensation payable to the Employer in rupees

GMA is Guaranteed Machine Availability (98% in high wind season & 96% in low wind season)

AMA is Actual Average Machine Availability

C is the applicable PPA tariff in ₹5/kWh

E is the actual energy generation in kWh during the period under consideration

- F. The Contractor must provide evidence for calculation of the Machine Availability. Machine Availability value or figure as such provided by the Contractor under the Daily Generation Report (DGR) or Monthly report shall not be accepted directly unless the Contractor attach relevant proof for the values or calculation. Relevant arrangement for verification or validation or audit for the evaluation of MA must be provided by the Contractor to the Employer.

2. Power Factor / Reactive Power Warrantee

- A. It will be the responsibility of Bidder to maintain power factor of the wind farm not less than the minimum requirement of TRANSCO/DISCOM so as to minimize reactive power drawl from state grid system. In any case, the actual reactive power drawl shall not be more than 3% of the active power generated from the Wind Turbines.
- B. Liquidated Damages
- (i) In the event of levy of any charges by state grid on account of low power factor than the minimum mandatory requirement, such charges at actual amount shall be deducted from the Contractor's bills/outstanding credit amount.
 - (ii) In case the reactive power drawl is more than 3% of the active power, then in such case the Contractor shall be responsible to compensate an amount equivalent to the reactive power charges required to be paid by the Employer to the DISCOM for the reactive

power consumed over and above 3% of the total active power generated from the wind turbines.

- (iii) In case of change in tariff for reactive power by SERC during O&M period, the difference will be paid by the Employer on written intimation by the Contractor as early as such change is notified.

III BESS

I. Equipment Availability

- A. The Contractor shall maintain all BESS equipment to ensure Annual Equipment Availability not less than 99%. Equipment Availability includes the availability of Batteries, Battery Management System (BMS), Power Conversion System (PCS), Energy Management System (EMS) as well as the power evacuation system for BESS up to interface with the system of power utility. i.e. till Pooling Substation.
- B. BESS Equipment Availability is the percentage of hours that the BESS is available during the year. The availability guarantee shall begin upon facility commissioning till the end of O&M period. BESS annual equipment availability shall be calculated as follows.

$$\text{Equipment Availability} = 1 - \left(\frac{\Sigma \text{Accountable BESS Outage duration in hours}}{8760} \right) \times 100$$

- C. Accountable BESS outage duration is the elapsed time of accountable BESS outages from the instant the BESS experiences reduced capacity or is out of service to the instant it is returned to service or full capacity. If the BESS experiences reduced capacity but is determined by the Employer to be available for service even if the Employer elects not to immediately return the equipment to full capacity, such time will be discounted from the outage duration.
- D. Liquidated Damages for Shortfall in Equipment Availability

If the annual equipment availability for BESS is less than 99% during any year, then Contractor shall compensate the Employer an amount calculated as per the following formula.

$$COM = \left(\frac{99 - EA}{EA} \right) \times C \times E$$

where,

COM is Compensation payable to the Employer in rupees

EA is Annual BESS Equipment Availability

C is the applicable PPA tariff in ₹5/kWh

E is the energy output from BESS in kWh during the respective year

Recovery of Compensation

The above compensations shall be deducted from price of comprehensive O&M Contract. During the free O&M period if any, compensation shall be paid by the Bidder else it will be deducted from the Security Deposit.

1 Annual CUF Guarantee

The Bidders shall guarantee for the annual CUF starting from the Operational acceptance till the end of 10th year from the date of Operational acceptance.

Warranty for Entire Plant Facility

- i) Contractor shall be responsible for appointing a Qualified Coordinating Agency at the Pooling Substation Level and shall be responsible for carrying out the forecasting and scheduling of the energy generation from the plant facility (In accordance with the Deviation Settlement Mechanism Regulations of the Andhra Pradesh Electricity Regulatory Commission). Scheduling given by the Contractors is such that no penalty is levied on the Employer due to any deviation of actual generation from scheduling beyond the allowed limit. If any penalty is imposed on the Employer due to such deviations beyond allowed limit the same shall be passed on to the Contractor and the recovery of the same will be done from the o&M price payable to the Contractor.

Schedule No. 1. Plant and Mandtory Spare Parts Supplied from Abroad

SCHEDULE OF RATES [SOR-1] - SOLAR PART (120 MW _{AC}) - Part- A																			
Item	Description	Country of Origin	Qty (Ls)	CIP Entry Border Point / CIF Indian Port of Entry Price														Total Price	
				Unit FOB Price		Total FOB Price	Unit Marine/Air Insurance Price		Total Marine/Air Insurance Price	Unit Marine/Air Freight & Unloading charges at Port		Total Marine/Air Freight & Unloading Charges at Port	Custom Duty & clearance charges in figures		Custom Duty & clearance charges in figures	% (Percentage) of Custom Duty considered	Currency	Total Price	
				Currency	Amount		Currency	Amount		Currency	Amount		Currency	Amount					
1	2	3	4	5	6	7=4*6	8	9	10=4*9	11	12	13=4*12	14	15	16=4*15	17	18	19=7*10+13*16	
A- SUPPLY																			
1	Supply of PV Modules as specified in the Tender Documents		1			0			0			0			0			0.00	
2	Supply of Inverters as specified in the Tender Documents		1			0			0			0			0			0.00	
3	Supply of Inverter Transformer as specified in the Tender Documents		1			0			0			0			0			0.00	
4	Supply of MV Switchgear and RMU as specified in the Tender Documents		1			0			0			0			0			0.00	
5	Supply of Module Mounting Structure as specified in the Tender Documents		1			0			0			0			0			0.00	
6	Spare Modules (As Mandatory Spares, 0.25% of total supply of solar modules)		1			0			0			0			0			0.00	
7	Mandatory Spares excluding Modules		1			0			0			0			0			0.00	
8	Cables (All DC, LT & HT)		1			0			0			0			0			0.00	
9	Weather Monitoring Station		1			0			0			0			0			0.00	
10	Manufacture & Supply of Balance of System including all Equipments, Materials, Spares, Accessories, Safety & Fire Fighting System etc. excluding in above Solar Part supply and any other Supplies specified in the Tender Documents		1			0			0			0			0			0.00	
Sub Total - A																		0.00	
SCHEDULE OF RATES [SOR-1] - WIND PART (40MW) - Part-B																			
B - SUPPLY																			
11	Supply of WTG Tower as specified in the Tender Documents		1			0			0			0			0			0.00	
12	Supply of Blades as specified in the Tender Documents		1			0			0			0			0			0.00	
13	Supply of Nacelle and Hub as specified in the Tender Documents		1			0			0			0			0			0.00	
14	Supply of Unit Substation Equipment (excluding step-up transformer) as specified in the Tender Documents		1			0			0			0			0			0.00	
15	Supply of Internal Transmission Network Equipment as specified in the Tender Documents		1			0			0			0			0			0.00	
16	Supply of Step-up Transformer as specified in the Tender Documents		1			0			0			0			0			0.00	
17	Mandatory Spares		1			0			0			0			0			0.00	
18	Manufacture & Supply of Balance of System including all Equipments, Materials, Spares, Accessories, Grounding, Lighting, Lightning, Safety & Fire Fighting System etc. excluding Wind part supply above and any other Supplies specified in the Tender Documents		1			0			0			0			0			0.00	
Sub Total - B																		0.00	
SCHEDULE OF RATES [SOR-1] - BESS PART (20 MWH) - Part - C																			
C - SUPPLY																			
19	Supply of Battery as specified in the Tender Documents		1			0			0			0			0			0.00	
20	Supply of Battery Management System (BMS) as specified in the Tender Documents		1			0			0			0			0			0.00	
21	Supply of Bidirectional Inverter (PCS) as specified in the Tender Documents		1			0			0			0			0			0.00	
22	Supply of Step-up Transformer as specified in the Tender Documents		1			0			0			0			0			0.00	
23	Supply of MV Switchgear/ RMU as specified in the Tender Documents		1			0			0			0			0			0.00	
24	Manufacture & Supply of Balance of System including all Equipments, Materials, Spares, Accessories, Grounding, Lighting, Lightning, Safety & Fire Fighting System etc. excluding BESS part supply above and any other Supplies specified in the Tender Documents		1			0			0			0			0			0.00	
Sub Total - C																		0.00	
SCHEDULE OF RATES [SOR-1] - COMMON INFRASTRUCTURE PART- Part - D																			
D - SUPPLY																			
25	Supply of Energy Management System (EMS) including SCADA, telemetering system as specified in the Tender Document & any other supply not included in A, B and C		1			0			0			0			0			0.00	

26	Solar Park Development : (a) All supplies for establishing 33 KV Pooling Substation at Project site & evacuation system from MCR to 33/220 KV Grid substation at Ramagiri. (b) Supply of lighting system, security system (CCTV), Water Treatment Plant etc required for the development of Solar Park.		1			0			0			0			0			0.00
Sub Total - D																		0.00
Grand Total (Supply from Abroad) A+B+C+D																		0.00

General instructioesn to fill the Price Schedules	
1	Bidders are required to fill the relevant portion/Parts/Line items/scope of the respective Price Schedules only. In case, any line item is left blank by the bidder, it will be deemed assumed by the Employer that such portion/Parts/line item/Scope has been considered by the bidder suitably somewhere else in the Price schedules.
2	In case the bidder don't want to mention any quantity/price in any particular line item, then he has to mandatorily put zero (0) against that particular line item.

Schedule No. 2. Plant and Mandatory Spare Parts Supplied from Within the Employer's Country

SCHEDULE OF RATES [SOR-2] - SOLAR PART (120 MW _{AC}) - Part- A								
Item	Description	Qty (Ls)	Currency	Unit EX Works Price	Total EX Works Price	Goods & Service Tax (GST) in absolute figures	% (Percentage) of Goods & Service Tax (GST) considered	Total Ex Works Price with GST
1	2	3	4	5	6=3*5	7	8	9=6+7
A - SUPPLY								
1	Supply of PV Modules as specified in the Tender Documents	1			0			0.00
2	Supply of Inverters as specified in the Tender Documents	1			0			0.00
3	Supply of Inverter Transformer as specified in the Tender Documents	1			0			0.00
4	Supply of MV Switchgear and RMU as specified in the Tender Documents	1			0			0.00
5	Supply of Module Mounting Structure as specified in the Tender Documents	1			0			0.00
6	Spare Modules (As Mandatory Spares, 0.25% of total supply of solar modules)	1			0			0.00
7	Mandatory Spares excluding Modules	1			0			0.00
8	Cables (All DC, LT & HT)	1			0			0.00
9	Weather Monitoring Station	1			0			0.00
10	Manufacture & Supply of Balance of System including all Equipments, Materials, Spares, Accessories, Safety & Fire Fighting System etc. excluding in above Solar Part supply and any other Supplies specified in the Tender Documents	1			0			0.00
Sub Total - A								0.00
SCHEDULE OF RATES [SOR-2] - WIND PART (40MW) - Part-B								
B - SUPPLY								
11	Supply of WTG Tower as specified in the Tender Documents	1			0			0.00
12	Supply of Blades as specified in the Tender Documents	1			0			0.00
13	Supply of Nacelle and Hub as specified in the Tender Documents	1			0			0.00
14	Supply of Unit Substation Equipment (excluding step-up transformer) as specified in the Tender Documents	1			0			0.00
15	Supply of Internal Transmission Network Equipment as specified in the Tender Documents	1			0			0.00
16	Supply of Step-up Transformer as specified in the Tender Documents	1			0			0.00
17	Mandatory Spares	1			0			0.00
18	Manufacture & Supply of Balance of System including all Equipments, Materials, Spares, Accessories, Grounding, Lighting, Lightning, Safety & Fire Fighting System etc. excluding Wind part supply above and any other Supplies specified in the Tender Documents	1			0			0.00
Sub Total - B								0.00
SCHEDULE OF RATES [SOR-2] - BESS PART (20 MWH) - Part - C								
C - SUPPLY								
19	Supply of Battery as specified in the Tender Documents	1			0			0.00
20	Supply of Battery Management System (BMS) as specified in the Tender Documents	1			0			0.00
21	Supply of Bidirectional Inverter (PCS) as specified in the Tender Documents	1			0			0.00
22	Supply of Step-up Transformer as specified in the Tender Documents	1			0			0.00
23	Supply of MV Switchgear/ RMU as specified in the Tender Documents	1			0			0.00
24	Manufacture & Supply of Balance of System including all Equipments, Materials, Spares, Accessories, Grounding, Lighting, Lightning, Safety & Fire Fighting System etc. excluding BESS part supply above and any other Supplies specified in the Tender Documents	1			0			0.00
Sub Total - C								0.00
SCHEDULE OF RATES [SOR-2] - COMMON INFRASTRUCTURE PART- Part - D								
D - SUPPLY								
25	Supply of Energy Management System (EMS) including SCADA, telemetering system as specified in the Tender Document & any other supply not included in A, B and C	1			0			0.00
26	Solar Park Development : (a) All supplies for establishing 33 KV Pooling Substation at Project site & evacuation system from MCR to 33/220 kV Grid substation at Ramagiri. (b) Supply of lighting system, security system (CCTV), Water Treatment Plant etc required for the development of Solar Park	1			0			0.00
Sub Total - D								0.00
Grand Total (Supply from Employer's Country) - A+B+C+D								0.00

General instruction to fill the Price Schedules

1	Bidders are required to fill the relevant portion/Parts/Line items/scope of the respective Price Schedules only. In case, any line item is left blank by the bidder, it will be deemed assumed by the Employer that such portion/Parts/line item/scope has been considered by the bidder suitably somewhere else in the Price schedules.
2	In case the bidder don't want to mention any quantity/price in any particular line item, then he has to mandatorily put zero (0) against that particular line item.

Schedule No. 3. Design Services

SCHEDULE OF RATES [SOR-3] - SOLAR PART (120 MW_{AC}) - Part- A

Sl. No.	Description of Item	Quantity (Ls)	Price					Total value of Applicable GST / Taxation in absolute figures	% (Percentage) of Goods & Service Tax (GST)/Taxation considered	Total Price including GST / Taxation
			Local currency Portion		Foreign currency Portion (Optional)					
			Unit Charges (INR)	Total Charges (INR)	Currency	Unit Charges	Total Charges			
1	2	3	4	5=3*4	6	7	8=3*7	9	10	11=5+8+9
A - DESIGN SERVICES										
1	Design & Engineering in respect of all the Equipments Supplied under SOR 1 & SOR 2 for Part A	1		0			0			0.00
	Sub Total - A									0.00

SCHEDULE OF RATES [SOR-3] - WIND PART (40MW) - Part-B

B - DESIGN SERVICES										
2	Design & Engineering in respect of all the Equipments Supplied under SOR 1 & SOR 2 for Part B	1		0			0			0.00
	Sub Total - B									0.00

SCHEDULE OF RATES [SOR-3] - BESS PART (20 MWH) - Part - C

C - DESIGN SERVICES										
3	Design & Engineering in respect of all the Equipments Supplied under SOR 1 & SOR 2 for Part C	1		0			0			0.00
	Sub Total - C									0.00

SCHEDULE OF RATES [SOR-3] - COMMON INFRASTRUCTURE PART- Part - D

D - DESIGN SERVICES										
4	Design & Engineering in respect of all the Equipments Supplied under SOR 1 & SOR 2 for Part D	1		0			0			0.00
	Sub Total - D									0.00
	Grand Total (Design Services) A+B+C+D									0.00

General instructions to fill the Price Schedules

1	Bidders are required to fill the relevant portion/Parts/Line items/scope of the respective Price Schedules only. In case, any line item is left blank by the bidder, it will be deemed assumed by the Employer that such portion/Parts/line item/Scope has been considered by the bidder suitably somewhere else in the Price schedules.
2	In case the bidder don't want to mention any quantity/price in any particular line item, then he has to mandatorily put zero (0) against that particular line item.

Schedule No. 4. Installation and Other Services

SCHEDULE OF RATES [SOR-4] - SOLAR PART (120 MW_{AC}) - Part- A

Sl. No.	Description of Item	Quantity (Ls)	Price					Total value of Applicable GST / Taxation in absolute figures	% (Percentage) of Goods & Service Tax (GST)/Taxation considered	Total Price including GST / Taxation
			Local currency Portion		Foreign currency Portion (Optional)					
			Unit Charges (INR)	Total Charges (INR)	Currency	Unit Charges	Total Charges			
1	2	3	4	5=3*4	6	7	8=3*7	9	10	11=5+8+9
A - INSTALLATION & OTHER SERVICES										
1	Inland Freight and Transit Insurance upto Site for all the mentioned supply portion under SOR 1 & SOR 2 for Part A	1		0	NA	NA	NA			0.00
2	Installation, Erection, Testing and Commissioning including Performance Testing and insurance in respect of all the Equipments Supplied under SOR 1 & SOR 2 for Part A	1		0			0			0.00
3	Civil and allied works including construction and installation of Trenches, Module Mounting Structure, foundations, etc. of all the Equipments Supplied under SOR 1 & SOR 2 for Part A	1		0			0			0.00
	Sub Total - A									0.00

SCHEDULE OF RATES [SOR-4] - WIND PART (40MW) - Part-B

B - INSTALLATION & OTHER SERVICES										
4	Inland Freight and Transit Insurance upto Site for all the mentioned supply portion under SOR 1 & SOR 2 for Part B	1		0	NA	NA	NA			0.00
5	Installation, Erection, Testing and Commissioning including Performance Testing and insurance in respect of all the Equipments Supplied under SOR 1 & SOR 2 for Part B	1		0			0			0.00
6	Civil and allied works including construction and installation of Trenches, Module Mounting Structure, foundations, etc. of all the Equipments Supplied under SOR 1 & SOR 2 for Part B	1		0			0			0.00
Sub Total - B										0.00

SCHEDULE OF RATES [SOR-4] - BESS PART (20 MWH) - Part - C

C - INSTALLATION & OTHER SERVICES										
7	Inland Freight and Transit Insurance upto Site for all the mentioned supply portion under SOR 1 & SOR 2 for Part C	1		0	NA	NA	NA			0.00
8	Installation, Erection, Testing and Commissioning including Performance Testing and insurance in respect of all the Equipments Supplied under SOR 1 & SOR 2 for Part C	1		0			0			0.00

9	Civil and allied works including construction and installation of Trenches, Module Mounting Structure, foundations, etc. of all the Equipments Supplied under SOR 1 & SOR 2 for Part C	1		0			0			0.00
Sub Total - C										0.00
SCHEDULE OF RATES [SOR-4] - COMMON INFRASTRUCTURE PART- Part - D										
D- INSTALLATION & OTHER SERVICES										
10	Inland Freight and Transit Insurance upto Site for all the mentioned supply portion under SOR 1 & SOR 2 for Part D	1		0	NA	NA	NA			0.00
11	Installation, Erection, Testing and Commissioning including Performance Testing and insurance in respect of all the Equipments Supplied under SOR 1 & SOR 2 for Part D	1		0			0			0.00
12 A	Civil and allied works including construction and installation of Trenches, Module Mounting Structure, foundations, etc. of all the Equipments Supplied under SOR 1 & SOR 2 for Part D	1		0			0			0.00
12 B	Civil works required for Solar Park establishment for Pooling substation cum control room Building, Land leveling, Road, Fencing, Bore Wells including water & plumbing arrangements	1		0			0			0.00
Sub Total - D										0.00
Grand Total (Installation & Other Services) A+B+C+D										0.00

General instructiosn to fill the Price Schedules	
1	Bidders are required to fill the relevant portion/Parts/Line items/scope of the respective Price Schedules only. In case, any line item is left blank by the bidder, it will be deemed assumed by the Employer that such portion/Parts/line item/Scope has been considered by the bidder suitably somewhere else in the Price schedules.
2	In case the bidder don't want to mention any quantity/price in any particular line item, then he has to mandatorily put zero (0) against that particular line item.

Schedule No. 5. Operation & Maintenance	

SCHEDULE OF RATES [SOR-5] [OPERATION AND MAINTENANCE]- PLANT FACILITIES													
Sl. No.	Description of Item	Year	PRICES (INR)										
			Currency	Yearly O&M Price in INR (Excluding GST)				Total O&M Price (INR) (Excluding GST) in figures	Total value of Applicable GST in absolute figures [GST to be calculated on absolute O&M Price	% (Percentage) of Goods & Service Tax (GST) considered	Total O&M Price including GST	Present Value Factor (PVF)	Total NPV of O&M Price including GST
				Solar PV - Part-A	Wind - Part-B	BESS - Part-C	Common Infra - Part-D						
1	2	3	4	5	6	7	8	9=5+6+7+8	10	11	12=9+10	9.08%	13=12*PVF
OPERATION & MAINTENANCE													
1	Operation and Maintenance of the Plant Facility for FIRST YEAR	1		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.917	0.000
2	Operation and Maintenance of the Plant Facility for SECOND YEAR	2		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.840	0.000
3	Operation and Maintenance of the Plant Facility for THIRD YEAR	3		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.770	0.000
4	Operation and Maintenance of the Plant Facility for FOURTH YEAR	4		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.706	0.000
5	Operation and Maintenance of the Plant Facility for FIFTH YEAR	5		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.648	0.000
6	Operation and Maintenance of the Plant Facility for SIXTH YEAR	6		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.594	0.000
7	Operation and Maintenance of the Plant Facility for SEVENTH YEAR	7		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.544	0.000
8	Operation and Maintenance of the Plant Facility for EIGHTH YEAR	8		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.499	0.000
9	Operation and Maintenance of the Plant Facility for NINTH YEAR	9		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.457	0.000
10	Operation and Maintenance of the Plant Facility for TENTH YEAR	10		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.419	0.000
	TOTAL NPV OF O&M FOR 10 YEARS (1+2+3+4+5+6+7+8+9+10)												0.00
TOTAL NPV OF O&M FOR 10 YEARS (1+2+3+4+5+6+7+8+9+10)			(In Words)										

Schedule No 6 : Energy Generation for Plant facility in KWh

SCHEDULE OF GENERATION [SOG]/ENERGY GENERATION IN KWH - PLANT FACILITIES				
Sl. No.	Year	Energy Generation (kWh)		
		Yearly Energy Generation (kWh)		Yearly Energy Generation (kWh) for Plant Facility
		Solar PV Plant	Wind Plant	
1	2	3	4	5=3+4
1	1	231264000	0	231,264,000
2	2	229645152	0	229,645,152
3	3	228037636	0	228,037,636
4	4	226441372	0	226,441,372
5	5	224856283	0	224,856,283
6	6	223282289	0	223,282,289
7	7	221719313	0	221,719,313
8	8	220167278	0	220,167,278
9	9	218626107	0	218,626,107
10	10	217095724	0	217,095,724
ENERGY GENERATION IN KWH - PLANT FACILITIES FOR 10 YEARS				2,241,135,154

SCHEDULE NO 7 /SCHEDULE OF RATES [SOR-7] - GRAND TOTAL SUMMARY	
Total Price of Schedule No 1/SOR 1	0.00
Total Price of Schedule No 2/SOR 2	0.00
Total Price of Schedule No 3/SOR 3	0.00
Total Price of Schedule No 4/SOR 4	0.00
Total Price of Schedule No 5/SOR 5	0.00
Evaluated Bid Value of the Plant Facility (SOR 1+SOR 2+SOR 3+SOR 4+SOR 5)	0.00
Energy Generation of the Plant facility SOG	2,241,135,154.00
Evaluated Bid Value per KWh (EBVKWh)	0
Evaluated Bid Value per KWh (EBVKWh) in Words	

**In case of Foreign Bidders, the price values of SOR 1, SOR 3 , SOR 3 & SOR 4 will be first converted to INR for evaluation purpose & then accordingly the final EBVKWH will be calculated