SUB-SECTION E

SPECIFIC ANNEXURE B

Project Specific Technical Details

TABLE OF CONTENTS (to be updated)

1 DESIGN PHIILOSOPHY

1.1 Bidder is free to propose his design of the solar plant including solar plant layout, solar block sizing, inverter sizing, inverter-transformer sizing etc. subject to meeting the boundary conditions/design parameters as specified in the **Clause 3** below.

1.2 Bidder would be required to submit design details for 540Wp Modules as well as actual Wp that would be supplied by Employer, during detailed engineering. However, for the purpose of bidding consideration, only the design for 540Wp is to be considered

1.3 **Solar PV Module – Input Details:**

Owner shall provide the exact PV Module characteristics including datasheet and other documents after the award to BOS Contractor. There might be changes in the dimensions, weight, and Isc as per the actual PV Module compared to the inputs provided by Owner at **Clause 3** of this document. BOS bidder may suitably design the BOS system to consider such minor changes.

2 GENERATION GUARANTEE

2.1 The annual generation shall be finalized during detailed engineering through PV Syst document (P75 value), based on the boundary conditions and design parameters specified by SECI.

2.2 Bidder shall submit PV Syst report complying with the design parameters specified in **Clause 3** below and the actual Module PAN file supplied by Employer to arrive at the **TARGET GENERATION (G_{T_ref})** (P75 value) for first year O&M at 220kV plant end ABT Meter.

2.3 However, this target generation figure for first year O&M shall be revised as per the outcome of O&M Target Generation Test (OTGT), based on following variations in the –

(i) Actual Loss Parameters
(ii) Results of O&M Target Generation Test
(iii) Any other factors considered reasonable by the Employer

2.4 This revised generation to be called as **UPDATED TARGET GENERATION (G_{TN})**, shall be

Actual Generation Target for the first year of the O&M period.

2.5 The bidder shall guarantee this UPDATED TARGET GENERATION (G_{TN}).

2.6 Generation Guarantee for N^{th} year of O&M period and Liquidated Damages for shortfall in performance during O&M period is calculated as per SS-F: Operation & Maintenance Agreement of this Tender Document.

2.7 **Note:** Kindly Refer to GA-J: O&M Target Generation Test procedure and SS-F: Operation & Maintenance Agreement of this Tender Document for more details.

3 BASIC ENGINEERING DESIGN PARAMETER OF SOLAR PV PLANT

S. No.	Parameter	Value
1	Geographical site	
	(i) Latitude	24° 30' 25.21" N
	(ii) Longitude	71° 16' 56.21" E
	(iii) Altitude	19 m
	(iv) Time zone	5.5
	(v) Data source	SolarGIS TMY P50
2	Reference PV Module (for Bidding Purpose only)	
	PV Module Wattage*	540 Wp Mono PERC
	PV Module Characteristic* (Bidder may perform PVSyst Simulations for any Mono PERC PV module - matching the module dimensions for Bidding Purpose)	For 540Wp - 2278mm x 1134mm Module Cable Length- 1200mm 28 modules in series
4	Module Orientation	
	(i) Field type	Fixed Tilt, South Facing
	(ii) No. of orientations	1
	(iii) Tilt[$]	19°
	(iv) Min Pitch[$]	7.5 m (as per site requirement)
	(v) Azimuth	0
4	System	
	(i) Planned power (MWp)	260,000 kWp (**Note:** Actual DC capacity which shall be provided by Employer may vary in the range of **+/- 10%**, consequent variation in contract price shall be calculated as per Contract Price Variation Clause of this Tender Document mentioned

S. No.	Parameter	Value
		elsewhere)
	(ii) Planned AC Capacity (MW)	200,000 kW
	(iii) PV Module PAN file	As provided by Employer during Detailed Engineering
5	Inverter Characteristics	As per BoS Contractor (shall provide OND file)
6	PV Syst Simulation Parameters	
(i)	Thermal Loss Factor (Uc, Uv)	Uc - 29 Watts/m^2-K Uv - 0.0 Watts/m^2-K
(ii)	DC Cabling loss at STC	as per system design chosen by bidder/contractor (Maximum limit as per **Clause 2.5** of SS-B: TS-Electrical)
(iii)	AC Cabling loss at STC	as per system design chosen by bidder/contractor (Maximum limit as per **Clause 6.5** of SS-B: TS-Electrical)
(iv)	Transformer Loss (for MV transformer, i.e. for IDT)	As per Transformer data sheet (Maximum 1.5%)
(v)	Power Transformer Loss	As per Actual data sheet (Maximum 1.5%)
(vi)	Module Quality/Efficiency Loss	• for C-Si Modules – 0.00% • for thin film Modules – First year degradation of PV module if provided by the Employer
(vii)	Module mismatch losses – Power Loss at MPP	1.0 %
(viii)	LID loss factor	• for C-Si Modules – First year degradation of PV module if provided by the Employer • for thin film Modules – 0.00%

<table>
<tr><th>S. No.</th><th>Parameter</th><th>Value</th></tr>
<tr><td>(ix)</td><td>Spectral correction</td><td>Applicable only for Thin-film CdTe</td></tr>
<tr><td>(x)</td><td>Bifacial System (applicable only if Bifacial Module is provided by the Employer)</td><td>i. Use Unlimited sheds 2D-model
ii. Ground Albedo- Refer to Clause 3 below.
iii. Shade transparent fraction - 0%
iv. Structure Shading factor - 5%
v. Mismatch loss factor - 10%
vi. Height above the ground- 0.5m
vii. Bifaciality factor - As per module manufacturer specifications</td></tr>
<tr><td>(xi)</td><td>Soiling Loss</td><td>1.00%</td></tr>
<tr><td>(xii)</td><td>IAM Losses</td><td>As per PV Module Characteristic</td></tr>
<tr><td>(xiii)</td><td>Auxiliary Energy Loss</td><td>5 Watts/kW</td></tr>
<tr><td>(xiv)</td><td>Auxiliary Power Loss at Pooling Substation</td><td>As per Actual outside PVSYST</td></tr>
<tr><td>Q</td><td>Weather Data Variability & Simulation Parameters Uncertainties</td><td><table>
<tr><td>Annual variability of solar radiation</td><td>1.78%</td></tr>
<tr><td>PV Module modelling uncertainty</td><td>1.00%</td></tr>
<tr><td>Inverter efficiency uncertainty</td><td>0.5%</td></tr>
<tr><td>Soiling and Mismatch Uncertainties</td><td>1.00%</td></tr>
<tr><td>Degradation uncertainty</td><td>1.00%</td></tr>
<tr><td>GHI modelling uncertainty</td><td>3.9%</td></tr>
</table></td></tr>
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*** The parameters may be suitably modified based on the actual module panel dimensions and site conditions.**

$ The parameters may be suitably modified based on the actual module panel dimensions and site conditions, provided the revised orientation results in improved energy generation.

Note: Bidder to mandatorily LIMIT the output of the Solar PV Plant at the Injection Point in PV Syst so that the Power injected into the grid NEVER exceeds the threshold of plot capacity.

4 SOLAR INSOLATION DATA FOR PROPOSED SITE

Month	Reference Global Horizontal Irradiation (GHI_{ref}) (kWh/m2)	Albedo
January	141.4	0.17
February	159.2	0.17
March	206.7	0.16
April	214.2	0.16
May	225.2	0.15
June	164.9	0.15
July	123.7	0.13
August	114.7	0.15
September	141.1	0.15
October	167.8	0.16
November	143.6	0.17
December	131.0	0.17
Annual	**1,933.7**	**0.16**

5 PV MODULE – PERFORMANCE DETERMINATION

5.1 The procurement of Solar PV modules is NOT the Scope of the BoS Bidder. However, any shortfall in generation during OTGT and during O&M Period resulting from the non-performance of the PV Modules (Defective Modules) shall be intimated by the BoS Bidder to the Owner at the earliest.

5.2 The responsibility for measuring the PV module performance output by using necessary equipment, shall lie with the BoS Contractor. The equipment used by BoS contractor for PV MODULE performance measurement shall be calibrated.

5.3 In case of shortfall in Generation during O&M Period or in case of OTF<1 during OTGT Test, if the Contractor attributes the shortfall to non-performance of the PV Modules supplied by the Owner, then the Contractor shall be required to carry out the following

activities:

5.3.1 The Contractor shall perform the following tests, as per the Manufacturer's guidelines (but not limited to), and furnish a comprehensive report to the Owner:

(i) Flash test

(ii) Electroluminescence (Not applicable for thin-film modules)

5.3.2 All such tests for determination of Defective Modules shall be performed by the BoS Contractor at an NABL accredited lab or at a test laboratory compliant with ISO 17025 for testing and calibration.

5.3.3 The determination of the lot size for such tests, shall be jointly decided by the Owner and the BoS Contractor.

5.3.4 The BoS Contractor shall initiate the testing process by randomly selecting samples from the identified lot. The number of samples shall be selected as per the inspection level specified below and in accordance with ISO 2859-1 (Single Sampling Plan for Normal Inspection):

Sr. No.	Test	Inspection level
1	Flash Test	Special inspection level S-1
2	Electroluminescence	Special inspection level S-1

5.3.5 The selected samples shall be tested for Flash Test and Electroluminescence Test (if applicable) as per the module manufacturer's guidelines.

5.3.6 **Flash Test:** A module shall be declared defective if its output power is derated by more than ±2% of its deemed Wp capacity, considering the allowed yearly degradation.

5.3.7 **Electroluminescence Test:**

(i) The Contractor shall verify EL images of PV Modules as per the Electroluminescence Inspection Criteria provided by the Module Manufacturer (and duly approved by the Employer)

(ii) The EL image shall have sufficient resolution for analysis of defects

5.3.8 **Decision Rules for Defective Modules:** The following Acceptance Quality Limit (AQL) shall be applied for determining the acceptance or rejection of the lot, as per ISO 2859-1:

Defect Type	AQL (%)
Major (Ma)	2.5
Minor (Mi)	4

5.3.9 The BoS Contractor shall submit the complete testing report along with supporting data and analysis to the Employer.

5.3.10 If the selected lot is within the AQL limits mentioned above, the BoS Contractor's claim regarding defective modules shall be rejected.