



Terms of Reference

for

Design, Supply, Installation, Commissioning, and Maintenance of 140 kWp Floating Solar Photovoltaic (FSPV) project at Periyakulam lake in Coimbatore, Tamil Nadu

Title	Design, supply, installation, commissioning, and maintenance of 140 kWp Floating Solar Photovoltaic (FSPV) project at Periyakulam lake in Coimbatore, Tamil Nadu
Project	CapaCITIES Phase II
Location	Coimbatore, Tamil Nadu, India
Timelines	Publishing of ToR on ICLEI SA /CapaCITIES websites: 26 June 2023
	Last date for acceptance of proposals: 21 July 2023
	Invitation to site visits for shortlisted bidders: 26 July 2023
	Last date to share detailed technical design: 4 August 2023
	Announcement of successful bidder: 8 August 2023
Award of Work Order: 11 August 2023	
Tender Inviting Authority	<p>ICLEI South Asia C-3, Lower Ground Floor Green Park Extension New Delhi – 110016, India Tel: +91 – 11 – 4974 7200 Email: iclei-southasia@iclei.org</p>



Contents

Contents.....	2
1. Project Background.....	4
2. Project Overview	4
Site Description	4
Brief Scope of Work.....	7
Details of Tasks.....	7
3. Technical Requirements and Bill of Quantities	9
Technical Specifications for the FSPV Project	9
Electrical Characteristics	9
Interfacing Facilities.....	10
Climatic Conditions	10
Bill of Quantities	11
4. Eligibility Criteria and Bid Submission.....	12
Eligibility Criteria for Bidders.....	12
General Conditions:	12
Technical Eligibility Criteria:	13
Financial Eligibility Criteria:	14
Bid Submission	14
Documents to be submitted by bidders	14
Contact Information for Bid Submission.....	15
5. Instruction to Bidders	16
General Instructions	16
Tender Evaluation & Bid Assessment	16
Instructions for Shortlisted Bidders.....	17
Award of contract.....	17
Performance Guarantee for Construction and Operation & Maintenance	18
Performance guarantee for EPC Contract.....	18
Performance guarantee for O&M Contract	18
Execution of Contract and Payment Schedule	19
6. Terms of Contract	19
Contractor Obligations.....	19
Penalty for delay.....	20



Extension of date of completion	20
Materials/Appliance at site	21
Photographs	21
Third Party Inspection Agency	21
Liability	21
Confidentiality	22
Procurement	22
Installation	22
Testing & Commissioning	22
Interconnection	23
O&M	23
Defects Liability	23
Plant Performance Guarantee	23
Commissioning	24
Provisional Plant Acceptance Criteria	24
Plant Acceptance and Handing Over –Taking Over	24
Performance Ratio (PR) Measurement and Testing	25
Performance Test Measurement Criteria	25
DC capacity calculation	25
PR test methodology for Provisional Plant Acceptance	25
Parties to the test and responsibilities	25
Preparations before performing PR test	25
Minimum irradiance criteria	25
Performing PR test	26
PR calculation methodology	26
Exclusion	27
Uncertainty	27
Annual PR	27
LD during O&M period for Plant Availability	28
7. Annexure 1: Formats for submission of bid	29
8. Annexure 2: Format for Performance Bank Guarantee	Error! Bookmark not defined.



1. Project Background

Capacity Building for Low Carbon and Climate Resilient City Development project (CapaCITIES) Phase II project, funded by the Swiss Agency for Development and Cooperation, aims to strengthen the capacities of Indian cities to plan and implement climate resilience actions, considering both climate change adaptation and mitigation measures in an integrated manner in key urban service sectors. After the successful implementation of the first phase of the project in Coimbatore, Rajkot, Siliguri and Udaipur cities, the CapaCITIES project in its second phase focuses on enhancing the capacity of 4 more cities namely, Ahmedabad, Vadodara, Tiruchirappalli, Tirunelveli, in implementing climate resilience actions. The project also engages with the state government of Gujarat and Tamil Nadu to mainstream climate action in urban development through adoption of integrated climate-resilient planning, design of innovative finance mechanisms and development of climate-resilient infrastructure.

ICLEI South Asia, the South Asian arm of ICLEI - Local Governments for Sustainability, is a strong and vibrant local government association with a membership base of over 70 cities in the region. ICLEI South Asia is a consortium partner of the CapaCITIES Phase II Implementing Agency, which also comprises of South Pole Group and econcept AG and is implementing the project across selected cities and states. The primary objectives of the project are to support the city and state governments to integrate climate change aspects (adaptation and mitigation) into urban planning and implementation, and to enhance the capacities of city and state governments to access finance for scaled up urban climate action.

Coimbatore, as a partner city to the CapaCITIES project, has been receiving technical and funding assistance from the project in preparation of the Climate Resilient City Action Plan addressing both climate change mitigation and adaptation aspects, and in identifying and implementing pilot demonstration projects and bankable projects. As part of their engagement with the CapaCITIES Phase II project, Coimbatore City Municipal Corporation (CCMC) expressed their interest to deploy RE plants for captive consumption in addition to its already existing cumulative RE capacity of 5.6 MWp.

The intention of CCMC was to deploy a pilot Floating Solar PV (FSPV) plant in one of the cities' water bodies with technical and funding support under the project and use that experience to scale up and deploy MW scale projects across lakes in the city to offset their energy consumption. The local government had proposed Periyakulam, one of the major lakes in the city spread over an area of 136 hectares, for deployment of FSPV subject to technical and financial feasibility of the project.

In this regard, CapaCITIES Phase II project tendered out an assignment entailing potential assessment and development of a technical feasibility report for deployment of MW scale FSPV in Periyakulam lake, including the identification of suitable location for deployment of a pilot project and assistance in the tender process. The project hired an experts team that assessed the potential of Periyakulam lake and prepared a technical feasibility report based on which this Terms of Reference (ToR) is published.

2. Project Overview

Site Description


The Periyakulam tank is one of the lakes in the city where eco-restoration work is has been undertaken under the Smart City Mission and is located at the focal point of the city, close to important transit facilities and in proximity to densely populated core city areas and commercial centre of the city. The

lake has inflow of water from 6 inlet points on the northern bank and outflow through 3 outlets on the eastern and Southern banks of the lake.

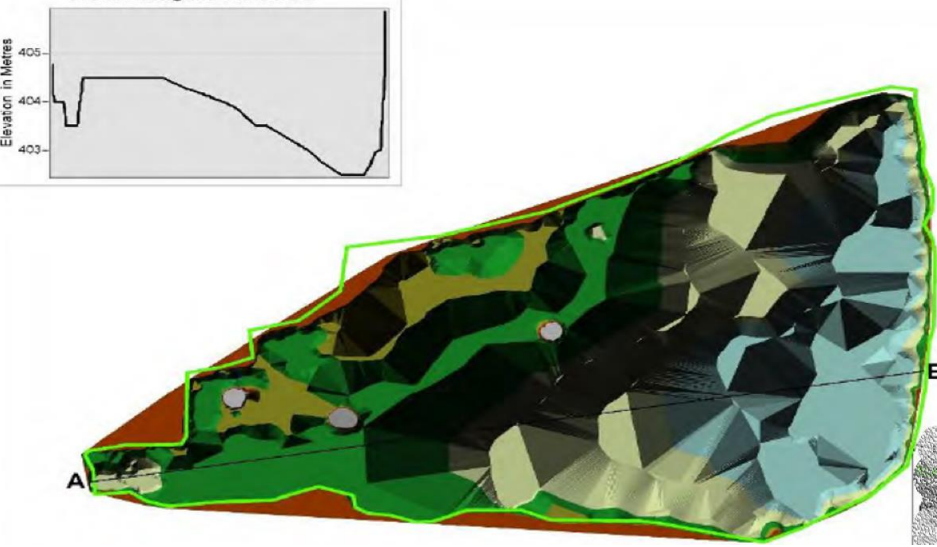


The lake has a Full Tank Level (FTL) of 5.82 m and Maximum Water Level (MWL) of 6.51 m and Tank Bund Level (TBL) of 7.88 m. Based on the bathymetry profile developed for the lake under the eco-restoration project, the difference in the depth of the lake is up to 6 m sloping towards southwestern region of the lake. Western edge slope is steep, while eastern edge is comparatively plainer. The lake interfaces with the city on the northern and the eastern banks while the southern and western banks are close to the river Noyyal and have agricultural fields around them, and the access to these banks are not defined.

The team of experts hired by the CapaCITIES Project for technical assistance to this project have assessed the potential of FSPV deployment in the lake, identified the suitable location within the lake area for deploying the pilot project and have submitted a technical feasibility report. Table 1 shows the study area, project location and other details.

Table 1 Project Site Details

Item	Description
Address	Periyakulam lake, Coimbatore, Tamil Nadu
Coordinates	10.98° N, 76.95° E
Site Image	



Item	Description
<p>Bathymetry chart</p>	<p>Profile along the section AB</p> 
<p>Plant location</p>	
<p>FSPV project</p>	



Brief Scope of Work

ICLEI South Asia, on behalf of Coimbatore City Municipal Corporation under Namakku Naame Thittam (NNT), invites bids from qualified contractors in two stages for the work of Design, Supply, Installation & Commissioning, and Maintenance of 140 kWp (DC) Floating Solar PV (FSPV) plant at Periyakulam lake in Coimbatore, Tamil Nadu. Eligible bidders will be shortlisted and invited by the CapaCITIES project team members to visit the site and submit the detailed proposal for Engineering, Procurement, Construction (EPC) and fifteen (15) years of Operation and Maintenance (O&M). Based on the evaluation of the detailed EPC cum O&M proposals, one (1) bidder will be selected to undertake the tasks outlined in this scope of work.

A qualified bidder, hereinafter referred to as the “Contractor” needs to set up a Floating Solar PV Power Plant at Periyakulam lake with total capacity of 140 kWp (DC) Power Plant including but not limited to the scope of works given below. The Contractor shall perform all the tasks required for successful commissioning and O&M of the FSPV project:

1. Engineering, Procurement, importing, transportation to site, storage at site,
2. Site development, Construction, Erection and Installation of equipment, Testing and Commissioning of the 140 kWp (DC) FSPV project,
3. Demonstrate assured performance of the Plant as specified in the bidding document,
4. Operate and maintain the plant for 15 years including 2 years of Defect Liability Period (DLP), effective from the date of commissioning or Commercial Operation Date (CoD).

Details of Tasks

The scope of work shall include Designing, Planning, Engineering, Procurement (Manufacturing / Supply), Construction, Erection and Installation of Equipment, Testing, and Commissioning of the 140 kWp (DC) Floating Solar PV Plant (hereinafter called as FSPVP) as a Turnkey Contract according to terms and conditions set out in this document.

The FSPVP should be designed, installed, and commissioned as per technical specifications provided in Section 3, and in conformance with IEC Standards as applicable for all the equipment considered for the project implementation such as IEC - 61727, 61730, 61215, 60904, 62109, etc. or currently available standards which ensure the best performance. The contractor shall also be responsible for operation and maintenance of the Project for a period of fifteen (15) years.

The Turnkey contract for the FSPVP shall be in accordance with all applicable permits and regulations set out by the Government of India, and the State Government of Tamil Nadu. The FSPVP should fulfil the minimum Guaranteed Performance and the Technical Specifications presented in this document. The contractor shall be responsible for, but not limited to, the following scope of works:

1. Basic project planning, sequencing, and scheduling, solar resource assessment, energy yield prediction, basic and detailed engineering, project component selection, preparing engineering and construction drawings, availing planning permissions, and all other requirements as required for commissioning and interconnecting the FSPV to the existing electrical distribution system.
2. The contractor must submit the Master Deliverable List (MDL) and Level 2 Project Schedule within seven (7) days from the date of award of work order.
3. The contractor shall provide organogram for project execution, and Health, Safety, and Environmental conditions.
4. The contractor shall provide a project schedule comprising of all key milestones till Provisional Plant Acceptance.



5. The contractor shall undertake Bathymetry survey for the project location and additionally for a buffer area to distance of 50m on all sides (lake side).
6. Submission of the drawings and documents as per Master Deliverable List (MDL) agreed between the contractor and ICLEI South Asia for approval.
7. The Contractor can only proceed for the procurement of the major components of the solar PV plant only after prior approval from ICLEI South Asia and CCMC.
8. Supply, sourcing, procurement, transportation including requisite insurance of all solar PV plant equipment.
9. The contractor shall submit all relevant system Single Line Diagrams (SLD), drawings, SPV system performance certificates, etc. to ICLEI South Asia and CCMC for review and approval.
10. The Data logger (both software and hardware) to monitor solar irradiation at tilt, module temperature, inverter parameters and export energy shall be provided.
11. The contractor shall obtain all permits and clearances from all local stakeholders, including government statutory bodies, Electrical Inspectorate etc. as required for completion and commissioning of the FSPVP.
12. As per plant HSE requirement, every work shall be supervised by the contractor deployed Supervisors and will report to the concerned person or representative of the CCMC.
13. Assembly and construction of the entire solar PV plant, all pre-construction tests, site management and supervision, labour provisions, testing and commissioning of all equipment in steps including commissioning and interconnection of the FSPV to the existing electrical distribution system.
14. Labels shall be clearly visible on various equipment, placed to remind the operator that the device should be accessed with caution as there could be an energized part that comes from the indirect renewable energy generation system.
15. All the operations not expressly included, that are necessary for proper functioning of the FSPV and fulfilment of the guaranteed performance, rules, regulations, and applicable codes, being the meaning of necessarily all these things which are inherent to the Project and without which the solar PV plant would be unable to start operating in Captive mode in synchronization with existing system.
16. Commissioning of the solar PV plant with Provisional Acceptance Test, seven (7) days Start-Up Performance Test, Monthly and Quarterly Performance Evaluations and Performance Tests on the basis of monitored data through data logger or Supervisory Control and Data Acquisition (SCADA) system as required by the CCMC during the Defects Liability Period (DLP).
17. Comprehensively warranting the entire solar PV plant against all defects through a DLP and O&M services for fifteen (15) years, transfer all component warranties, spare parts and tools and tackles to the CCMC post completing the DLP and O&M period.
18. Further to commissioning of the FSPV project; training CCMC's Personnel for Operation and Maintenance, handing-over the plant to CCMC, provision of all the documentation necessary for the correct performance and maintenance for the lifetime of solar PV plant.
19. Operation and Maintenance of the PV plant post commissioning up to fifteen (15) years (including Defect liability Period). During the Defect liability Period and O&M period of fifteen (15) years, the Contractor shall supply all necessary equipment/spares, materials, manpower for replacement of faulty equipment at their own cost.



20. The EPC Contractor shall be the O&M Contractor for fifteen (15) years from the Date of Commissioning (CoD). The O&M Contractor shall follow the plant Health Safety and Environment (HSE) requirements and provide all the required harnesses, tools & tackles, consumables etc. at their own cost.
21. The Contractor shall make his own arrangement for material storage. The space shall be provided by the CCMC. The security of materials is Contractor's responsibility. The Contractor must make suitable arrangements for its own and its sub-contractor's (if applicable) employees during construction and O&M period.
22. The Contractor shall make suitable arrangements for CCMC and/or CCMC's representative for witnessing Factory Acceptance Test (FAT) of key equipment. The list of equipment to be considered for factory witness shall be proposed by the bidding contractor along with their technical bid. The Contractor shall provide fifteen (15) days advance notice for factory inspection along with required documentation for ICLEI South Asia and CCMC's approval.
23. The Contractor shall provide a safety officer for complete construction period.
24. The Contractor shall remove left over construction materials and debris from site within one week of achieving CoD.
25. The Contractor shall make its own arrangements for material lifting to the project execution area.
26. The Contractor shall be responsible for the title transfer of the plant to the CCMC prior to Provisional Plant Acceptance.
27. The Contractor shall depute licensed (with local distribution company) electrical contractor for performing the electrical HT side works.

3. Technical Requirements and Bill of Quantities

Technical Specifications for the FSPV Project

The pilot FSPV project capacity of 140 kWp (DC) is to be installed in the Periyakulam lake in the area identified as shown in the lake layout presented in Table 1. The area considered for the pilot project is approximately 0.4 acres. The renewable electricity generated from the FSPV project shall be fed into the TNEB grid at 11 kV.

Electrical Characteristics

DC System: This shall essentially be applicable from solar PV Modules up to the Inverter. The operating voltage of Inverters shall essentially depend upon the Maximum Power Point Tracking (MPPT) range; however, the maximum system voltage shall be 1500 V. The PV Module of 72 cells has been proposed for complete floating solar plant. The exact number of strings and number of modules in a string should be decided during the detailed engineering. All individual input terminals of Inverter shall have disconnection facility. Solar grade DC cables shall be provided for interconnection between Modules and input terminals of Solar Inverter. A string Inverter with DC input fuse, DC side SPD, and string level monitoring features shall be selected. The Inverter receives varying DC input power from the Module due to varying nature of solar irradiance and motion of Sun throughout the day and year, which is converted into AC power by its highly efficient Power Electronics Circuit working based on Multi MPPT mode and synchronizing to the Grid Frequency and Voltage.

AC System: The recommended point of connection shall be at 11kV. The 11kV AC cable shall be selected based on the power, voltage rating, route length and laying pattern and all AC cables shall be



XLPE, FRLS & armored. The AC output of the single inverter is directly connected to a transformer which shall step-up power to 11 kV. There shall be an In-Coming and Out-Going (ICOG) Vacuum Circuit Breaker (VCB) panel at 11 kV before termination at the existing 11 kV transmission line.

At inverters output end, there should be at least overcurrent, type-II overvoltage, under/over frequency, insulation fault monitor and anti-island protections. The fault current contribution by the inverters is usually limited by the inverter control circuit and this should be based on IEC 61727 or IEEE 1547. Additionally, in ICOG panel, there shall be over current, over voltage, earth fault protections. The Energy Meter with suitable accuracy level is recommended as per metering standard of Central Electricity Authority (CEA) and guideline of Tamil Nadu Generation and Distribution Company (TANGEDCO) for metering. The grid interconnection of the FSPV plant to the TNEB grid at 11 kV has to be carefully assessed by the Contractor during bidding stage.

The earthing system is divided into three parts; DC, AC and lighting Arrester (LA). Earthing of PV module and module mounting structure on floating platform are considered under DC earthing, and inverters, 11 kV switchgear panel or ICOG panel and AC side equipment for power evacuation are considered under AC earthing. Separate earth pits has to be provided by the Contractor for DC, AC and LA. Earthing of each LA in case of ESE type has to be considered under LA earthing. The required number of earth pits has to be calculated to limit effective earth resistance under 1Ω in any event within applicable norms and standards and good practice. ESE type LA of 107 m or more range recommended to protect complete PV array in the lake area. The location of LA to be decided considering the coverage area, shadow impact and ease of installation. However, the Contractor is free to select conventional type LA for which the required quantity of LA must be calculated as per applicable standard.

Interfacing Facilities

The EPC Contractor shall provide the interconnection at 11 kV distribution line of TNEB at the South-East corner of the Periyakulam lake. The FSPV project shall operate in synchronisation with TNEB's grid. The general guidelines for the interconnection arrangement shall be as follows:

1. Evacuation facilities from the point of generation at inverter end to the interconnection point (HV) including the required metering, and protection arrangement at the interfacing point shall be new and properly designed as per applicable codes and standards;
2. All the equipment required for interfacing such as HT switchgear panel, cable, jointer kit etc. shall be provided by the Contractor;
3. The interconnection shall be as per CEA (Central Electricity Authority) "Technical Standards for Connectivity of the Distributed Generation Resources 2007" and amendments thereafter and any other applicable codes and standards.
4. Metering arrangement shall be as per CEA (Installation and Operation of Meters) (Amendment) Regulations and amendments thereafter.

Climatic Conditions

There has been no onsite monitoring of weather parameters till the time of releasing this document. Desktop assessment indicates that the following conditions may be considered by the Contractor for the project component selection and system design:



1. All equipment shall be designed for 50°C Ambient Temperature.
2. Project location falls under Wind Zone- II, where the basic wind speed is 39 m/sec (140.4 kmph) as per IS-875:1987 (Part-3). All structures on the ground and anchoring and mooring system has to be designed considering a design wind speed of 39 m/sec.
3. The seismic forces has to be estimated and considered as per the provisions of IS: 1893 Part 1.
4. Relative humidity of 90% has to be considered for the design and equipment selection.

Bill of Quantities

The equipment and material for 140 kWp (DC) Floating Solar Photovoltaic Power Plant with associate systems (typical) shall include, but not limited to the following:

Items	Item description	Preferred make
PV module	Mono c-Si PERC, 540 Wp or above, 1000 V	Tier-1 and ALMM
Inverter	Min. 100 kW, Grid-tied solar string inverter, 1500 V DC, 3-ph, 50 Hz, multiple Multi Power Point Trackers (MPPTs), Surge Protection Device (SPD) type - II (DC and AC)	SunGrow / Huawei / SMA / Ingeteam / Delta / reputed make
2 Pole structure	Hot dip galvanized iron steel structure	
Floats	Thermoplastic, High Density Poly-Ethylene (HDPE) material with UV stabilizer	Reputed make
Anchoring and mooring system	Helical / dead weight anchors, mooring rope of suitable materials and size	Reputed make
Power Transformer	150 kVA, LV / 11 kV Oil Natural Air Natural (ONAN)	Reputed make
ICOG Panel	11 kV, 40 kA, 630 A Vacuum Circuit Breaker and relay panel with earth fault protection, Multi-Function Meter 0.2s, Red-Yellow-Blue indicators, transformer protection, energy meter, IP 54	Reputed make
Module and equipment mounting accessories	Aluminium, Stainless Steel of suitable grade Hot dip galvanized / Aluminium clamp arrangement for Inverter mounting	Reputed make
DC cable	1Cx6mm ² , Cu, XLPO, FRLS, 1.5kV grade	Leoni/Lapp/reputed
MC4 connectors	IP67	Staubli/Leoni/MC
AC cable	3Cx240mm ² , Al, 1.1 kV grade, XLPE, FRLS AR	Polycab/Havells/Seichem/RR Kabel



Data logger and Weather Monitoring System (WMS)	Data logger, radiation sensor, and module temperature sensors	Datalogger – iPLON/SolarLog /Webdyn/ reputed make Pyranometer - Kipp&Zonen/ reputed make Others – reputed make
Module Cleaning System	1 HP mono block pump, piping network with sprinklers with automated on-off feature	Reputed make
Control cable	Shielded RS485	Belden/reputed make
Earth pit	17.2 mm diameter and 3m long Cu bonded rod, maintenance free earth enhanced material, cast iron pit cover and accessories.	Reputed make
Earthing cable	Module to module - 1Cx2.5mm ² , Cu cable, UV resistance Inverter earthing and earthing grid in floating island - 1Cx16mm ² , Cu cable UV resistance	Polycab/Havells/Seichem/RR Kabel
Lightning Protection System	Early Streamer Emission (ESE) air terminal type lightning arrester with 100 m radial coverage.	Reputed make
Miscellaneous	Fire extinguisher, lighting system, auxiliary supply system, signages, lugs, cable ties, cable trays, thimbles, sleeves, cable identification tags, wall anchors, conduits, connectors, cable	Reputed make

4. Eligibility Criteria and Bid Submission

Eligibility Criteria for Bidders

General Conditions:

1. The contractor should be a body incorporated in India under the Companies Act, 1956 or 2013/NGO/Proprietorship/Partnership/LLB firm & shall be in operation for the last three years.
2. If the contractor ceases to meet the eligibility criteria or the qualification criteria set out in the tender at any time after the application due date and on or after the bid due date, then such contractor shall be disqualified, and its bid shall be liable for rejection.
3. ICLEI South Asia reserves the right to assess the capabilities and capacity of the Contractor / his collaborators / associates / subsidiaries / group companies to perform the contract, should the circumstances warrant such assessment in the overall interest of the project.
4. ICLEI South Asia reserves the right to reject any or all bids or cancel/ withdraw the Terms of Reference (ToR) without assigning any reason whatsoever and in such case no contractor/ intending contractor shall have any claim arising out of such action.



5. The contractor may sub-contract part of his deliverables to another agency. In such case, prior information of the same must be provided to ICLEI South Asia at the time of bid submission. The information of such intention must be sufficed with a suitable letter of authorization from sub-contracting agency expressing their consent to work on behalf of the bidding contractor.
6. In case the contractor wishes to sub-contract part of the deliverables, the final responsibility of delivery and performance lies solely with the contractor.
7. The participating contractor may be a single entity or a group of entities, the “Consortium”, coming together to execute the project. Hereinafter, the word ‘contractor’ used would apply to both single entity and a consortium.
8. In the event the contractor is a consortium, it shall, comply with the following additional requirements:
 - a. Number of members in a consortium shall not exceed 2 (Two) including the Lead Member
 - b. The members of the consortium shall nominate one member as the lead member.
 - c. The members of the consortium shall be responsible for successful implementation of the project throughout the terms of the contract.
 - d. The lead member shall be authorized and shall be fully responsible for the accuracy and veracity of the representations and information submitted by the members respectively from time to time in the response to this Bid.
 - e. The consortium agreement should be submitted with the bid.
 - f. The agreement should be on stamp paper and duly notarized, members should be jointly and severally responsible.
 - g. The consortium should jointly fulfill Eligibility Criteria & pre-qualification criteria mentioned in the document.
 - h. The consortium agreement should clearly mention the roles and responsibilities of each company in the consortium and the percentage share of each member.
 - i. The consortium agreement should mention the lead partner in the consortium.
9. If the contractor ceases to meet the eligibility criteria or the qualification criteria set out in the tender at any time after the application due date and on or after the bid due date, then such Contractor shall be disqualified, and its Bid shall be liable for rejection.
10. ICLEI South Asia reserves the right to seek information and evidence from contractors regarding their continued eligibility and continued compliance with the Qualification Criteria at any time during the bid process. The contractor shall undertake to provide all the information and evidence sought by ICLEI South Asia and CCMC.

Technical Eligibility Criteria:

1. The Contractor should have **installed and commissioned FSPV project(s) of cumulative capacity at least 1 MWp as an EPC contractor or at least 3 MWp as an Installation & Commissioning (I&C) contractor**, which should have been commissioned within the last 36 months prior to the Bid Submission date.
2. The Contractor shall submit, in support to the above, the list of projects commissioned within the last 36 months along with their work order/ LOI/Commissioning certificates and the letter from Client/Employer/Owner confirming satisfactory performance of the Plant.
3. The certificates shall be in English language with mentioning the name of power plant, capacity, contract date and commissioning date of the power plant (make and model of components)



supplied by the Contractor; issue date, name, and address (Telephone/Fax/e-mail) of the end user duly signed in the official letter head.

4. The contractor shall have at least 5 years' experience in implementing any renewable energy (RE) installation work, preferably Solar PV projects.

Financial Eligibility Criteria:

1. An eligible bidder should have a total turnover of at least INR 3 Crore in the last 3 financial years ending March 2023 (cumulatively over 3 years).
2. The net worth of the contractor for the last financial year should be positive.
3. The Contractor will provide a copy of the audited annual report for each of the previous three financial years to ascertain their turnover.
4. The contractor should have GST/VAT registration and up-to-date TIN certificate and should comply to all applicable financial regulations for operating in India.

Bid Submission

Documents to be submitted by bidders

1. The contractor shall possess a valid registration certificate for the said firm.
2. The contractor shall submit GST/VAT registration, up-to-date TIN certificate and all relevant financial & registration documents declared by relevant authorities of Government of India for organization to operate in India.
3. The contractor must not have defaulted under any of the applicable Acts like Income Tax, GST Act, PF & ESI Act, or any other Act which as per the nature of contract is required (Declaration/Return Copies to be furnished).
4. Last 3 Financial Year's balance sheet audited by a certified Chartered Accountant.
5. Details of similar work previously carried out, mentioning Beneficiary, Capacity of Installation, Contract Value, Date of Commencement, Date of Commissioning, Contact details (with telephone no.) of contact person for the given contract etc. shall be provided.
6. Details of tools, tackles, machinery available with contractor.
7. Technical Specifications (TS) Technical document with all relevant enclosures for all equipment as listed in Section 3
8. Details of the key technical personnel (technical personnel must include anchoring & mooring design engineer, electrical engineer, civil engineer) whom the contractor shall engage for this project. Please include their resume providing name, qualification, nature of work (field or office), mode of employment, previous experience.
9. The contractor shall produce original documents for cross verification as and when requested by ICLEI South Asia.
10. Each page of all the documents mentioned above as well as technical and price bid documents shall be duly signed by the contractor.

Financial proposal for the scope mentioned above and comprising all the minimum technical components as specified in Section 3. The unit cost of each component should be mentioned as per the BOQ. The financial bid shall be inclusive of all the costs including taxes associated with the project. It is clarified that, for the purposes of evaluation, the financial bid should be prepared in Indian Rupees (INR). In submitting the price bid, the Consultant shall adhere to the following requirements:



1. The price quoted shall be fixed and firm and not subject to any escalation or variation. The price should be inclusive of all transportation and installation charges including all required material to successfully complete tasks, duties & taxes, insurance and as per the format given in Annexure 1.
2. Bill of materials for the FSPV system as indicated in Section 3 should be provided along with the price bid format as given in Annexure 1.
3. Details of cash flows during the Operation and Maintenance Period shall be provided by the contractor separately as per the format given in Annexure 1. The contractor should also mention minimum unit generation guaranteed by the bidder for a period of 15 years from commercial operations date. The contract shall mention yearly generation of minimum guaranteed units after factoring panel deration, auxiliary plant consumption etc. i.e., net units to be available for CCMC for its own use.
4. The contractor shall submit a separate quotation for conducting annual O&M of the plant for 15 years along with the financial bid along with cash flow estimations for CCMC during the period. However, the overall cost for EPC and O&M provided as per the financial bid format will be considered for bid evaluation.
5. ICLEI South Asia reserves the right to modify the final size and components of the FSPV system at the unit rate quoted by the contractor.
6. All or any accessories/consumables/items required for satisfactory commissioning of the work shall be deemed to be included in the contract and shall be provided by the contractor without extra charges.

Contact Information for Bid Submission

1. The Terms of Reference (ToR) shall be downloaded free of cost from the [ICLEI South Asia](#) and [CapaCITIES](#) project websites.
2. **The bid documents** consisting of both technical and financial bids, and the supporting documentation **shall be submitted by contractor through email to the below mentioned email IDs on or before 10/07/2023:**
 - a) Soumya Chaturvedula, Deputy Director, ICLEI South Asia
(Email: soumya.chaturvedula@iclei.org)
 - b) Sella Krishnan, Senior Manager (Energy & Climate), ICLEI South Asia
(Email: sella.krishnan@iclei.org)
 - c) Nikhil Kolsepatil, Senior Manager (Energy & Climate), ICLEI South Asia
(Email: nikhil.kolsepatil@iclei.org)
 - d) Senthil Kumar Arumugam, Senior Project Officer (Energy & Climate), ICLEI South Asia
(Email: senthil.arumugam@iclei.org)
3. For any queries, please write to the below mentioned email contacts for clarification **at least 3 days in prior to the last date of bid submission:**
senthil.arumugam@iclei.org
sella.krishnan@iclei.org
v.jain@southpole.com
4. The bid shall be valid for a period of 60 days from the date of submission of the bid document.
5. A contractor shall submit the bid documents that satisfies every condition laid down in this notice, failing which, the bid will be liable to be rejected by ICLEI South Asia.



5. Instruction to Bidders

General Instructions

1. The bidder shall be deemed to have carefully examined the work and site conditions. In this regard, he/she will be given necessary information to the best of knowledge of ICLEI South Asia in consultation with but without any guarantee to it.
2. If he/she shall have any doubt as to the meaning of any portions of the scope of the work, or any other matter concerning the contract, he/she shall in good time, before submitting his tender, set forth the particulars thereof and submit them to the point of contacts, as given in Section 4 this TOR, by email in order that such doubts may be clarified authoritatively before tendering. ICLEI South Asia will respond to queries until 3 days prior to the last date of bid submission. Once a tender is submitted, the matter will be decided according to the tender conditions in the absence of such authentic pre clarification.
3. The contractor/ consultant shall address all aspects of the proposed outputs and deliverables mentioned in this TOR.
4. The comments and suggestions provided by the bidder on the TOR are not binding and should not affect the financial proposal.
5. It should be noted that the project is being implemented in areas under the jurisdiction of CCMC, and hence instructions to bidders will be given by ICLEI South Asia in consultation with officials from the CCMC. ICLEI South Asia will be overall in-charge of all the work that would be executed under the present scope of work.

Tender Evaluation & Bid Assessment

1. The bids received will be scrutinized & evaluated by ICLEI South Asia, and if required, in consultation with senior city officials from CCMC involved in the execution of the project.
2. The bids will first be evaluated to determine responsiveness to the ToR. A Bid shall be considered responsive only if:
 - a) the Bid is received by the Bid Due Date, including any extension thereof,
 - b) it is signed, sealed, and marked as stipulated in ToR,
 - c) it contains the following information and documents (complete in all respects) as requested in this ToR:
 - Technical bid
 - Financial bid
 - Supporting documents
3. ICLEI South Asia shall evaluate and determine whether the contractors have submitted a technically responsive bid. The decision of ICLEI South Asia shall be final with respect to the selection of the qualified bidders. If required, clarification or additional documents from the contractor shall be sought.
4. ICLEI South Asia will inform those contractors whose proposals did not meet the minimum qualifying requirements or were considered technically non-responsive to the terms of reference and their Price Bids will not be opened.
5. Total Contract Value quoted by each qualified Bidder that has submitted a substantially responsive Financial Proposal will be tabulated and shall be checked for arithmetical errors. If there is a



discrepancy between words and figures quoted as the Total Contract Value, then the amount in words shall prevail.

- 6 Only contractors whose bids are found to be responsive shall be shortlisted and invited for a site visit to the project location, and subsequently to submit the system design proposal.
- 7 Based on an evaluation of the detailed system design proposals, one (1) contractor will be selected to undertake the tasks outlined in the scope of work. For seeking any further clarification/s a meeting would be called virtually or individually, if desired, in which case the contractors shall be informed accordingly.
- 8 Selection of the qualified contractor to undertake the work detailed in this ToR shall be a techno-commercial decision based on price negotiation, Net Present Value (NPV), and agreed terms and conditions as per the contract.
- 9 The Bid Award Criteria shall be the highest NPV computed with a discount rate of 8% on 15 years cash flows. The cash flows would be computed as under:
 - a) Based on the yearly minimum guaranteed units available for use to CCMC, CCMC shall consider 6.5 INR per unit as unit rate (levelized for 15-year period) for computing yearly revenues.
 - b) From these revenues, capital expenditure and yearly operation and maintenance expenses shall be deducted and yearly 15 years cash flows shall be prepared (as per format) provided in financial bid.
 - c) These cash flows shall be discounted at an 8% discount rate to arrive at the NPV. The technically qualified bidder obtaining highest NPV shall be the successful bidder.

Instructions for Shortlisted Bidders

1. Based on the technical and financial bids, contractors will be shortlisted and requested to submit a system design proposal to ICLEI South Asia based on a site visit.
2. The shortlisted contractors will be requested by ICLEI South Asia to inspect and examine the site and its surroundings and satisfy themselves before submitting their system design proposals as to the nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information. A shortlisted contractor shall be deemed to have full knowledge of the site based on the inspection and no extra charges consequent on any misunderstanding or otherwise shall be allowed. ICLEI South Asia team will assist with necessary permissions and access to the sites.
3. Shortlisted contractors are expected to study the site condition from both EPC works and O&M point of view.
4. The selected contractor shall submit a detailed project schedule, list of engineering deliverables, conceptual project layout, conceptual Single Line Diagram (SLD), and make and model of key components of project.

Award of contract

- 1 Detailed Work Order will be issued to the winning contractor within 5 days of announcing the winning contractor.
- 2 The winning contractor is to forward the signed and sealed work order to ICLEI at the earliest or not more than 3 (three) days of issue of work order.
- 3 In case the winning contractor fails to indicate his intent to undertake the said work within the



stipulated time of 3 (three) days and observe the formalities as above, the Letter of Intent will be cancelled, and the next contractor will be finalized by ICLEI South Asia in Consultation with senior city officials.

- 4 After selection of the qualified bidder, ICLEI South Asia will issue the Letter of Award (Work Order) to the selected contractor in duplicate:
 - a) declaring it as the successful contractor,
 - b) accepting its Financial Proposal,
 - c) requesting it to fulfil the condition specified in the tender,
 - d) requesting it to pay the Performance Security in accordance with the tender,
 - e) subject to fulfilment of the conditions specified in the ToR, requesting it to execute the Contract within specified timelines.
- 5 Within 7 days of receipt of the Work Order, the contractor declared as the successful contractor shall sign and return, as acknowledgement, the duplicate copy of the Work Order.
- 6 If the duplicate copy of the Work Order duly signed by the successful contractor is not received by the stipulated date, the ICLEI South Asia may, unless it consents to an extension, without prejudice to any of its rights under the Bid Documents or law, withdraw the Work Order and encash the Bid Security.
- 7 Upon withdrawal of the Work Order issued to the successful contractor, ICLEI South Asia has the discretion to select from other qualified bidders.

Performance Guarantee for Construction and Operation & Maintenance

Performance guarantee for EPC Contract

1. The contractor shall submit a Performance Security of 10% of total EPC Contract Value in the form of an irrevocable and unconditional bank guarantee issued by any scheduled Bank of India payable in favor of ICLEI South Asia and payable at New Delhi.
2. The Performance Security or the Performance Bank Guarantee shall remain valid till one (1) month post Plant Acceptance (estimated as Six (6) months from the date of award of contract).
3. A refund of the Performance Bank Guarantee shall be made within Thirty (30) days from the date of Plant Acceptance post commissioning of the FSPVP and receiving a provisional plant acceptance letter from ICLEI South Asia / CCMC.

Performance guarantee for O&M Contract

1. Upon commissioning, prior to refund of the Performance Bank Guarantee for the EPC contract, the contractor shall submit a second bank guarantee of 10% of the total cost of annual O&M contract in the form of an irrevocable and unconditional bank guarantee issued by any scheduled commercial bank payable in favour of Coimbatore City Municipal Corporation (CCMC) as a Performance Bank Guarantee for the O&M Contract.
2. In case, the bidder is unable to generate minimum generation guaranteed units (as per the clauses mentioned in "Plant Performance Guarantee" sub-section of Section-6 of this ToR), measured over a quarter period, then the bidder must pay to CCMC the shortfall at the rate of INR 6.50 per shortfall units in that quarter. In case the bidder does not pay, CCMC shall have the right to recover it from the O&M performance security.



3. The Performance Security or the Performance Bank Guarantee during O&M shall remain valid till one (1) month post Plant Acceptance and Handing Over – Taking Over post the 15 years of O&M.
4. A refund of the Performance Bank Guarantee shall be made within Thirty (30) days from the date of Plant Acceptance and completion of Handing Over – Taking Over, post the O&M period of 15 years.

Execution of Contract and Payment Schedule

1. The contractor shall execute the EPC contract signed with ICLEI South Asia **within 20 weeks of issuance of the Work Order**
2. The contractor shall submit the Performance Bank Guarantee for EPC Contract to ICLEI South Asia within 7 days of award of work order.
3. The contractor shall submit the Master Deliverable List (MDL) and Level 2 Project Schedule within seven (7) days from the date of award of work order. The contractor shall provide the project schedule along with a detailed work plan comprising of all key milestones till Provisional Plant Acceptance.
4. If the contractor fails to satisfy the above conditions or fails to execute the Contract on or before the date stipulated in the Work Order, ICLEI South Asia has the right to disqualify the contractor and revoke the Work Order.
5. If, after the execution of the Contract, the successful contractor fails to fulfil any of the conditions precedent to the effectiveness of the Contract, ICLEI South Asia may terminate the Contract and encash the performance guarantee.
6. The payment schedule for the EPC contract will be as per the schedule mentioned below:
Payment Schedule: Payment will be made within 15 days from the date of submission of invoice accompanied by an acceptance certificate/ letter from ICLEI South Asia and photographs depicting work progress printed in color.

Milestones		Payment Terms
1	Completion of detailed engineering and approval of all design documents by ICLEI South Asia and CCMC	5 % of Total Contract Value
2	Receipt of PV modules at site and acceptance by the ICLEI South Asia and CCMC	30 % of Total Contract Value
3	Receipt of all other equipment at site and acceptance by ICLEI South Asia and CCMC	15 % of Total Contract Value
4	Mechanical completion of the Project and Provisional Plant Acceptance by ICLEI South Asia and CCMC	30% of Total Contract Value
6	One month after Commercial Operations Date (date of generation of units for use of CCMC)	20% of Total Contract Value

6. Terms of Contract

Contractor Obligations

In addition to obligations of the contractor specified elsewhere in other sections, the contractor shall be bounded by the following basic obligations:

1. Adherence to all the sections of this document along with all the drawings is essentially a key obligation of the contractor.



2. The contractor shall independently conduct resource assessment and predict energy yields clearly specifying losses and degradation over Project lifecycle. ICLEI South Asia / Third Part Agency representing ICLEI South Asia and CCMC shall closely monitor these losses / degradations and shall link these parameters with the Project performance.
3. The contractor shall be responsible for required liaison with TNEB, CCMC and other local bodies as per requirement for approvals, permits and clearances, including any application, charges/fees that may be payable.
4. Wherever standard codes are referred to in this document, the same shall be followed by the Contractor. Wherever standard codes are not mentioned, the latest relevant BIS, IS, NEC, IEEE and IEC codes and standard shall be followed.
5. The Project being a Turnkey Contract, the scope shall include everything as required for successful implementation, commissioning and operating the plant for its lifecycle of twenty-five (25) years. No variation shall be entertained on this account by ICLEI South Asia or CCMC.
6. The Contractor shall perform works strictly adhering to technical documents and drawings approved by ICLEI South Asia as well as requirements established by the applicable technical regulations.
7. The Contractor shall follow and perform all works in accordance to this technical document, State Solar policies and regulations, Ministry of New and Renewable Energy (MNRE) guidelines, CEA "Technical Standards for Connectivity of the Distributed Generation Resources 2013" and subsequent amendments thereof, "CEA technical standard for Installation and Operation of Meters 2013 and subsequent amendments thereof.
8. The Contractor shall strictly follow the start-up and functional requirements of the Project; this shall essentially include all the material and construction equipment supply, implementation, testing and commissioning of the relevant systems as required for successful completion, and commissioning of the FSPV project.

The Contractor's obligations in respect of the EPC work shall include performing all works and provision of Contractor's Equipment for the Design, Engineering, Procurement, Construction, Installation, Connection, Testing, Start-up, and Commissioning of the Plant at the Site in accordance with the Laws and this document.

Penalty for delay

1. Time is the essence of the contract and as such all work shall be completed within the time stipulated in the contract/ work order.
2. If the bidder, without reasonable cause or valid reasons, commits default in completing the work within the aforesaid time limit, ICLEI South Asia shall without prejudice to any other right or remedy, be at liberty, by giving 15 days' notice in writing to the contractor to commence the work, to forfeit the balance payment depending on the status of work, and to cancel the Work Order.

Extension of date of completion

On occurrences of any events causing delay as stated hereunder, the bidder shall intimate immediately in writing to ICLEI South Asia-

Force Majeure:



1. Natural phenomena, including but not limited to abnormally bad weather, unprecedented floods and draught, earthquakes & epidemics.
2. Political upheaval, strikes, lockouts, acts of any Government (domestic/foreign) including but not limited to war, properties, and quarantine embargoes.

Please note that this clause will only account if an event occurs during site surveys / construction / commissioning period.

Materials/Appliance at site

1. Neither ICLEI South Asia nor CCMC undertake any responsibility for supply of any materials/ equipment/ Appliance/ tool for site analysis to the bidder.
2. All materials/ equipment/ tools brought to site by the bidder shall be the responsibility of the bidder. CCMC and ICLEI South Asia shall extend help as and when approached by the bidder to keep/store any materials/ equipment/ Appliance/ tool, however not liable for any loss, theft, or damage due to fire or other cause, the responsibility for which shall lie entirely on the bidder.

Photographs

To observe the progress of work at different stages of execution of works Contractor shall take out colored photograph at 3 stages i.e., 1) Before execution 2) During execution 3) After completion of work. Contractor shall take out at least 15 photographs of each sub works at each stage. The photographs will be of post card size same shall be submitted along with the running bill in duplicate. No extra cost shall be paid to Contractor on this account.

Third Party Inspection Agency

A third-party agency shall be appointed by ICLEI South Asia, at its sole discretion, to conduct any kind of inspection regarding but not limited to procurement, fabrication, installation, hook-up, and commissioning during the execution of the Project. The Contractor shall provide necessary access and coordination to conduct such inspections. The extent of third-party inspectors' involvement shall be finalized after mutual discussions between the Contractor and ICLEI South Asia.

ICLEI South Asia or its authorized representatives, reserve the right to inspect the project components, as per project schedule to ensure compliance of the quality of Components/ material as per the specification and data sheet before dispatch to site. ICLEI South Asia at its own discretion will visit the premises for inspection with prior intimation to the Contractor. It is the responsibility of the contractor to inform ICLEI South Asia at least 14 days prior to the dispatch of the project equipment. All administrative expenses for ICLEI South Asia or its authorized representatives, will be borne by ICLEI South Asia for above inspections. However, all the expenses related to testing and inspection at manufacturer/ supplier premises or at project site shall be borne by the contractor only.

Liability

ICLEI South Asia may, upon written notice of default to Contractor, terminate the contract in circumstances detailed hereunder:

- If in the judgment of ICLEI South Asia, Contractor fails to complete within the time specified in the contract or within the period for which extension has been granted by ICLEI South Asia in writing in response to written request of Contractor, &/ or,



- If in the judgment of ICLEI South Asia, Contractor fails to comply with any of the provisions of this contract.

In the event ICLEI South Asia terminates the contract either in whole or in part, ICLEI South Asia reserves the right to purchase upon such terms and in such a manner as deemed appropriate work similar to those terminated and Contractor will be liable to the CCMC for any additional costs for such similar work and/or for penalty for delay until such reasonable time as may be required for the final completion of work

Confidentiality

All data and information received from ICLEI South Asia and CCMC for the purpose of this work order are to be treated confidentially and are only to be used in connection with the execution of these Terms of Reference. The contents of written materials obtained and used in this assignment may not be disclosed to any third parties without the expressed advance written notice of ICLEI South Asia.

The documents/ report generated during the work order and submitted to ICLEI South Asia will be jointly owned by CCMC, ICLEI, and Contractor and will be exclusively used for the purpose of this work order only.

Procurement

The Contractor shall be responsible for proper receipt, inspection, unloading and security of all materials in accordance with the Laws and the Contract. The procurement shall be started after approval from ICLEI South Asia and CCMC.

Installation

The Contractor shall complete design of the floating island, anchoring and mooring system, structures, civil, mechanical, and electrical Works required for the installation of the Plant and secure approval of the same from ICLEI South Asia and CCMC prior to commencing execution at site. The Contractor shall install all equipment in accordance with the applicable laws/ rules. EPC contractor shall ensure that installation works shall not cause any disturbance to the local/lake activity.

Testing & Commissioning

The Contractor shall conduct or manage inspections and tests, prepare, and submit documentations to the ICLEI South Asia as per standard processes and procedures set forth in the Contract. The Contractor shall commission the Plant in accordance with the ICLEI South Asia's Requirements and the requirement laid down in this document and the Contract. The Contractor shall commission the Inverter and transformer with On-site Manufacturers' Representative.

The Contactor shall perform all works in accordance with the Contract and in a manner so that the works meet the associated requirements of the ICLEI South Asia/CCMC and Distribution Utility. The Contractor shall provide all staffs, equipment and materials required to complete the Works, including everything necessary to achieve the agreed Plant Commissioning Date, save the specific requirements which are to be fulfilled by the CCMC. The Contractor shall meet all applicable safety and performance standards set out by applicable Laws and Standards.



The Contractor shall maintain all As-Built Drawings on Site for review and shall provide the final set of “As-Built” drawings.

Interconnection

The Contractor’s scope of work shall start from the point of Module supply and installation, supply of floaters and their installation including anchoring and mooring system, equipment foundations and continue up to the point of interconnection at 11 kV. The grid interconnection arrangement has to be such that the grid-tied FSPV project shall remain operational during grid-on hours. Supply, installation, testing and commissioning of all systems, equipment, materials etc. within the range of the interconnection Point shall be in the scope of the EPC Contractor.

O&M

The EPC Contractor shall take full responsibility of comprehensive O&M, starting from CoD for a period of fifteen (15) years. The EPC Contractor shall submit a comprehensive O&M Plan consisting of Plant operation, preventive, corrective and contingency maintenance philosophies. The Contractor shall prepare and submit all Operator’s and Owner’s training and Plant O&M Manuals.

Defects Liability

During the Defects Liability Period of 2 years, the Contractor shall execute any work required to remedy Defects in accordance with the Conditions of the Contract. The response time for remedying defects on working days shall be within maximum twenty-four (24) hours from the time of intimation. In case of holidays, the Contractor shall respond on the next working day. Above all, the Contractor must ensure guaranteed FSPV plant availability and performance.

Plant Performance Guarantee

The Plant Performance Test for Provisional Plant Acceptance will be conducted after commissioning and synchronizing of the Plant. **The guaranteed performance for provisional plant acceptance shall be 79%.** If the Contractor fails to achieve the Guaranteed Performance Ratio for the plant acceptance as per PR methodology as a part of this ToR, the Contractor shall at its own cost rectify all the defects identified during the test and take necessary steps/efforts to pass the PR Test within the stipulated time span. The measurement uncertainty shall be $\pm 3\%$. The deductions against the performance bank guarantee shall be applicable if the actual measured PR is below 97% of guaranteed PR for plant acceptance.

The plant generation during defect liability period i.e., for year 1 and year 2 shall be calculated annually. The plant generation calculation will be based on data recorded through data logger for a complete year from the CoD. The Contractor shall ensure correct working of all sensors, energy meters, measuring instruments and data logger up to the satisfaction of the CCMC throughout the defect liability period.

The Contractor has to provide a minimum annual generation guarantee of 1,490 kWh/kWp of specific energy corresponding to annual solar irradiation of 1,900 kWh/m². The generation shall be weather corrected corresponding to the actual irradiation. The guaranteed generation for subsequent years shall be reduced by 0.5% year on year. The deductions against the bank guarantee during O&M period shall be applicable if the actual generation is below 97% of guaranteed generation for the respective year. If the annual generation of any operational year is lower than the guaranteed generation of that year, the O&M Contractor shall be liable for monetary compensation to the CCMC for loss in revenue due to lower generation for that relevant year e.g. if for year one (1), the Contractor achieves 95% of



the guaranteed generation, then the Contractor will compensate to the CCMC for this 2% (97% - 95%) shortfall of the generation for the year one (1). At the end of the defect liability period, , if the Contractor after the rectification is unable to meet 97% of the guaranteed generation for the year two (2) and instead achieved 95% of the guaranteed generation, then the Contractor will compensate to the CCMC for this shortfall of generation for the entire plant life (up to 25 year) calculated from the year two (2) as per the procedure agreed in the Contract. The electricity tariff of INR 6.50 per kWh shall be applicable for calculating compensation amount to be paid by the O&M Contractor for the shortfall in generation. The specific energy generation value of 1,491 kWh/kWp corresponds to generation value of 79.8%, which shall be considered for the calculation of deductions against performance bank guarantee.

Commissioning

The Plant shall be commissioned means the plant shall be electrically charged and starts supplying solar power. The date on which the Plant is charged electrically and starts supplying power is called date of commissioning or commercial operation date (CoD). The DLP and O&M of the Plant shall start from the CoD.

Provisional Plant Acceptance Criteria

The Provisional Plant Acceptance Certificate shall be issued by ICLEI South Asia / CCMC upon successfully:

1. Achieving mechanical completion;
2. Achieving commissioning of the total project capacity;
3. Achieving guaranteed PR;
4. Clearing of all punch points;
5. Submitting as-built drawings and documents (2 sets of hard copy of all drawings and documents, and soft copy of all drawings and documents in a flash drive);
6. Transferring the plant title to the CCMC;
7. Submitting a performance bank guarantee applicable for O&M period;
8. Submitting the O&M plan for CCMC's approval.

Plant Acceptance and Handing Over –Taking Over

The Plant shall be accepted, and the Plant Acceptance Certificate shall be issued by the CCMC to the Contractor upon successful in meeting guaranteed PR and plant availability. Once Plant Acceptance Certificate is issued, the Plant shall be handed over by the Contractor and taken over by the CCMC upon successful completion of all tasks to be performed at Site on equipment supplied, installed, erected, commissioned, and guaranteed PR achieved for year 1 to year 15 by the Contractor in accordance with provision of the Contract. During handing over of complete Project, the Contractor shall submit the following for considering final payment and release of BG:

1. All as- built drawings and documents as per the contract coordination procedure set out for the successful completion of the Project (two sets of hard copy and a set of soft copy in appropriate format; both pdf and editable file formats).
2. Final Engineering Documents (as-built or detail engineering, which ever is final) with detailed specification, schematic drawing, circuit drawing, cable routing plans and test results, manuals for all deliverable items, Operation, Maintenance and Safety Instruction Manual and other information about the Project.
3. Bill of materials for as-built.



4. Inventory of recommended and mandatory spares and tools and tackles.
5. Clearing dues if any to be paid by the Contractor with respect to applicable penalties, LDs etc.

Performance Ratio (PR) Measurement and Testing

Performance Test Measurement Criteria

This section details the procedure for conducting the Performance Ratio (PR) test for the solar PV project considering weather correction factors (ambient temperature & irradiance) in the calculations and demonstrates guaranteed values for the same.

DC capacity calculation

The sum total of the nameplate values of the rated power of the PV modules actually installed and this is referred as installed DC capacity (P_{stc}). The rated power is at standard test conditions (STC).

PR test methodology for Provisional Plant Acceptance

The test on completion of EPC Contractor ('the Contractor') works by the Contractor shall include conducting a PR test. The duration of the test called 'Test Period' shall be for seven (7) days. The Contractor shall perform the PR test for the entire project capacity. The section below describes the methodology for calculation of weather-corrected PR.

Parties to the test and responsibilities

The parties to the test are the Client, Owner's Engineer and the Contractor. All parties have to understand following test methodology before commencement of test.

The test will be executed by the Contractor. All relevant test data in raw file format, spreadsheets, and computations shall be provided to all other parties to the test for their review. The Contractor will supply raw data before any manipulation and highlight any gaps in the data. The final test report will be produced by the Contractor in the timeline detailed in the Contract.

During the test, any anomalies to this protocol will be documented. The resolutions to anomalies or variations to this protocol that occur during the test period will be documented and approved by all parties to the test in order to continue with the testing effort.

Preparations before performing PR test

Before commencement of test, following activities need to be completed:

- a. Proper install of all primary measurement instruments;
- b. All installed primary measurement instruments are calibrated;
- c. Cold and hot commissioning to be performed successfully for each equipment;
- d. The test procedure shall be published, agreed and understood by all parties to the test;
- e. An adjustment for availability is assumed in the calculation of the PR, whereby anytime there is an availability shortfall (i.e., such time resulting from (a) insured events and their replacement times; (b) main power supply instability; (c) interruptions caused by facility alterations initiated by the Client; and (d) force majeure) all data during such period of unavailability shall be excluded from the PR calculation.

Minimum irradiance criteria

The Provisional Plant Acceptance test period is for seven (7) days long with the following minimum irradiance criteria:



- a. At least three (3) days must have irradiance measured in the Plane of Array (PoA), that is greater than 600 W/m² for three (3) continuous hours, between 11:00 hrs and 15:00 hrs;
- b. If there are not seven (7) days that meet these minimum irradiance criteria, the decision has to be taken by all the parties. There will not be any Liquidated Damage (LD) triggered as a result of this weather-related test delay.

The data will be automatically collected using weather station and temporary loggers (if any) and instruments with a scan rate of at least one (1) minute. Manual data sheets will be used for any non-functioning logger data channel if there will be no increase in test uncertainty.

All collected data will be averaged into 15-minute records, and each record will be used to calculate performance results and evaluate contract guarantees. The calculation methodology is stipulated in section below.

Performing PR test

The following procedure shall be followed by all parties during PR test. Any modification of this procedure shall require mutual agreement between the ICLEI/CCMC's representatives and the Contractor. The tilt angle for period of test shall be the same as the fixed tilt angle during normal plant operation.

The ICLEI/CCMC shall ensure availability of a reliable grid and evacuation system to receive 100% generation before the start of PR test. Any loss of time and / or performance due to such reason shall not be the cause for re-run of the test and the effect of such interruptions shall be excluded from the test results.

During the PR Test, all incidents shall be recorded in a log including the results of the PR test every 15 minutes when the Project is in operation. All unsatisfactory results shall be recorded in the test logbook as well.

The results of PR test shall be daily signed by the ICLEI/CCMC's representative and the Contractor's representative.

The PR test period will conclude with a review meeting. The results of final PR test report for entire test period shall be signed by the ICLEI/CCMC's representative and the Contractor's representative.

PR calculation methodology

The Performance Ratio is a metric used for the comparative performance of grid-connected PV systems irrespective of their orientation, technology, and location. It is unit less and its definition is as follows:

$$PR_{corr} = \frac{\sum_i EN_{AC_i}}{\sum_i \left[P_{STC} \left(\frac{G_{POA_i}}{G_{STC}} \right) \left(1 - \frac{\delta}{100} (T_{cell_typ_avg} - T_{cell_i}) \right) \right]}$$

Where:

PR_{corr} : Weather corrected PR

EN_{AC} : Measured AC electrical generation

P_{STC} : STC-rated capacity of the array in kWp



G_{STC} : STC irradiance, i.e., 1000 W/m²

G_{POA} : Measured PoA irradiance (kW/m²)

i : a given point of time

T_{cell} : Cell temperature computed from measured meteorological data (°C)

$T_{cell_typ_avg}$: Average cell temperature computed from one year (or measured period) of weather data using the project weather file (°C) [as per Owner's or Owner's representative's produced cell temperature data from assumed weather database and PVSyst simulation]

δ : Temperature coefficient for power (%/°C, negative in sign) that corresponds to installed modules.

PR shall incorporate all losses attributed to the quality of the physical and electrical components selected, climatic conditions, and the quality of the installation. However, the PR shall be measured 'net of losses' attributed to accumulated dust and soiling of the modules, hence the reference sensor shall maintain the same level of dust and soiling as the Plant in question and shall therefore receive the same level of maintenance and cleaning as the PV modules.

In addition, the data shall be sorted to eliminate erratic data points caused by force majeure or instability in the grid and/or evacuation system.

For the purpose of conducting the tests on completion, the PR shall be calculated as the average production measured over the period of time of maximum seven (7) days for the number of days minimum radiation criteria meets. To pass Provisional Plant Acceptance test, the measured PR shall be at least 97% of the guaranteed PR.

The 15-minute interval for recording of data may vary according to data logger system actually installed at site.

Exclusion

Energy data during the time period where irradiance / module temperature data is incorrect / missing should be ignored for PR calculation. The data points for irradiance values at which all the inverters are not operational during stable grid condition hours shall not be considered. All equipment, system downtime, grid down time and those periods during which the Project could not deliver electricity due to risk event; should be excluded from PR calculations. Average the measurements from multiple redundant sensors (if available) to increase confidence in measured values.

Uncertainty

Uncertainty due to instrument and energy estimation errors: measurement errors in instruments (meter, pyranometer and thermocouple) and energy estimation errors (from PVSYST or any other yield estimation tool) should be taken into account while making a decision on the test results. Uncertainty in the PR measurement shall be 3%.

[Actual measured PR] >= [(1 - 0.03) x Guaranteed PR]

Data Gaps: Time periods with missing irradiance and/or temperature data should be excluded from PR calculation. All equipment should be operational during PR test.

Annual PR

The PR during defect liability and O&M period i.e. for year 1 to year 2 shall be calculated annually using the formula given in Section 0. There shall not be any PR test conducted at the end of year 1 to



year 5, the calculation will be on the basis of recorded data through data logger for complete year from the CoD. The Contractor shall ensure correct working of all sensors, energy meters, measuring instruments and data logger up to the satisfaction of the ICLEI/CCMC through out the five years O&M period.

LD during O&M period for Plant Availability

During O&M Contract Year 1 to Year 15 of the Operational Term, the O&M Contractor shall achieve annual average Plant Availability of not less than ninety nine percent (99%) (the “Guaranteed Plant Availability”). LD against plant availability shortfall shall be applicable for Year 1 to Year 5. If the O&M Contractor fails to achieve the Guaranteed Plant Availability, the O&M Contractor will be liable to pay LD @0.25% of the annual O&M contract value for every 0.1% shortfall in Guaranteed Plant Availability and such plant availability LD will not exceed five percent (5%) of annual O&M contract value for that contract year. The availability LD shall be calculated at end of each contract year and the same shall be adjusted from subsequent payment(s) due to O&M Contractor.

As per IEC 63019, an equipment is in an unavailable state when the equipment is not capable of operation because of operational or equipment failures, external restrictions, testing, work being performed, or some adverse condition. The unavailable state persists until the unit is made available for operation by being synchronised to the system in service state. The following formula shall be used for the calculation of system availability:

$$\text{System Availability} = 1 - \frac{1}{H_{ttp} * kW_{np}} * \sum_{\text{incident}} (H_{un} * kW_{dr})$$

Where,

1. Theoretical total production hours (H_{ttp}): the hours in the period when sufficient sunlight exists to allow the inverters to reach the input voltage needed to operate. The minimum irradiation is set at 50 W/m² measured on the lowest of the installed plane of array pyranometer / radiation sensor.
2. Array power (kW_{np}): the expected DC power of the array for the entire solar generating facility determined by the sum of each module nameplate kWp rating.
3. Component unavailability hours (H_{un}): the hours in the period when solar irradiance is sufficient to power the inverters, yet an inverter within the facility is not available to generate power due to an equipment fault or failure.
4. Derated system power (kW_{dr}): the kilowatts of lost system power due to inverter unavailability. Derated system power will be calculated from the period the system enters the derated state until it returns to a fully operational state. The value for derated system power will be calculated by the amount of unavailable DC nameplate capacity for the period and is determined by sum of each module’s nameplate kWp rating for that given unavailable inverter. Any string combiner box (SCB, if applicable) outage should not mean that the corresponding capacity is excluded from the calculation, it counts towards unavailability.
5. Note: any testing equipment and work being performed as part of maintenance activity under O&M contract shall be performed within 1% of the agreed unavailability limit.

LD during O&M period against breakdown of other Infrastructure of 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 penalized @ INR 1000/day, per incident of breakdown reported beyond Five (5) Days of such reporting. Cumulative value of such penalty shall be limited to 5% of yearly O&M cost.



The LD as specified on account of delays and on account of deviations in Functional Guarantees as above shall be assessed and levied independent of each other.

The maximum limit of liability for LD for Performance and LD for Availability or breakdown, shall be ten percent (10%) of total O&M Contract Value, then the total Contract Performance Security submitted by the Contractor will be forfeited and further quarterly payments of O&M services will not be made.

7. Annexure 1: Formats for submission of bid

A. Sample format for Submission of Price Bid for FSPV project at Periyakulam lake, Coimbatore, Tamil Nadu

Name of the bidder			
Components	Per Unit kW Cost (INR)	Total Cost (INR)*	Remarks
Solar PV Modules			
String inverter			
Transformer			
Floats and anchoring & mooring			
Balance of System Components			
Installation & commissioning			
Operation & Maintenance for 15 years			
Soft cost			
Total Tax applicable			
Total Cost Design, Supply, Installation, Testing, Commissioning of 140 kWp FSPV project (Inclusive of O&M cost for 15 years) **			
Total Cost in Words			
Lead time for procurement of <ul style="list-style-type: none"> • solar PV modules • inverter • floats • transformer • BoS components 			
*Note- All the rates should be inclusive of all taxes, duties, excise, insurance etc. ** Scope of work subject to approval by ICLEI South Asia and CCMC authority.			

B. Sample format for providing Cashflow details of O&M period.

S. No	Particulars	Year—1	Year--2	Year--n	Year--n	Year--n	Year--15
1	Total Minimum guaranteed yearly Generation of Units (kWh)						



S. No	Particulars	Year— 1	Year-- 2	Year-- n	Year-- n	Year-- n	Year-- 15
2	Yearly deemed revenue to CCMC @ INR 6.50 per unit (levelized for 20 years)						
3	Operation and Maintenance Cost (all heads to be considered including wages, asset maintenance contract, spares, parts replacement, insurance etc.)						
4	Total Project Cost (to be paid by CCMC to the successful Bidder)						
5	Cash Flows (2-3-4)						
6	NPV discounted cashflows at 8%						