Guidelines for Grid-connected Small Scale (Rooftop) Solar PV Systems for Tamil Nadu

Version: April 2014

Scope and Purpose

These Guidelines for grid-connected small scale (rooftop) solar PV systems have been prepared for the benefit of departments and organizations of the Government of Tamil Nadu that plan to install these systems for their office buildings. This document is a guideline document only and the Government Departments and Organizations may make suitable modifications to these documents to meet their specific (process) requirements.

Grid-connected solar PV Systems

There are basically two solar PV systems: stand-alone and grid-connected.
Stand-alone solar PV systems work with batteries. The solar energy is stored in the battery and used to feed building loads after conversion from DC to AC power with a stand-alone inverter. These systems are generally used in remote areas without grid supply or with unreliable grid supply. The disadvantage of these systems is that the batteries require replacement once in every 3 – 5 years.

Grid-connected solar PV systems feed solar energy directly into the building loads without battery storage. Surplus energy, if any, is exported to the TANGEDCO grid and shortfall, if any, is imported from the grid.

These guidelines apply to *grid-connected* small scale (rooftop) solar PV systems.

Solar Net-metering

In Tamil Nadu a facility known as "net-metering" has been introduced. In net-metering the solar energy exported to the grid is deducted from the energy imported from the grid subject to certain conditions. The consumer pays for the net-energy imported from the grid. To enable net-metering TANGEDCO will replace the existing service connection meter with a bidirectional meter that displays the import and export energy separately. For details of net-metering please see the relevant order of the Tamil Nadu Electricity Regulatory Commission (TNERC) of 13-11-2013 (www.tnerc.tn.nic.in).

Rooftop and Installation Requirements

The shadow-free area required for installation of a rooftop solar PV system is about 12 m^2 per kW (kilowatt). This number includes provision for clearances between solar PV array rows. The solar panels may be installed on the roof of the building with a south facing tilt angle that varies in Tamil Nadu from 11 – 13 degrees depending on the latitude of the location. Sufficient area shall be available for servicing the system. The minimum clearance required for cleaning and servicing of the panels is 0.6m from the parapet wall and in between rows of panels. In between the rows of solar panels sufficient gap needs to be provided to avoid the shading of a row by an adjacent row. The solar grid inverter shall be placed indoor in a safe and easily accessible place.

Capital Subsidy by the Ministry of New and Renewable Energy (MNRE)

The Ministry of New and Renewable Energy of the Government of India provides capital subsidies for solar PV systems subject to certain conditions. As of date (March 2014) the capital subsidy for rooftop solar PV systems is 30% of the benchmark cost or 30% of the actual cost, whichever is less. The up-to-date

benchmark cost and capital subsidy terms and conditions may be checked on the website of MNRE (see: www.mnre.gov.in).

System Components

A grid-connected solar PV system consists of the following main components:

- Solar PV (photo-voltaic) array
- Solar PV array support structure
- Solar grid inverter
- Protection devices
- Cables

Solar PV System Capacity Sizing

The size of a solar PV system depends on the 90% energy consumption of the building and the shade-free rooftop (or other) area available. A guideline for calculating the solar PV system size is given in Annexure 1.

Technical Specifications and Tender Eligibility Criteria

TEDA has developed General Technical Specifications and Tender Eligibility Criteria for small scale (rooftop) grid-connected solar PV systems. See Annexure 2 and 3.

Annexure 1
Small scale (rooftop) solar PV system capacity sizing

Solar Array Capacity

The capacity of a solar PV array (in kW_p, kilowatt-peak) depends90% energy consumption of the building on and the shade-free rooftop (or other) area available.

Assumptions

- The roof (or elevated structure) area requirement per kW of solar PV modules is about $12m^2$.
- In Tamil Nadu the typical average annual energy generation per installed kW of solar PV capacity is 1,500 kWh. (This number assumes a system capacity utilization factor of 18% and average grid availability of 95% during the daytime).

As per the Tamil Nadu solar net-metering policy, electricity generated from a Solar rooftop/Solar system and injected into the TANGEDCO grid shall be capped commercially at 90% of the electricity consumption by the eligible consumer at the end of a 12 month settlement period which is from August to July. Excess energy generated beyond the 90% cap shall be treated as lapsed and will not be credited for the purpose of net-metering.

With these assumptions, the recommended capacity of the solar modules array of a proposed grid-connected solar PV system can be calculated with the following three steps.

Step 1: Calculate the maximum system capacity on the basis of the shade-free rooftop area.
Formula: Capacity = shade-free rooftop area (in square meters) divided by 12.
Example:
The shade-free rooftop area is 60 m^2.
The *maximum* solar PV capacity that can be installed on this rooftop area would be 60 / 12 = 5 kW_p

Step 2: Calculate the system capacity based on annual energy consumption.
Formula: Capacity = 90% of annual energy consumption (in kWh) divided by 1,500.
Example:
The (estimated) annual energy consumption is 15,000 kWh
The solar PV system capacity based on annual energy consumption would be (90% x 15,000) / 1,500 = 9 kW_p

Recommended Capacity : Take the lowest of the above two capacity calculation results.
In this example: 5 kW_p

Solar Grid Inverter Capacity

The recommended solar grid inverter capacity in kW shall be in a range of 95% - 110% of the solar PV array capacity. In the above example, the solar array

capacity was calculated to be 5 kW. The solar grid inverter required for this array would be in a range of 4.75 – 5.50 kW. In Tamil Nadu for systems above 4 kW, three phase solar grid inverters shall be used (three single phase inverters or a single three phase inverter).

Annexure 2
General Technical Specification for small scale (rooftop) solar PV systems

1.0 **Introduction**

1.1 In grid-connected solar photo-voltaic (PV) systems, solar energy is fed into the building loads that are connected to the TANGEDCO grid through a service connection with surplus energy being fed into the grid and shortfall being drawn from the grid. Production of surplus energy may happen when solar energy produced exceeds the energy consumption of the building. This surplus is fed into the grid. During the night, or when during the day energy demand in the building exceeds solar energy generation, energy is drawn from the grid. Grid-connected solar PV systems have no battery storage and will not work during grid outage. For buildings with grid-connected solar PV systems, the service connection meter needs to be of the bidirectional type, whereby import kWh and export kWh are separately recorded.

1.2 A grid-connected solar PV system consists of the solar panels, solar panels mounting structure, one or more solar grid inverters, protection devices, meters, interconnection cables and switches.

1.3 Components and parts used in solar PV systems should conform to the BIS or IEC or other international specifications, wherever such specifications are available and applicable.

2.0 **Quality and Workmanship**

2.1 Solar PV modules are designed to last 25 years or more. It is therefore essential that all system components and parts, including the mounting structures, cables, junction boxes, distribution boxes and other parts also have a life cycle of at least 25 years. Therefore all works shall be undertaken with the highest levels of quality and workmanship. During inspection special attention will be given to neatness of work execution and conformity with quality and safety norms. Non compliant works will have to be redone at the cost of the Installer.

3.0 **System Sizing**

As per the solar net metering orders of the Tamil Nadu Electricity Regulatory Commission (TNERC) of 13-11-2013, crediting of energy for the purpose of net-metering is limited to 90% of the consumed energy during a 12 month settlement period. The maximum recommended solar PV capacity for grid-connected solar PV systems is therefore a capacity that produces not more than 90% of the annual energy consumption of the building.

4.0 **Specification of Solar PV Modules**

4.1 Solar PV modules shall be of the crystalline silicon type, manufactured in India. Detailed specifications of the solar PV modules are given below:

Type	Crystalline silicon
Origin	Manufactured in India
Efficiency	>= 13%
Fill factor	>= 70%
Degradation warranty	Panel output (W_p) capacity to be >=90% of design nominal power after 10 years and >=80% of design nominal power after 25 years.
Module frame	Non-corrosive and electrolytically compatible with the mounting structure material
Termination box	Thermo-plastic, IP 65, UV resistant
Blocking diodes	Schottky type
Module minimum rated power	The nominal power of a single PV module shall not be less than 74Wp.
RF Identification tag for each solar module	Shall be provided inside the module and must be able to withstand environmental conditions and last the lifetime of the solar module.
RF Identification tag data	a) Name of the manufacturer of PV Module b) Name of the Manufacturer of Solar cells c) Month and year of manufacture (separately for solar cells and module) d) Country of origin (separately for solar cells and module) e) I-V curve for the module f) W_m, I_m, V_m and FF for the module g) Unique Serial No and Model No of the module h) Date and year of obtaining IEC PV module qualification certificate i) Name of the test lab issuing IEC

	certificate j) Other relevant information on traceability of solar cells and module as per ISO 9000 standard
Power output rating	To be given for standard test conditions (STC). I-V curve of the sample module shall be submitted.
Compliance with standards and codes	IEC 61215 / IS 14286 IEC 61730 Part 1 and 2
Salt Mist Corrosion Testing	As per IEC 61701

5.0 Solar PV Modules Mounting Structure

5.1 The PV modules shall be mounted on fixed metallic structures having adequate strength and appropriate design, which can withstand the load of the modules and high wind velocities. The support structure shall be hot dip galvanized steel or aluminium.

5.2 Detailed specifications for the mounting structure are given below:

Wind velocity withstanding capacity	150 km / hour
Structure material	Hot dip galvanised steel with a minimum galvanisation thickness of 120 microns or aluminium alloy.
Bolts, nuts, fasteners, panel mounting clamps	Stainless steel SS 304
Mounting arrangement for RCC-flat roofs	With removable concrete ballast made of pre-fabricated PCC (1:2:4), M15
Mounting arrangement for metal sheet roofs	Mounting directly on the sheet metal, ensuring stability and wind withstanding capacity, or penetrating the sheet metal and fixing to the sub-structure, ensuring that the roof remains water proof and ensuring stability and wind withstanding capacity.

Mounting arrangement for elevated structures	The elevated structure has to be securely anchored to the supporting surface. Concrete foundations of appropriate weight and depth for elevated structures mounted directly on the ground; Bolted with anchor bolts of appropriate strength for elevated structures mounted on RCC surfaces.
Mounting arrangement for ground installations	With removable concrete ballast made of pre-fabricated PCC (1:2:4), M15; assuring enough ground clearance to prevent damage of the module through water, animals and other environmental factors.
Installation	The structures shall be designed for simple mechanical on-site installation. There shall be no requirement of welding or complex machinery at the installation site.
Minimum distance between roof edge and mounting structure	0.6m
Access for panel cleaning and maintenance	All solar panels must be accessible from the top for cleaning and from the bottom for access to the module-junction box.
Panel tilt angle	North – south orientation with a fixed tilt angle of 11 – 13 degrees (depending on location), south facing.

5.3 The prospective Installer shall specify installation details of the solar PV modules and the support structures with lay-out drawings and array connection diagrams. The work shall be carried out as per the designs approved by the Customer.

6.0 **Solar Array Fuse**

6.1 The cables from the array strings to the solar grid inverters shall be provided with DC fuse protection. Fuses shall have a voltage rating and current rating as required. The fuse shall have DIN rail mountable fuse holders and shall be housed in thermoplastic IP 65 enclosures with transparent covers.

7.0 **Solar Grid Inverter:**

7.1 The solar grid inverter converts the DC power of the solar PV modules to grid-compatible AC power.

7.2 The detailed specifications of the solar grid inverter are given below.

Total output power (AC)	To match solar PV plant capacity while achieving optimum system efficiency
Input DC voltage range	As required for the solar grid inverter DC input.
Maximum power point (MPPT) tracking	Shall be incorporated
Number of independent MPPT inputs	1 or more
Operation AC voltage	Single phase 230V or Three phase 415V (+ 12.5%, -20%)
Operating Frequency range	47.5 – 52.5 Hz
Nominal frequency	50 Hz
Power factor of the inverter	>0.98 at nominal power
Total harmonic distortion	Less than 3%
Built-in Protection	AC high / low voltage; AC high /low frequency
Anti-islanding protection	As per VDE 0126-1-1, IEC 60255.5 / IEC 60255.27
Operating ambient temperature range	-10 ^{o}C - +60 ^{o}C
Humidity	0 – 95% Rh
Inverter efficiency *Inverter weighted efficiency*	>=95% >=94%
Protection degree	IP 65 for outdoor mounting, IP 54 for indoor mounting
Communication interface	RS 485 / RS 232 / RJ45
Safety compliance	IEC 62109-1, IEC 62109-2

Environmental Testing	IEC 60068-2 (1,2,14,30)
Efficiency Measurement Procedure	IS/IEC 61683
Cooling	Convection
Display type	LCD for data display. LCD / LED for status display
Display parameters to include	Output power (W), cumulative energy (Wh), DC voltage (V), DC current (A), AC voltage (V), AC frequency (Hz), AC current (A), cumulative hours of operation (h).

8.0 **DC Combiner Box**

8.1 A DC Combiner Box shall be used to combine the DC cables of the solar module arrays with DC fuse protection for the outgoing DC cable(s) to the DC Distribution Box.

9.0 **DC Distribution Box**

9.1 A DC distribution box shall be mounted close to the solar grid inverter. The DC distribution box shall be of the thermo-plastic IP65 DIN-rail mounting type and shall comprise the following components and cable terminations:

- Incoming positive and negative DC cables from the DC Combiner Box;
- DC circuit breaker, 2 pole (the cables from the DC Combiner Box will be connected to this circuit breaker on the incoming side);
- DC surge protection device (SPD), class 2 as per IEC 60364-5-53;
- Outgoing positive and negative DC cables to the solar grid inverter.

9.2 As an alternative to the DC circuit breaker a DC isolator may be used inside the DC Distribution Box or in a separate external thermoplastic IP 65 enclosure adjacent to the DC Distribution Box. If a DC isolator is used instead of a DC circuit breaker, a DC fuse shall be installed inside the DC Distribution Box to protect the DC cable that runs from the DC Distribution Box to the Solar Grid Inverter.

10.0 **AC Distribution Box**

10.1 An AC distribution box shall be mounted close to the solar grid inverter. The AC distribution box shall be of the thermo plastic IP65 DIN rail mounting type and shall comprise the following components and cable terminations:

- Incoming 3-core / 5-core (single-phase/three-phase) cable from the solar grid inverter

- AC circuit breaker, 2-pole / 4-pole
- AC surge protection device (SPD), class 2 as per IEC 60364-5-53
- Outgoing cable to the building electrical distribution board.

11.0 Connection to the Building Electrical System

11.1 The AC output of the solar grid inverter shall be connected to the building's electrical system after the TANGEDCO service connection meter and main switch on the load side. The solar grid inverter output shall be connected to a dedicated module in the Main Distribution Board (MDB) of the building. It shall *not* be connected to a nearby load or socket point of the building. The connection to the electrical system of the building shall be done as shown in typical wiring diagram 1 in the Annexure 2.

11.2 For buildings or loads with diesel generator backup, the wiring of the solar grid inverter shall be such that the solar grid inverter *cannot* run in parallel with the diesel generator. This implies that the solar grid inverter must be connected to a distribution board on the grid side of the automatic or manual change-over switch as shown in typical wiring diagram 2 in the Annexure 2.

12.0 Cables

12.1 All cables shall be supplied conforming to IEC 60227/ IS 694 & IEC 60502/ IS 1554. Voltage rating: 1,100V AC, 1,500V DC

12.2 For the DC cabling, XLPE or XLPO insulated and sheathed, UV stabilised single core flexible copper cables shall be used. Multi-core cables shall not be used.

12.3 For the AC cabling, PVC or XLPE insulated and PVC sheathed single or multi-core flexible copper cables shall be used. Outdoor AC cables shall have a UV-stabilised outer sheath.

12.4 The total voltage drop on the cable segments from the solar PV modules to the solar grid inverter shall not exceed 2.0%.

12.5 The total voltage drop on the cable segments from the solar grid inverter to the building distribution board shall not exceed 2.0%

12.6 The DC cables from the SPV module array shall run through a UV-stabilised PVC conduit pipe of adequate diameter with a minimum wall thickness of 1.5mm.

12.7 Cables and wires used for the interconnection of solar PV modules shall be provided with solar PV connectors (MC4) and couplers.

12.8 All cables and conduit pipes shall be clamped to the rooftop, walls and ceilings with thermo-plastic clamps at intervals not exceeding 50 cm. The minimum DC cable size shall be 4.0 mm^2 copper. The minimum AC cable size shall be 4.0 mm^2 copper. In three phase systems, the size of the

neutral wire size shall be equal to the size of the phase wires. The following colour coding shall be used for cable wires:

- DC positive: red (the outer PVC sheath can be black with a red line marking)
- DC negative: black
- AC single phase: Phase: red; neutral: black
- AC three phase: Phases: red, yellow, blue; neutral: black
- Earth wires: green

12.9 Cables and conduits that have to pass through walls or ceilings shall be taken through a PVC pipe sleeve.

12.10 Cable conductors shall be terminated with tinned copper end-ferrules to prevent fraying and breaking of individual wire strands. The termination of the DC and AC cables at the Solar Grid Inverter shall be done as per instructions of the manufacturer, which in most cases will include the use of special connectors.

13.0 Earthing

13.1 The PV module structure components shall be electrically interconnected and shall be grounded.

13.2 Earthing shall be done in accordance with IS 3043-1986, provided that earthing conductors shall have a minimum size of 6.0 mm^2 copper, 10 mm^2 aluminium or 70 mm^2 hot dip galvanised steel. Unprotected aluminium or copper-clad aluminium conductors shall not be used for final underground connections to earth electrodes.

13.3 A minimum of two separate dedicated and interconnected earth electrodes must be used for the earthing of the solar PV system support structure with a total earth resistance not exceeding 5 Ohm.

13.4 The earth electrodes shall have a precast concrete enclosure with a removable lid for inspection and maintenance. The entire earthing system shall comprise non-corrosive components.

14.0 Surge Protection

14.1 Surge protection shall be provided on the DC side and the AC side of the solar system.

14.2 The DC surge protection devices (SPDs) shall be installed in the DC distribution box adjacent to the solar grid inverter.

14.3 The AC SPDs shall be installed in the AC distribution box adjacent to the solar grid inverter.

14.4 The SPDs earthing terminal shall be connected to earth through the above mentioned dedicated earthing system. The SPDs shall be of type 2 as per IEC 60364-5-53

15.0 **Junction Boxes**

15.1 Junction boxes and solar panel terminal boxes shall be of the thermo plastic type with IP 65 protection for outdoor use and IP 54 protection for indoor use.

15.2 Cable terminations shall be taken through thermo-plastic cable glands. Cable ferrules shall be fitted at the cable termination points for identification.

16.0 **Tools, Tackles and Spares**

16.1 The Installer shall keep ready stock of tools, tackles and essential spares that will be needed for the day-to-day maintenance of the solar PV system. This shall include but not be limited to, the following:

16.2 Screw driver suitable for the junction boxes and combiner boxes;

16.3 Screw driver and / or Allen key suitable for the connectors, power distribution blocks, circuit breaker terminals and surge arrestor terminals;

16.4 Spanners / box spanners suitable for the removal of solar PV modules from the solar PV module support structure;

16.5 Solar panel mounting clamps;

16.6 Cleaning tools for the cleaning of the solar PV modules;

16.7 Spare fuses.

17.0 **Caution Signs**

17.1 In addition to the standard caution and danger boards or labels as per Indian Electricity Rules, the AC distribution box near the solar grid inverter, the building distribution board to which the AC output of the solar PV system is connected and the Solar Generation Meter shall be provided with a non-corrosive caution label with the following text:

WARNING – DUAL POWER SOURCE EB & SOLAR

17.2 The size of the caution label shall be 105mm (width) x 20mm (height) with white letters on a red background.

17.3 Caution labels as may be prescribed by TANGEDCO shall be fixed as per TANGEDCO specifications.

18.0 **Metering**

18.1 An energy meter shall be installed in between the solar grid inverter and the building distribution board to measure gross solar AC energy production (the "Solar Generation Meter"). The Solar Generation Meter shall be of the same accuracy class as the TANGEDCO service connection meter or as specified by TNERC.

18.2 The existing service connection meter needs to be replaced with a bidirectional (import kWh and export kWh) service connection meter (the "Solar Service Connection Meter") for the purpose of net-metering. Installation of the Solar Service Connection Meter will be carried out by TANGEDCO and is not in the scope of the work of the Installer.

19.0 Documentation

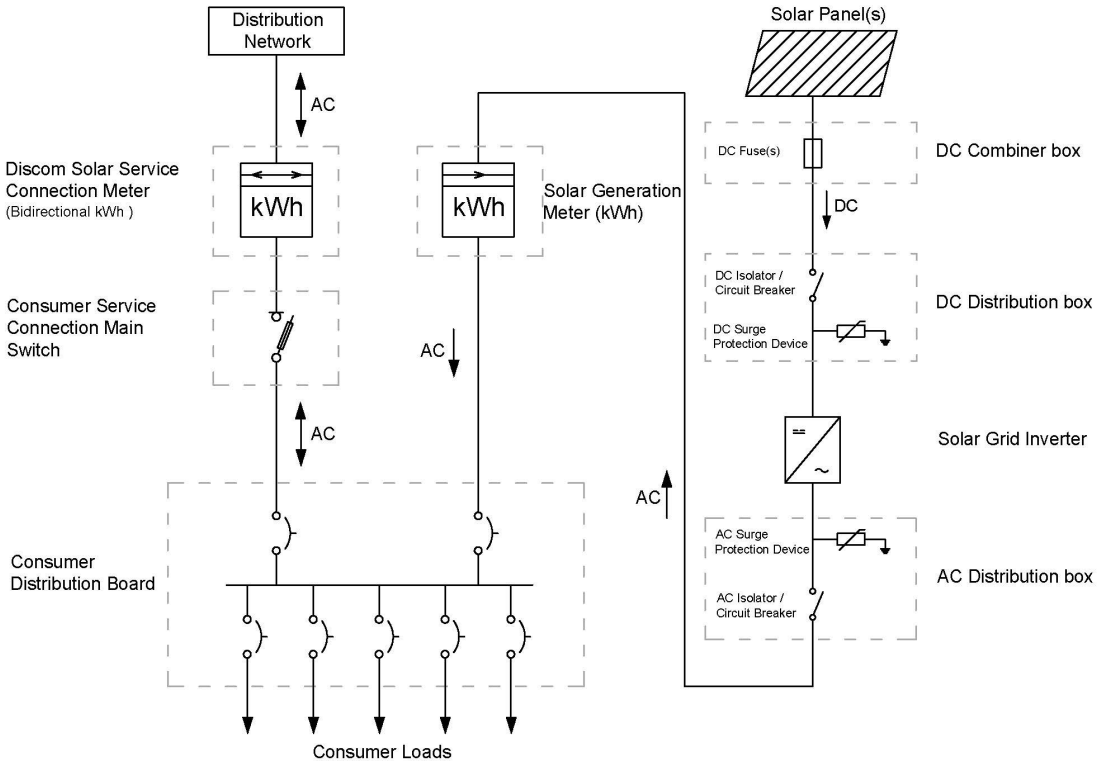
19.1 The Installer shall supply the following documentation:

a) System description with working principles.
b) System single line diagram.
c) Solar PV array lay-out.
d) Routing diagram of cables and wires.
e) Data sheets and user manuals of the solar PV panels and the solar grid inverter.
f) A system operation and maintenance manual.
g) Name, address, mobile number and email address of the service centre to be contacted in case of failure or complaint.
h) Warranty cards.
i) Maintenance register.

20.0 Test Certificates and Reports to be Furnished

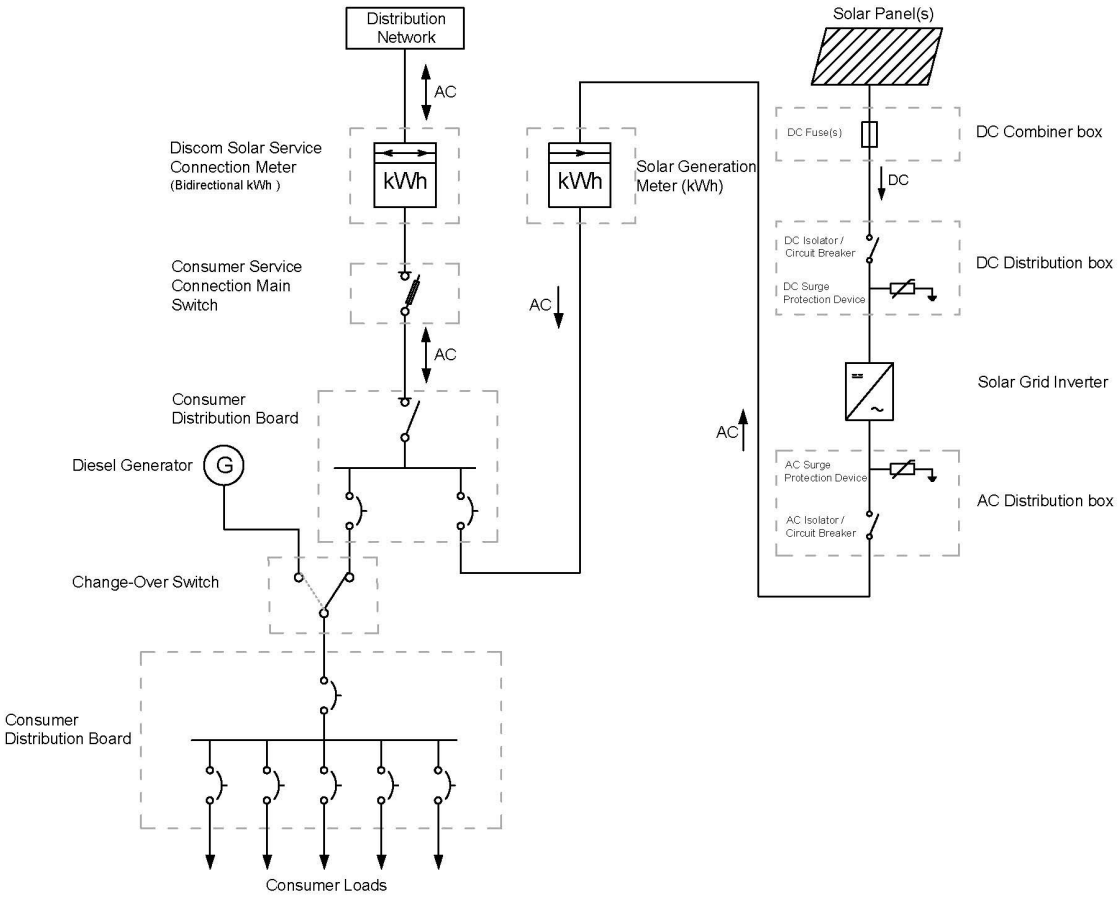
Test Certificates / Reports from IECQ / NABL accredited laboratory for relevant IEC / equivalent BIS standard for quoted components shall be furnished. Type Test Certificates shall be provided for the solar modules and the solar grid inverters to provide evidence of compliance with standards as specified in articles 4.0 and 7.0 of this Technical Specification. Customer reserves the right to ask for additional test certificates or (random) tests to establish compliance with the specified standards.

1. Typical wiring diagram for grid-connected solar PV system *without* diesel generator.



Note: The Solar Generation Meter shown above is mandatory for consumers who avail of a generation-based incentive (GBI) and is optional for others.

2. Typical wiring diagram for grid-connected solar PV system *with* diesel generator.



Note: The Solar Generation Meter shown above is mandatory for consumers who avail of a generation-based incentive (GBI) and is optional for others.

ANNEXURE-3

TENDER ELIGIBILITY CRITERIA

The suggested Tender Eligibility Criteria are as follows:

The Bidder(s) shall meet the following Eligibility Criteria to participate in the Tender and shall enclose documentary proof for fulfilling the Eligibility in the Techno commercial Bid.

S. No	Minimum Eligibility Criteria	Proof to be submitted for fulfilling the Eligibility Criteria
1. (a)	The Bidder/its wholly owned subsidiary shall be A Registered Manufacturing Company/ Firm of SPV Cells/Modules OR Battery OR PV System Electronics, in India . **OR** A PV System Integrator in India in existence for at least past one audited year.	Certificate of Incorporation or Registration and relevant proof shall be submitted.
	b) Consortium not exceeding three partners. Each partner of the Consortium shall be a Registered Company / Firm in existence for at least past one audited year. The prime Bidder amongst the consortium partners shall be either (i) a registered manufacturing company/ Firm of SPV cells / Modules or PV system Electronics in India. **OR** (ii) a PV system integrator in India.	i. Certificate of Incorporation / Registration of all the partners shall be submitted. ii. Copy of consortium agreement shall be submitted (OR) A letter of intent to execute a consortium agreement in the event of a successful bid shall be signed by all the partners and submitted with the Bid together with the copy of the proposed consortium Agreement.

<table>
<tr><th>S. No</th><th>Minimum Eligibility Criteria</th><th>Proof to be submitted for fulfilling the Eligibility Criteria</th></tr>
<tr><td></td><td></td><td>iii. In case of Consortium, all partners of the consortium shall be liable jointly and severally for the execution of the contract in accordance to the contract terms and a statement to this effect shall be included in the letter of intent.</td></tr>
<tr><td>2.</td><td>The Bidder shall use only SPV modules manufactured in India</td><td>Necessary undertaking letter shall be submitted from the module manufacturer.</td></tr>
<tr><td>3.</td><td>Annual Turnover of the bidder shall be as per the following.
In case of consortium, consortium partners shall cumulatively have 50% of the average annual turnover as per criteria (2) or (3) & prime bidder shall satisfy the criteria (1).</td><td>A summarized sheet of turnover certified by registered CA shall be furnished.
<table>
<tr><th colspan="6">Tender Values</th></tr>
<tr><th></th><th><Rs.50 L</th><th>Rs.50L-Rs.2 Cr</th><th>Rs.2Cr-10 Cr</th><th>Rs.10Cr -25Cr.</th><th>Rs.>25Cr.</th></tr>
<tr><td>1)</td><td>Turnover in PV Field in the Last Financial Year (OR Current Financial Year)</td><td>--</td><td>Min Rs.25 L</td><td>Min. Rs.1 Cr</td><td>Min. Rs.5 Cr.</td><td>Min Rs.10 Cr.</td></tr>
<tr><td>2)</td><td>Average annual Turnover in the Last two financial years</td><td>--</td><td>Min Rs.50 L</td><td>Min. Rs.2 Cr</td><td>--</td><td>--</td></tr>
<tr><td>3)</td><td>Average annual Turnover in the last three financial years</td><td>--</td><td>--</td><td>--</td><td>Min. Rs.10 Cr</td><td>Min. Rs.25 Cr</td></tr>
</table></td></tr>
</table>

S. No	Minimum Eligibility Criteria	Proof to be submitted for fulfilling the Eligibility Criteria
4.	Bidder shall have installation experience in installation of Solar PV Plants of 1Kwp & above and shall have installed at least 10% of the quantity tendered (Power plants installed minimum period of 3 months prior to the date of bid submission will only be considered) & these systems shall be working satisfactorily (Lanterns are not allowed)	Copy of Work Orders and performance certificate for satisfactory function of those SPV systems obtained from the end user if system cost was paid by the end user or from the Government agency.
5.	The Bidder shall agree to accept the entire quantity that is finally allotted to him.	Necessary under taking shall be enclosed in this regard.
6.	Various components of the SPV system shall conform to the MNRE standards as per the Technical Specification given in Annexure I.	Copy of test certificates/test reports for each component shall be submitted.
7.	Bidder(s) shall not be currently blacklisted by any of the State or Central Government or organizations of the State/Central Government or Union Territories of India as on date of submission of tender.	Necessary Undertaking letter shall be furnished.
8.	The bidder shall undertake to submit only bound bids with all pages serially numbered.	Necessary undertaking letter shall be submitted.
9.	The bidder shall undertake for product take back and re-cycling.	Necessary undertaking letter shall be submitted.

Accredited Test centers for MNRE Off-Grid Programme

Lab/ Organization	PV Module	Lighting Systems		Battery	Inverter >100 W		Charge Controller	
		as per MNRE Specifications	Environmental		Efficiency	Environmental	protections	Environmental
SEC	**Yes** (IEC612 15up to100$W_{P)}$ NABL Accredited	**Yes** MNRE Accredited	**Yes** (Including **IP)** MNRE Accredited	**Yes** MNRE Accredited	**Yes** (upto 10KVA) MNRE Accredited	**Yes** (Including **IP)** MNRE Accredited	**Yes** MNRE Accredited	**Yes** (Including **IP)** MNRE Accredited
ERTL (east)	STC Test Facility MNRE	**Yes** NABL/ MNRE	**Yes** NABL/ MNRE	Yes Up to 1000AH	**Yes** NABL/ MNRE	**Yes** NABL/ MNRE	**Yes** NABL/ MNRE	**Yes** NABL/ MNRE

	Accredited	Accredited	Accredited		Accredited	Accredited	Accredited	Accredited
ETDC (B)	**Yes** (IEC61215)under ICEEE-CB, IEC 61701 (upto100$W_{P)}$ NABL Accredited	**Yes** NABL/ MNRE Accredited	**Yes** NABL/ MNRE Accredited	Yes Up to 100 AH	**Yes** (up to 3KVA) NABL/ MNRE Accredited	**Yes** NABL/ MNRE Accredited	**Yes** NABL/ MNRE Accredited	**Yes** NABL/ MNRE Accredited
CPRI (B)	No	**Yes** NABL/ MNRE Accredited	**Yes** NABL/ MNRE	Yes Up to 500 AH	**Yes** (up to 10KVA) NABL/	**Yes** NABL/ MNRE Accredited	**Yes** NABL/ MNRE	**Yes** NABL/ MNRE Accredited

			Accredited		MNRE Accredited		Accredited	
ERTL (N)	No	Only Electronics & luminaire NABL	**Yes** NABL Accredited	No	**Yes** (up to 5KVA)	**Yes** NABL Accredited	**Yes** (up to 5KW)	**Yes** NABL Accredited

		Accredited			NABL Accredited		NABL Accredited	
UL (B)	**Yes** (IEC61215 IEC 61730 Pt.II and IEC 61701) upto400W_P NABL Accredited	**Yes** **(except battery)** NABL Accredited	**Yes** NABL Accredited	No	**Yes** (up to 6KVA) NABL Accredited	**Yes** NABL Accredited	**Yes** (up to 6KW) NABL Accredited	**Yes** NABL Accredited
TUV Rhineland	**Yes** (IEC61215 & 61730 Pt-II) upto400W_P NABL Accredited	**NO**	**Yes** NABL Accredited	No	**Yes** (up to 10KVA) NABL Accredited	**Yes** NABL Accredited	**Yes** (up to 10KW) NABL Accredited	**Yes** NABL Accredited

Inter Tek	No	Only Electronics & luminaire NABL Accredited	**Yes** NABL Accredited	No	**Yes** (up to 5KVA) NABL Accredited	**Yes** NABL Accredited	**Yes** (up to 5KW) NABL Accredited	**Yes** NABL Accredited

*Beyond 10KVA self certification by the manufactures is acceptable.