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Thiruvananthapuram,
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CIRCULAR

Subject: - Installation of Solar Energy System - guide lines issued - regarding

Reference:-
1. Circular No.B4-1750/14/CEI dated 09/01/2015.
2. Circular No. B4-1750/14/CEI dated 10/05/2016.
3. Letter No.B2-4335/16/CEI dated 10.05.2016.
4. Minutes of "Solar connect-distributed power generation through grid connected rooftop solar power plant programme stakeholders meeting" convened by the Additional Chief Secretary, Power department on 02/11/2016.

For the effective implementation of Kerala Solar Energy Policy, 2013 the following guide lines are issued.

A. Guidelines for scrutiny / inspection of Solar Energy System

1. The minimum qualification for carrying out the installation work of a solar energy system shall be a B-Class Contractor licensee and depending up on the capacity of installation, eligible contractors can carry out the work.
2. Verify whether the inverter is grid tied or not.
3. Inverter capacity shall be selected based on the solar PV generation, so that maximum generation can be utilized.
4. Solar PV module details such as number of modules, wattage, number of cells, voltage, current etc. shall be verified.
5. It has to be verified whether PV module shall be MNRE approved or not. If MNRE approved, their certificate of approval shall be verified. Otherwise certificate from MNRE approved lab shall be obtained.
6. It shall be verified that harmonics are within specified limit for grid tied systems.
7. Solar inverter details and its specifications shall be verified.
8. In the grid System, ensure that there is no back feeding to the grid when grid supply is off and anti islanding protection shall be ensured. Certificate from the manufacturer shall be obtained.
9. The adequacy of cable size for solar PV system shall be verified and ensured.
10. It shall be ensured that energy meter is provided for recording the solar energy generated.
11. If it is grid tied, it shall be ensured that Bi-directional meter (Net meter) is provided at the interconnection point to record the import and export of energy.
12. Solar panel supporting structures, inverter neutral, body etc. shall be earthed as per standards.
13. Breakers having adequate rating and surge protection device (SPD) shall be provided in the array junction box.
14. It shall be ensured that whether indicating meters are provided in DC and AC DBs .
15. Battery and inverter shall be segregated properly with fire proof partition.
16. If the proposed installation is having a DG set, reverse power relay shall be provided to avoid back feeding to DG set, if necessary.

17. While issuing sanction for energisation for Solar Energy System, following conditions are to be included in addition to normal conditions.
    a) Consent from licensee shall be obtained (In case of grid tied system).
    b) The whole installation should be in conformity with Central Electricity Authority (Technical Standards for connectivity of the distributed generation resources) Regulations, 2013 and Kerala State Electricity Regulatory Commission (Grid interactive distributed solar energy system) Regulations, 2014.

B. Important extracts of Central Electricity Authority (Technical Standards for connectivity of thedistributed generation resources) Regulation, 2013(For information only)

5.11(1) Harmonic current injections from a generating station shall not exceed the limits specified in IEEE 519

5.11(2) The distributed generating resource shall not inject direct current greater than 0.5 % of the full rated output at the interconnection point

5.11(3) The distributed generating resource shall not introduce flicker beyond the limits specified in IEC 61000

7. The equipment of the generating station shall meet the following requirements.
    (a) Circuit breakers or other interrupting equipment shall be suitable for their intended application with the capability of interrupting the max available fault current expected at their location.
    (b) Distributed generation resource and associated equipment shall be designed so that the failure of any single device or component shall not potentially compromise the safety and reliability of the electricity system.
    (c) Paralleling device of distributed generation resource shall be capable of withstanding 220 % of the nominal voltage at the interconnection point.

8. Every time the generating station is synchronised to the electricity system, it shall not cause voltage fluctuation greater than ± 5 % at the point of connection

9. Provide a manually operated isolating switch between the distributed generation resource and the electricity system which shall meet following requirements.
    (a) Allow visible verification that separation has been accomplished.
    (b) Include indicators to clearly show open and closed positions.
    (c) Be capable of being reached quickly and conveniently 24 hrs a day by licensee's personnel without requiring clearance from the applicant.
    (d) Be capable of being locked in the open position.
    (e) May not be rated for load break nor may have features of over current protection
    (f) Be located at a height of at least 2.44 m above the ground level

C. Important extracts of Kerala State Electricity Regulatory Commission (Grid interactive distributed solar energy system) Regulation, 2014 (For information only)

4(2)(c) The solar energy system installed by the consumer shall be connected with interlocking system and operated safely in parallel with the distribution system of the licensee.

8(b) The interconnection of the solar energy system with the distribution system of the licensee conforms to the relevant provisions of the Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2010

8(c) The net meter and solar meter installed conform to the standards, specifications and accuracy class as provided in the Central Electricity Authority (Installation & Operation of Meters) Regulation, 2006.

9(1) The net meter shall be installed at the interconnection point of the eligible consumer with the network of the distribution licensee.

9(2) Solar meter shall be installed at the delivery point of the solar energy system to measure the solar electricity generated.

9(4) The meters shall be tested, installed and sealed.

11 The eligible consumer shall comply with the specifications and standards and install grid - tied inverter, manually operated isolating switch and associated equipment with sufficient safe guards to prevent injection of electricity from his solar energy system to the distribution system of the licensee when the distribution system is de-energised.

13(12) The eligible consumer shall obtain from the Electrical Inspector necessary sanction for commissioning the solar energy system and produce the sanction to the distribution licensee.

D. Work distribution for the Scrutiny of Scheme and inspection of Solar Energy System.

1. For installations above 10kW and up to and including 200kW, prior scheme approval and sanction for energisation orders shall be obtained from the District office concerned.
2. For the scrutiny and inspection, the check list given in the annexure shall be followed.
3. For all installations other than item(2) above, scheme approval and sanction for energisation orders shall be obtained from Chief Electrical Inspector.
4. The following tests shall be conducted at the time of inspection:
   a. PV Module: Irradiance measurement, angle of inclination, temperature of the PV module and VI characteristics using PV Array Tester.
   b. Solar Inverter: Efficiency, input voltage, output voltage, power, THD, DC injection flicker etc. and anti-islanding protection.

Sd/-
Chief Electrical Inspector

SOLAR POWER GENERATION - CHECK LIST

(Annexure to Circular No: B2 - 13958 / 2017 / CEI Dated 24 / 07 / 2018)

A	Installation Details	
1.	Name & Address of Installation	
2.	Contact Number	
3.	Classification (LT/MV/HT/EHT)	
4.	Date of receipt of completion report	
5.	Date of Inspection	
6.	Name of Inspecting Officer	
7.	Capacity of Solar System	
B	SPV Module	
1	Details of MNRE approval test for SPV Module	
2	Maximum output (20% Peak Power)	
3	Type of SPV module	Thin film or Polycrystalline
4	Degree of protection (IP)	
5	Orientation	Towards south
6	Inclination angle	
7	Total number of PV modules	
8	Wattage of each module	
9	Total installed capacity	
10	Type of system	Grid interactive system / Off grid system
C	Mounting Structures	
1	The mounting structures shall be designed and constructed as per IS 2062: 1992 and IS 4759.	
D	Whether DCDB provided If yes, details of switch board	Yes / No
E	Power and Control Cables	
1	Rating of Power cables for inter connection of Modules (panels with in array).	
2	(i) Array & charge controller.	
	(ii) Charge controller & battery.	
3	Type of Cable	
4	Size of Cable	
5	Whether the connection properly terminated, soldered in outdoor and indoor elements	
F	DC combiner box details (Verify with manufacture date sheet)	
1	I - V curve details submitted	Yes / No
2	Optimum power to be delivered by SPV panel (optimum power 2.25V/cell)	
3	Standard irradiance or light intensity of SPV panel : (1000W/m2 at 25^0C and AM 1.5)	

4	Details of MNRE approval test for SPV Module	
G	Inverter	
1	Make	
2	Serial Number	
3	Specification	
4	Total number of inverter	
5	Power quality of inverter	
	(i) AC voltage	
	(ii) frequency	
6	Type of inverter	
7	Whether automatic syncrhonisation for inverter to output of grid done	
8	Details of over voltage protection provided	
9	Details of under voltage protection provided	
10	Maximum power output of the inverter system	
11	Type of installation - Indoor / out door	
12	Degree of protection for inverter panel.	
H	Batteries :-	
1	Type of battery	
2	Output voltage.	
I	Metering Parameter Provided	
1	DC Battery voltage.	
2	DC current.	
3	AC system voltages	
4	Current and	
5	Frequency	
6	Solar gross generation	
7	Consumer load consumption	
8	Export of energy to grid.	
9	Import of energy from grid	
J	Test result	
1	Earth resistance	
2	Insulation Resistance value	
3	Total voltage harmonic distortion	
4	Individual voltage harmonic distortion	
5	Total current harmonic distortion	
K	Earthing	
1	Details of earthing. Equipment earthing System earthing: (AC Supply - Neutral to be earthed and DC Supply - Negative to be earthed)	
2	No. of earth pits.	
3	Details of lightning protection if any	
L	Junction Boxes	
1	Whether FRP Junction boxes are provided	
	Rating of Fuses for solar arrays	

M	Parameters to be measured and monitored	
1	Solar system temperature.	
2	Ambient temperature.	
3	Solar irradiation/isolation.	
4	DC current and voltages.	
5	DC injection into the grid (One time measurement at the time of installation.)	
6	Efficiency of the inverter.	
7	Solar system efficiency.	
8	Display of I-V curve of the solar system.	
N	Protection and control	
1	Fuse rating on inverter input side (DC)	
2	Fuse rating on inverter output side (AC)	
3	Rating of Isolator provided for AC & DC	
4	Earth Fault protection details	
O	Remarks	

Signature of Inspecting Officer