

**KERALA STATE ELECTRICITY REGULATORY COMMISSION
THIRUVANANTHAPURAM**

PRESENT: Sri.T.M. Manoharan, Chairman
Sri. K.Vikraman Nair, Member
Sri. S. Venugopal, Member

Directives issued under Section 23 of the Electricity Act, 2003 for the promotion of the grid interactive distributed solar energy systems in the State of Kerala.

Order dated 21-01-2016 issued under Section-23 of the Electricity Act-2003

1. Renewable energy has been accepted as a supplementary source of energy all over the world. In tune with the global trend, our nation has also come out with policies and targets to accelerate the implementation of Renewable Energy Projects. Solar, wind and small hydel are the major sources of renewable energy in our nation including our state. The national target for renewable energy till the year 2022, has been fixed at 1,75,000 MW, out of which 1,00,000 MW shall be solar. As per letter No.03/13/2015-16/GCRT dated 30.06.2015 from the Joint Secretary to Government of India in Ministry of New and Renewable Energy, the target for roof top solar systems for the nation is 40000 MWp till 2022 and the annual targets for roof top solar systems for Kerala are as given below,-

2015-16	4 MW
2016-17	96 MW
2017-18	100 MW
2018-19	120 MW
2019-20	140 MW
2020-21	160 MW
2021-22	180 MW
Total	800 MW

It has been reported that Kerala has the following potential for harnessing renewable energy,-

Roof Top Solar Photo voltaic systems (domestic)	more than 13000 MW
Roof Top Solar Photo voltaic systems (institutional)	more than 18000 MW
Wind energy systems	more than 3000 MW
Small hydro-electric projects	more than 500 MW

2. The Commission has a statutory duty under Section 86 of the Electricity Act, 2003, to promote renewable energy and co-generation. Clause (e) of sub-section (1) of Section 86 of the Electricity Act, 2003, is quoted hereunder.

“(e) promote co-generation and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee;”

From the above statutory provision, it is clear that the Commission has a mandatory duty to,-

- (i) Promote co-generation and generation of renewable energy;
- (ii) Provide suitable measures for connectivity to grid;
- (iii) Provide suitable measures for sale of renewable energy; and
- (iv) Specify by regulation the renewable purchase obligation (RPO) of the obligated entity as a percentage of the total consumption in its area of supply.

Therefore the Commission has to take all possible proactive steps to incentivize installation of solar energy systems including roof top solar energy systems and to remove all disincentives and difficulties. It was with a view to promoting the harnessing of solar energy, the Commission issued KSERC (Grid Interactive Distributed Solar Energy Systems) Regulations, 2014. The Commission has also issued orders relating to generation based incentives payable to the renewable energy generated using off grid solar systems.

3. Government of India has, in its letter No.30/58/2014-15/NSM dated 10.07.2015, issued directives under Section 86 (1) (e) of the Electricity Act, 2003 and Tariff Policy, 2006, for the compliance of Renewable Purchase Obligation by the State Utilities and Distribution Companies. The Joint Secretary to Government of India in Ministry of New and Renewable Energy has, as per letter No.03/09/2014-15/GCRT dated 10.08.2015, issued further instructions relating to installation of grid connected roof top solar systems on the roofs of buildings belonging to Government, public sector undertakings and such other institutions. Government of India is also providing incentives such as capital subsidy, soft loans, accelerated depreciation and Income Tax concessions.
4. Government of Kerala and the Commission, have taken many pro-active policy initiatives and regulatory initiatives to facilitate harnessing of renewable energy. The Agency for Non-conventional Energy and Rural Technology

(ANERT) and the Energy Management Centre (EMC) have also been promoting the implementation of projects for harnessing renewable energy and for improving energy efficiency. The State Government in Power Department has been regularly reviewing the progress of implementation of renewable energy projects. With a view to facilitating speedy implementation of solar PV projects, the Chief Electrical Inspector has standardized the schemes and liberalized the procedures relating to scheme approval and energization for small solar PV projects with a capacity up to 10 kW. A large number of consumers have shown interest in installation of roof top solar systems. Similarly many persons have shown interest in establishing solar energy projects with capacity above one Mega Watt. In spite of such initiatives from the Central and State Governments, the Central and State Commissions, ANERT, EMC and the Electrical Inspectorate, the tangible results in installation of renewable energy plants / projects in Kerala, are seen to be much below the targets fixed for the State.

5. According to the information available to the Commission, there are several practical problems faced by the consumers for installing roof top solar energy systems. Such problems relate to availability of solar meter and net meter, lack of clarity relating to the safety standards for giving connectivity to the grid, nature of tests to be conducted before commissioning the project etc.
6. In order to address the practical problems faced by the consumers for the installation of grid interactive solar energy systems, the Commission has constituted a Technical Committee under the Chairmanship of Member (Engineering), as per order No. 1158/CT/KSERC/2015 dated 13.07.2015 of the Commission. The objectives of the committee were to examine the technical and other issues impeding the implementation of solar energy projects and to suggest solutions for such issues. The Committee after due deliberations, submitted its report on 14.09.2015 to the State Commission. The Committee was of the view that,
 - (i) the registration fee authorized by the Commission to be collected by the distribution licensee under the above regulation is on the higher side;
 - (ii) provisions in sub-regulation (9) of regulation 13 of the Solar Energy Regulations, 2014 to the effect that registration fee is non-refundable would be a disincentive to the prosumers; and
 - (iii) the said sub-regulation should therefore be amended.
7. The Technical Committee again met on 11.11.2015 and after due deliberations the following decisions were taken,-
 - (i) The total installed capacity of solar systems that can be connected to a distribution transformer without conducting measurement of the load on the feeder under it, shall be 15% of the transformer capacity.

Connectivity exceeding 15% of the transformer capacity need be granted after conducting necessary studies relating to the load on the feeder.

- (ii) KSEB Ltd will ensure availability of sufficient net meters for which purchase orders shall be issued on or before 30.11.2015. The availability of net meters required for roof top solar systems will be reported to the Commission at the end of each month.
 - (iii) KSEBL agreed to publish on or before 30.11.2015, the model numbers and specifications of selected three phase net meters and single phase net meters in their website and to report compliance to the Commission.
 - (iv) Installation of meters are to be carried out according to Central Electricity Authority (Installation and Operation of meters) Regulations 2006.
 - (v) Officials of KSEB Ltd and Electrical Inspectorate will conduct inspection and testing of the solar system jointly on a day convenient to them within ten days.
 - (vi) The Type Test Certificates issued by the laboratories accredited by the National Accreditation Board For Testing and Calibration Laboratories (NABL) or by the institutions at international level for the testing and calibration of electrical equipment can be accepted without conducting further test for the equipment like MCB, ELCB, Fuse, inverter etc. The circular No. DREP / Solar / General / 14-15 dated 23.3.2015 of Director (Renewable Energy and Planning), KSEB Ltd may be reviewed to simplify the procedural formalities required for commissioning of roof top solar systems of capacity of and below 10 kW and the tests required to be conducted at site for the installation of roof top solar energy systems of and below the capacity of 10kW may be decided accordingly.
 - (vii) KSERC will take necessary steps to amend Regulation 5 (2) and 13 of KSERC (Grid Interactive Distributed Solar Energy Systems) Regulations, 2014 for enhancing the penetration level of solar energy systems and enabling refund of the registration fee.
8. The Commission has issued the KSERC (Grid Interactive Distributed Solar Energy System) Regulations, 2014 with a view to expediting the installation of solar systems. At the same time the Commission has also taken sufficient safeguards for the safety of the grid of the distribution licensee by reiterating that the regulations issued by CEA regarding safety and standards shall be complied with. Regulation 8 of the said Regulations issued by the KSERC, which deals with specifications, standards and safety is quoted hereunder,-

8. Specifications, standards and safety.- (1) *The distribution licensee shall ensure that,-*

(a) the interconnection of the solar energy system with the distribution system of the licensee conforms to the specifications and standards as provided in the Central Electricity Authority (Technical Standards for connectivity of the Distributed Generation Resources) Regulations, 2013, as amended from time to time;

(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, as amended from time to time;

(c) the net meter and solar meter installed conform to the standards, specifications and accuracy class as provided in the Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006, as amended from time to time and are installed in such a way that they are accessible for reading.

(2) The licensee shall, while intimating the feasibility as per sub-regulation (6) of regulation 13, inform the eligible consumer, the specifications and such other details of the components if any to be installed along with the solar energy system as per the provisions of the regulations mentioned in sub-regulation (1).

9. The CEA has issued the CEA (Technical Standards for Connecting the Distributed Generation Resources) Regulations, 2013, with a view to facilitating and expediting installation of distributed generation systems. Fourth regulation deals with the general connectivity conditions and the fifth regulation deals with standards & codes of practice. The sixth, seventh and eighth regulations deal with safety, sub-station grounding and metering respectively. These Regulations refer to CEA (Measures relating to Safety and Electricity Supply) Regulations, 2010, the specifications in 153043 of Bureau of Indian Standards (BIS), CEA (Installation and Operation of Meters) Regulations, 2006 etc. Similarly Regulation 9 (Schematic Diagrams), Regulation 10 (Inspection, Test, Calibration and Maintenance prior to Connection), Regulation 11 (Standards of Distributed Generation Resources) etc refer to standards IEEE 519, IEC 61000 etc.
10. The Electrical Inspector is the statutory authority to inspect and test the electrical installations and to certify their fitness for energization, in accordance with the provisions of the regulations issued by CEA. The Electrical Inspectorate in power department, Government of Kerala have, as per GO (Ms) No. 34 / 2012 / PD, Thiruvananthapuram, dated 31. 12. 2012 and GO (Ms) No. 15 / 2013 / PD, Thiruvananthapuram, dated 05. 04. 2013,

fixed the inspection and testing fee for electrical installations. The fee fixed for inspection and testing of electrical installations as per the above government orders are extracted below,-

Nature of Service	Revised Rate
Renewal fee of scheme approval (Maximum Three (3) times or Two (2) Years whichever is earlier	a) Rs. 250/- (If application received on or before the expiry date of Validity of approved Scheme (b) Seventy five percent (75 %) of initial inspection fee (If application received after the expiry date of validity of approved scheme.
Valuation of electrical undertakings	Rs 2000/- + 0.5% of valuation amount
Initial Inspection fee	
Extra High Voltage /High Voltage Equipments	Rs. 5/- per kVA /kW/ kVAr Subject to a maximum of Rs 30000/-
Medium Voltage/ Low Voltage Equipments	Rs.10/- per kVA/ kW/ kVAr
Bus Duct	Rs. 2 /- per Ampere per 20 M length or part thereof
Breakers/Switches/ Switch Boards	Rs. 2/- per Ampere per Incomer or Outgoing
Fruth Electrodes	Rs 50/- per Electrode
Lightning Protection	Rs 2500/- Building
Over head lines	Rs 25/- per kM
Special Equipments	
(a) CT Scanner	Rs 10000/-
(b) X- Ray	Rs 10/- per mA
(c) Neon Sign Board	Rs 1000/- per kVA
(d) Lift	Rs 2000/-
(e) Escalator	Rs 5000/-
High Rise Buildings	Rs 250/- per Medium Voltage or Low Voltage per Consumer
Compliance verification	Fifty per cent (50%) of inspection fee
Other Inspections	
1. Certificate Under Regulation 62 of Central Electricity Authority (Measures related to Safety and Electric Supply) Regulation 2010	Rs 1000/-
If the applicant is belonging to SC/ST category or BPL (Certificate from the authority shall he verified prior to inspection)	Rs 100/-
2. Soil Resistivity Measurement	Rs 1000/-
3. Temporary Installation	Rs 250 /-
Exhibition / Fair	Rs 2500 /-
Circus	Rs 1000 /-
Periodical Inspection Fee	(a) Fifty percent (50%) of Initial Inspection fee (b) 25% of Initial Inspection fee for licensees and KSEB installation
Fees for Technical Advice / Consultancy	
Detailed engineering, preparation of technical drawings and estimates and specification of the equipments and technical scrutiny of tenders	Three per cent (3%) of estimated cost of works
Supervision, Inspection and control during execution	Four per cent(4%) of total cost of works
Construction of new works including detailed engineering	Fifteen per cent (15%) of total cost of works plus actual cost of establishment employed and actual expenses
Giving opinion on plans estimates and specifications	Seventy five per cent (75%) of initial inspection fee
Scrutiny fee for initial / final scheme approval	
Initial Inspection fee	Seventy five per cent (75%) of initial inspection fee
All fees above & included in the G.O read above are subjected to minimum of Rs. 500 /- per day	

11. Consumer has to invariably get the solar PV systems installed in his premises inspected and tested by the Electrical Inspector after paying the fee at the rates stipulated above by the Government. The tests conducted by the Electrical Inspector are sufficient for testifying the fitness of solar PV installations for commissioning. At the same time the licensee, before giving connectivity to its distribution system has to conduct the tests relating to the functions of inverter in the solar PV systems with special reference to,-

- (i) Harmonic current injection
- (ii) Anti-islanding property
- (iii) Direct current injection and flicker.

The experts in the Technical Committee constituted by the Commission opined that many tests as proposed in the circular No.DREP/Solar/general/14-15 dated 23.03.2015 of the Director (Renewable Energy and Planning) KSEB Ltd, cannot be conducted at site. The Committee was of the view that the Type Test Certificate issued by the laboratories accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) or by such other international institutions and the test certificates issued by the manufacturer can be accepted in view of the provisions in the CEA (Measures Relating to Safety and Electrical Supply) Regulations, 2010 and the CEA (Technical Standards for Connecting Distributed Generation Resources) Regulations, 2013.

12. In the case of concentrated solar plants (CSP) with high capacity and output either at HT level or at EHT level, the tests as proposed by KSEB Ltd in its circular dated 23.03.2015 can be insisted. But in the case of roof top solar systems which are covered under the KSERC (Grid Interactive Distributed Solar Energy Systems) Regulations 2014, only the minimum tests as indicated above have to be conducted along with those conducted by the Electrical Inspector. It would be better in the interest of development of renewable energy in the State, if KSEB Ltd stipulates the standards of solar PV equipment, gives appropriate instructions to the field officers regarding the tests to be conducted before commissioning of roof top solar systems and makes arrangements for such tests required for giving connectivity, by providing necessary equipment and training to its field officers. If such proactive steps are taken by KSEB Ltd, many avoidable delays can be minimized. It has to be appreciated that KSEB Ltd has also duties and responsibilities relating to promotion of renewable energy and protection of consumer interests. While ensuring the financial viability of the licensee and the technical standards and safety of the power system, the Commission has also a paramount duty to protect the interests of the consumers.

13. It has been noticed by the Commission that, the officers of the SBU-D of KSEB Ltd in the field are not following proper procedures for accounting and billing the energy under the net metering system. As per the said system, the solar energy injected from the Grid Interactive Distributed Solar Energy

System shall be adjusted against the energy drawn from the grid of KSEB Ltd. The Commission hereby clarifies that, the net energy, after adjusting the energy injected from Grid Interactive Distributed Solar Energy System, against the energy drawn from the grid (i.e., the net drawn from the grid), only shall be billed at the prevailing tariff applicable to the respective consumer category.

14. Under these circumstances, the Commission hereby issues the following directives under Section 23 of the Electricity Act, 2003, which shall be implemented by KSEB Ltd and other licensees for installation of grid interactive distributed solar energy system in the State of Kerala.
- (i) The total installed capacity of the grid interactive distributed solar energy systems that can be connected to a distribution transformer without conducting measurement of the load on the feeder under it, shall be 15% of the transformer capacity. Connectivity exceeding the above limit of 15% of the transformer capacity need be granted to such solar energy systems after conducting necessary studies relating to the load on the feeder.
 - (ii) KSEB Ltd will ensure availability of sufficient net meters required for the installation of grid interactive distributed solar energy system in the premises of the consumer. The availability of net meters required for grid interactive distributed solar energy systems shall be reported to the Commission at the end of each month, commencing from January 2016.
 - (iii) KSEB Ltd shall publish the model numbers and specifications of the selected three phase net meters and the single phase net meters in their website and shall report compliance to the Commission on or before 31st March of every year.
 - (iv) Installation of meters are to be carried out by the licensee according to the provisions of the Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006.
 - (v) Officials of KSEB Ltd and Electrical Inspectorate shall conduct inspection and testing of the grid interactive distributed solar energy systems jointly on a day convenient to both of them, within ten days from the date of intimation relating to the completion of installation.
 - (vi) The Type Test Certificates issued by the laboratories accredited by the National Accreditation Board For Testing and Calibration Laboratories (NABL) or by such other institutions at international level for the testing and calibration of electrical equipment can be accepted without conducting further test for the equipment like MCB, ELCB, Fuse, inverter etc. The circular No. DREP / Solar / General / 14-15 dated 23.3.2015 of Director (Renewable Energy and Planning), KSEB Ltd may be reviewed to simplify the procedural formalities required for commissioning of the grid interactive distributed solar energy systems

of capacity of and below 10 kW and the tests required to be conducted at site for the installation of grid interactive distributed solar energy systems of and below the capacity of 10kW may be decided accordingly.

- (vii) The licensees may, before giving connectivity to its distribution system, conduct the tests relating to the functions of inverter in the solar PV systems with special reference to,-
 - a. Harmonic current injection
 - b. Anti-islanding property
 - c. Direct current injection and flicker.
- (viii) In the case of concentrated solar plants (CSP) with high capacity and output either at HT level or at EHT level, the tests as proposed by KSEB Ltd in its circular dated 23.03.2015 can be insisted.
- (ix) KSEB Ltd shall stipulate the standards of solar PV equipment, give appropriate instructions to the field officers regarding the tests to be conducted before commissioning of the grid interactive distributed solar energy systems and make arrangements for such tests required for giving connectivity, by providing necessary equipment and training to its field officers.
- (x) KSEB Ltd and other small licensees, shall bill only for the net energy, after adjusting the energy injected to the grid from Grid Interactive Distributed Solar Energy System, against the energy drawn from the grid of the licensee (i.e., the net energy drawn from the grid), at the prevailing tariff applicable to the respective consumer category.

15. **Orders of the Commission**

Commission hereby, under Section 23 read with clause (e) of sub section (1) of section 86 of the Electricity Act, 2003, directs that, the KSEB Ltd and other licensees shall implement the directives specified in paragraph-14 of this order for promoting the installation of grid interactive distributed solar energy systems in the State of Kerala

Sd/-
K. Vikraman Nair
Member

Sd/-
S. Venugopal
Member

Sd/-
T.M.Manoharan
Chairman

Approved for issue,

Santhosh Kumar.K.B
Secretary