

ANDHRA PRADESH POWER COORDINATION COMMITTEE

Vidyut Soudha:: Hyderabad

From  
Chief Engineer/IPC  
APPCC,  
Vidyut Soudha,  
Hyderabad-500082  
(Fax: 040-23393304)

E-mail:  
ce.ipc@aptransco.gov.in.

- To
- 1) The Chief General Manager, (Op, Comml. & IPC), APNPDCL, Corporate Office, Opp. NIT Petrol Bunk, Hanamkonda, Warangal.
  - 2) The Chief General Manager, (Comml.) APCPDCL, Corporate Office, Mint Compound, Hyd.
  - 3) The Chief General Manager, (Comml, RA, Plg & PP) APEPDCL, Corporate Office, Seethammadhara, Vizag.
  - 4) The Chief General Manager, (Operation), APSPDCL, Corporate Office, Tiruchanoor Road, Tirupati.

Lr.No. CE/IPC/F. IPC 1/Solar Rooftop/CEA Reg. 2013/D.No.36/14, dt.18.01. 2014

Sub: IPC Wing – Solar Rooftop Net Metering Scheme – Technical Standards for connectivity of the distributed generation resources – CEA Regulations, 2013 – Communicated - Reg.

Ref: Lr.No. 5/9/2012-13/ST, dtd. 28.10.2013 of Joint Secretary, MNRE, Gol.

\*\*\*

Please find enclosed herewith the notified regulations, 2013 issued by Central Electricity Authority, Ministry of Power, Gol on technical standards for connectivity of the distributed generation resources for clarity on technical standards while implementing the grid connected rooftop/ground mounted solar PV power plants in the state.

Encl: As above

Yours faithfully,

Chief Engineer/IPC

Encl: APSPDCL/GH/IPC/FCsolar, D.No 194/14 dt 19-2-2014

All CEA opw/ SESA opw/ DE/M&P/ for taking necessary action

Encl: As above.

CHIEF GENERAL MANAGER  
P&MM & IPC  
APSPDCL :: TIRUPATI.

**MINISTRY OF POWER**  
**(Central Electricity Authority)**

**NOTIFICATION**

New Delhi, the 30<sup>th</sup> September, 2013

**File No.12/X/STD(CONN)/GM/CEA.**—Whereas draft of the Central Electricity Authority (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations, 2010 was published on 4<sup>th</sup> April 2012, as required by sub-section (3) of section 177 of the Electricity Act, 2003 (36 of 2003), read with rule 3 of the Electricity (Procedure for Previous Publication) Rules, 2005;

Now, therefore, in exercise of powers conferred by sub-section (1) of Section 177 of the Electricity Act, 2003, the Central Electricity Authority hereby makes the following regulations, namely:-

**1. Short title and commencement** - (1) These Regulations may be called the Central Electricity Authority (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations, 2013.

(2) They shall come into force on the date of their publication in the Official Gazette.

(3) For distributed generation resources already connected to the electricity system on the date of commencement of these regulations, the generating company and the licensee of the electricity system to which the generating station is connected shall mutually discuss and agree on the measures which can be taken to meet the technical standards specified in these regulations within one hundred and eighty days of the coming into force of these regulations.

**2. Definitions** - (1) In these regulations -

(a) "Act" means the Electricity Act, 2003 (No. 36 of 2003);

(b) "applicant" means a generating company or a person seeking connectivity to the electricity system at voltage level below 33 kV for its distributed generation resource;

(c) "appropriate licensee" means transmission licensee or the distribution licensee, as the case may be, to whose electricity system the electricity generated from the distributed generation resource shall be injected or is being injected;

(d) "British Standards" (BS) means those standards and specifications approved by the British Standards Institution;

(e) "distributed generation resource" means a generating station feeding electricity into the electricity system at voltage level of below 33 kV;

(f) "frequency" means the number of alternating cycles per second expressed in Hertz;

(g) "IEC Standard" means a standard approved by the International Electrotechnical Commission;

(h) "Indian Standards" means standards specified by Bureau of Indian Standards;

(i) "interconnection point" means a point on the electricity system, including a sub-station or a switchyard, where the interconnection is established between the facility of the applicant and the electricity system and where electricity injected into or drawn from the electricity system can be measured unambiguously for the applicant;

(j) "inverter" means a device that changes direct current power into alternating current power;

(k) "protection system" means the equipment by which abnormal conditions in the electricity system are detected and fault clearance, actuating signals or indications are initiated without the intervention by the operator;

(l) "Site Responsibility Schedule" (SRS) means a schedule for demarcating the ownership, responsibility for control, operation and maintenance of the equipment at the interconnection point;

(m) "unintended island" means a part of the electricity system which remains energised by one or more distributed generation resource, when such part of the system has been isolated from the remaining part of the electricity system; and

(n) "user" means a generating company whose distributed generation resource is connected to the electricity system.

(2) The words and expressions used herein and not defined in these regulations but defined in the Act shall have the meanings assigned to them in the Act.

**3. Applicability of the Regulations -** These regulations shall be applicable to all the generating companies or persons owning distributed generation resource, which are connected to or seeking connectivity with the electricity system:

Provided that, in case a licensee owning the electricity system to which connection is to be made also owns the distributed generation resource, these regulations shall be applicable *mutatis mutandis*.

**4. General Connectivity Conditions -** (1) The applicant shall make a formal request to the appropriate licensee for connection to electricity system of the appropriate licensee or generating station as the case may be.

(2) The applicant shall be responsible for the planning, design, construction, reliability, protection and safe operation of its own equipment subject to the regulations for construction, operation, maintenance and connectivity and other statutory provisions.

(3) The applicant and the user shall furnish data as prescribed by the appropriate licensee in a non-discriminatory manner.

(4) The applicant and the user shall provide necessary facilities in the distributed generation resource for communication and storage of data and other parameters as may be stipulated by the appropriate licensee in a non-discriminatory manner.

(5) The applicant and the user shall coordinate with the appropriate licensee on the issues including but not limited to protection, safety, and metering.

(6) The appropriate licensee shall carry out the inter-connection study to determine:-

- (a) the point of inter-connection, required interconnection facilities and modifications required on the existing electricity system, if any, to accommodate the interconnection,
- (b) the maximum net capacity of the distributed generation resource at a particular location for single-phase and three phase generators connected to a shared single-phase system or three phase system respectively, based on the capacity and configuration of the electricity system, and imbalance in the power flows that distributed generation resource may cause,
- (c) likely impact, if any, on the quality of service to consumers connected to the electricity system and measures to mitigate the same,
- (d) additional measures to ensure safety of the equipment and personnel.

(7) Every connection of an applicant's system to the electricity system shall be covered by a connection agreement between the applicant and appropriate licensee, which shall contain general and specific technical conditions, applicable to that connection.

(8) The appropriate licensee shall inform the concerned State transmission utility within thirty days of acceptance of application for connectivity of a generating station to electricity system operating at voltage level below 33 kV. The concerned State transmission utility shall in turn inform the State Load Despatch Centre with details of installed capacity, generator capabilities, connectivity and likely date of commissioning or date of commercial operation.

**5. Standards and Codes of Practice. -** (1) The applicant shall follow the industry best practices and applicable industry standards in respect of the equipment installation and its operation and maintenance.

(2) The equipment including overhead lines and cables shall comply with the relevant Indian standards issued by Bureau of Indian Standards.

(3) In case the Bureau of Indian Standards has not issued relevant standard, IEC standard or British Standards or standard issued by American National Standards Institute (ANSI) or any other equivalent International Standard shall be followed in that order:

Provided that whenever a standard other than Indian Standard is followed, necessary corrections or modifications shall be made for nominal system frequency, nominal system voltage, ambient temperature, humidity and other conditions prevailing in India before actual adoption of the said standard.

(4) The effects of wind, storms, floods, lightning, elevation, temperature extremes, icing, contamination, pollution and earthquakes must be considered in the design and operation of the connected facilities.

(5) Installation, operation and maintenance of the equipment by the applicant shall conform to the relevant standards specified by the Central Electricity Authority as and when they come into force.

6. Safety. - The applicant shall comply with the Central Electricity Authority (Measures Relating to Safety and Electricity Supply) Regulations, 2010 for the purposes of safety under these regulations.

7. Sub-station Grounding. - Sub-station grounding shall be done in accordance with IS 3043, the code of practice for earthing issued by Bureau of Indian Standards.

8. Metering. - (1) Meters shall be provided as specified in the Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006 for the purpose of metering under these regulations.

(2) Measurement of harmonic current injection, Direct Current injection and flicker shall be done with calibrated meters before the commissioning of the project and once in a year in presence of the parties concerned and the indicative date for the same shall be mentioned in the connection agreement:

Provided that in addition to annual measurement, if appropriate licensee or the generating company, as the case may be, desires to measure harmonic current injection or Direct Current injection or flicker, it shall inform the other party in writing and the measurement shall be carried out within five working days

9. Schematic Diagrams. - The applicant and user shall prepare single line schematic diagrams in respect of its system facility and make the same available to the appropriate licensee.

10. Inspection, Test, Calibration and Maintenance prior to connection. - (1) Before physical connection, the applicant shall complete all inspections and tests finalised in consultation with the appropriate licensee or generating station to which his equipment is getting connected.

(2) The applicant shall make available all drawings, specifications and test records of the project equipment to the appropriate licensee or generating station as the case may be.

11. Standards for distributed generation resources. - Harmonic current injections from a generating station shall not exceed the limits specified in IEEE 519.

(2) The distributed generating resource shall not inject Direct Current greater than 0.5% of the full rated output at the interconnection point.

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

Provided that the standards for flicker shall come into effect from 1<sup>st</sup> April 2014.

(4) Every distributed generating resource shall be equipped with automatic synchronisation device:

Provided that induction generators, except self-excited induction generators, shall not require a synchronising device:

Provided further that distributed generation resources using inverters shall not be required to have separate synchronising device, if the same is inherently built into the inverter.

(5) For three-phase generators, the circuit breakers shall be three-phase devices with electronic or electromechanical control.

4298 4/13-3

(6) Distributed generation resource operating in parallel with electricity system shall be equipped with the following protective functions to sense abnormal conditions on electricity system and cause the distributed generation resource to be automatically disconnected from electricity system or to prevent the distributed generation resource from being connected to electricity system inappropriately-

- (a) over and under voltage trip functions if voltage reaches above 110% or below 80% respectively with a clearing time upto two seconds; however, appropriate licensee may prescribe a narrower range of voltage for the purpose.
- (b) over and under frequency trip functions, if frequency reaches 50.5 Hz and below 47.5 Hz with a clearing time upto 0.2 seconds; however, appropriate licensee may prescribe a narrower range of frequency for the purpose.
- (c) the distributed generation resource shall cease to energise the circuit to which it is connected in case of any fault in this circuit.
- (d) a voltage and frequency sensing and time-delay function to prevent the distributed generation resource from energising a de-energised circuit and to prevent the distributed generation resource from reconnecting with electricity system unless voltage and frequency is within the prescribed limits and are stable for at least sixty seconds; and
- (e) a function to prevent the distributed generation resource from contributing to the formation of an unintended island, and cease to energise the electricity system within two seconds of the formation of an unintended island.

(7) The equipment of the generating station shall meet following requirements, namely:-

- (a) circuit breakers or other interrupting equipment shall be suitable for their intended application with the capability of interrupting the maximum 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  $\pm 5\%$  at the point of connection.

(9) After considering the maintenance and safety procedures, the distribution licensee may require the applicant with a distributed generation resource of capacity exceeding a particular level to 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 twenty four hours 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 feature of over-current protection; and
- (f) be located at a height of at least 2.44 m above the ground level.

(10) Prior to synchronisation of the distributed generation resource for the first time with electricity system, the applicant and the appropriate licensee shall agree on the protection features and control diagrams.

(11) one copy each of the approved drawing and diagrams showing important equipment, protection and control features shall be signed by representative of the applicant and the licensee and shall be in possession of the applicant and licensee.

(12) These drawing and diagrams shall be amended as and when any changes are made in the distributed generation resource or interconnection facility.

12. Site Responsibility Schedule. - (1) A Site Responsibility Schedule for every interconnection point shall be prepared by the appropriate licensee.

(2) Following information shall be included in the Site Responsibility Schedule, namely:-

- (a) schedule of electrical apparatus services and supplies;
- (b) schedule of telecommunications and measurement apparatus; and
- (c) safety rules applicable to each plant and apparatus.

(3) Following information shall also be furnished in the Site Responsibility Schedule for each item of equipment installed at the connection site, namely:-

- (a) the ownership of equipment;
- (b) the responsibility for control of equipment;
- (c) the responsibility for maintenance of equipment;
- (d) the responsibility for operation of equipment;
- (e) the manager of the site;
- (f) the responsibility for all matters relating to safety of persons at site; and
- (g) the responsibility for all matters relating to safety of equipment at site.

43. Access at Connection Site - The applicant and user shall provide reasonable access and other required facilities to the appropriate licensee for inspection of the equipment belonging to the applicant or user, as the case may be, and for maintenance of the equipment, if any, installed by the appropriate licensee in the premises of the applicant or user, as the case may be.

M. S. PURI, Secy.

Central Electricity Authority

[ADVT-III/4/Exty./150/13]