

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

New Delhi, the 15th October, 2013

**No.12/X/STD(CONN)/GM/CEA.**—Whereas the draft of the Central Electricity Authority (Technical Standard for Connectivity to the Grid) (Amendment) Regulations, 2012 were published, under sub-section (3) of section 177 of the Electricity Act, 2003 (36 of 2003) and rule 3 of the Electricity (Procedure for previous Publication) Rules, 2005 on 16th March, 2012;

Now, therefore, in exercise of powers conferred by section 7 and clause (b) of section 73 read with sub-section (2) of section 177 of the Electricity Act, 2003, the Central Electricity Authority hereby makes the following regulations to amend the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007, namely:--

1. **Short title and commencement.** - (1) These regulations may be called the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Amendment Regulations, 2013.

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

2. In the Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 (hereinafter referred to as the said regulations), in regulation 2, -

(a) for clause (10) the following clause shall be substituted, namely :-

“Earthing” means electrical connection between non-energized conducting parts and the general mass of earth by an earthing device”;

(b) in clause (14) the following paragraph shall be added at the end, namely:-

“In case of Solar Photo voltaic generating station, each inverter along with associated modules will be reckoned as a separate generating unit”;

(c) for clause (17) the following clause shall be substituted, namely:-

“Interconnection point” means a point on the grid, including a sub-station or a switchyard, where the interconnection is established between the facility of the requester and the grid and where electricity injected into or drawn from the grid can be measured unambiguously for the requester”;

(d) after clause (17), the following clause shall be inserted, namely:-

“(17A) “Inverter” means a device that changes direct current power into alternating current power”;

(e) for clause (19) the following clause shall be substituted, namely:-

“Maximum Continuous Rating” (MCR) will carry same meaning as defined in the Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010”;

(f) clause 20 shall be omitted;

(g) after clause (28) the following clause shall be inserted, namely:-

“(28A) “Standard Protection” means electrical protection functions specified in Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010”.

3. in the said regulations, for the words “Central Electricity Authority ( Grid Standards for Operation and Maintenance of Transmission Lines) as and when they come into force” the words “Central Electricity Authority (Grid Standards) Regulations, 2010”, shall be substituted.

4. In regulation 6 of the said regulations, -

(a) in clause (6) the following proviso shall be Inserted at the end, namely:-

“ Provided that in order to carry out the said study, the requester shall present the mathematical model of the equipment in accordance with the requirements as stipulated by the Appropriate Transmission Utility or distribution licensee, as the case may be.”

(b) after clause (7) following clause shall be inserted, namely:-

“(8) The State Transmission Utility shall inform the Central Transmission Utility and the Authority, within thirty days of acceptance of application for connectivity of a generating station to electricity system operating at 110 kV and above.”

5. In regulation 7 of the said regulations, in clause (1) for the words “owner of the sub-station where” the words “ generating company or licensee operating the electricity system to which” shall be substituted.

6. In the Schedule of the said regulations, -

(a) for Part II the following shall be substituted, namely:-

4414 G/13-3

**“Part II****Connectivity Standard applicable to the generating stations****A. Connectivity Standards applicable to the Generating Stations other than wind and generating stations using inverters**

These generating stations shall comply with the following requirements besides the general connectivity conditions given in the said regulations and Part I of the schedule:-

**A1. For Generating stations which are connected on or after the date on which Central Electricity Authority (Technical Standards for Connectivity of the Grid) Regulation, 2007 became effective**

(1) The excitation system for every generating unit:-

(a) Shall have state of the art excitation system;

(b) Shall have Automatic Voltage Regulator (AVR). Generators of 100 MW rating and above shall have Automatic Voltage Regulator with digital control and two separate channels having independent inputs and automatic changeover; and

(c) The Automatic Voltage Regulator of generator of 100 MW and above shall include Power System Stabilizer (PSS).

(2) The Short-Circuit Ratio (SCR) for generators shall be as per IEC-34.

(3) The generator transformer windings shall have delta connection on low voltage side and star connection on high voltage side. Star point of high voltage side shall be effectively (solidly) earthed so as to achieve the Earth Fault Factor of 1.4 or less.

(4) All generating machines irrespective of capacity shall have electronically controlled governing system with appropriate speed/load characteristics to regulate frequency. The governors of thermal generating units shall have a droop of 3 to 6% and those of hydro generating units 0 to 10%.

(5) Generating Units located near load centre, shall be capable of operating at rated output for power factor varying between 0.85 lagging (over-excited) to 0.95 leading (under-excited) and Generating Units located far from load centres shall be capable of operating at rated output for power factor varying between 0.9 lagging (over-excited) to 0.95 leading (under-excited).

Provided that all generating units commissioned on or after 01.01.2014, shall be capable of operating at rated output for power factor varying between 0.85 lagging (over-excited) to 0.95 leading (under-excited).

Provided further that the above performance shall also be achieved with voltage variation of  $\pm 5\%$  of nominal, frequency variation of  $+3\%$  and  $-5\%$  and combined voltage and frequency variation of  $\pm 5\%$ . However, for gas turbines, the above performance shall be achieved for voltage variation of  $\pm 5\%$ .

(6) The coal and lignite based thermal generating units shall be capable of generating up to 105% of Maximum Continuous Rating (subject to maximum load capability under Valve Wide Open Condition) for short duration to provide the frequency response.

(7) The hydro generating units shall be capable of generating up to 110% of rated capacity (subject to rated head being available) on continuous basis.

(8) Every generating unit shall have standard protections to protect the units not only from faults within the units and within the station but also from faults in transmission lines. For generating units having rated capacity greater than 100 MW, two independent sets of protections acting on two independent sets of trip coils fed from independent Direct Current (DC) supplies shall be provided. The protections shall include but not be limited to the Local Breaker Back-up (LBB) protection.

(9) Hydro generating units having rated capacity of 50 MW and above shall be capable of operation in synchronous condenser mode, wherever feasible.

Provided that hydro generating units commissioned on or after 01.01.2014 and having rated capacity of 50 MW and above shall be equipped with facility to operate in synchronous condenser mode, if necessity for the same is established by the interconnection studies.

(10) Bus bar protection shall be provided at the switchyard of all generating station.

(11) Automatic synchronisation facilities shall be provided in the requester's Project.

(12) The station auxiliary power requirement, including voltage and reactive requirements, shall not impose operating restrictions on the grid beyond those specified in the Grid Code or state Grid Code as the case may be.

(13) In case of hydro generating units, self-starting facility may be provided. The hydro generating station may also have a small diesel generator for meeting the station auxiliary requirements for black start.

Provided that hydro generating units shall have black start facilities in accordance with provisions of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010 from the date of publication of these Regulations.

(14) The standards in respect of the switchyard associated with the generating stations shall be in accordance with the provisions specified in respect of 'Sub-stations' under Part III of these Standards.

**A2. Generating stations which were already connected to the grid on the date on which Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007 became effective**

For thermal generating units having rated capacity of 200 MW and above and hydro units having rated capacity of 100 MW and above, the following facilities would be provided at the time of renovation and modernization.

- (1) Every generating unit shall have Automatic Voltage Regulator. Generators having rated capacity of 100 MW and above shall have Automatic Voltage Regulator with two separate channels having independent inputs and automatic changeover.
- (2) Every generating unit of capacity having rated capacity higher than 100MW shall have Power System Stabilizer.
- (3) All generating units shall have standard protections to protect the units not only from faults within the units and within the station but also from faults in transmission lines. The protections shall include but not limited to the Local Breaker Back-up (LBB) protection.

**B. Connectivity Standards applicable to the Wind generating stations and generating stations using inverters**  
These generating stations shall comply with the following requirements besides the general connectivity conditions given in the said regulations and Part I of the Schedule:-

**B1. Requirements with respect to Harmonics, Direct Current (DC) Injection and Flicker**

- (1) Harmonic current injections from a generating station shall not exceed the limits specified in Institute of Electrical and Electronics Engineers (IEEE) Standard 519.
- (2) The Generating station shall not inject DC current greater than 0.5 % of the full rated output at the interconnection point.
- (3) The generating station shall not introduce flicker beyond the limits specified in IEC 61000.  
Provided that the standards for flicker will come into effect from 1<sup>st</sup> April 2014.
- (4) Measurement of harmonic content, DC injection and flicker shall be done at least once in a year in presence of the parties concerned and the indicative date for the same shall be mentioned in the connection agreement;

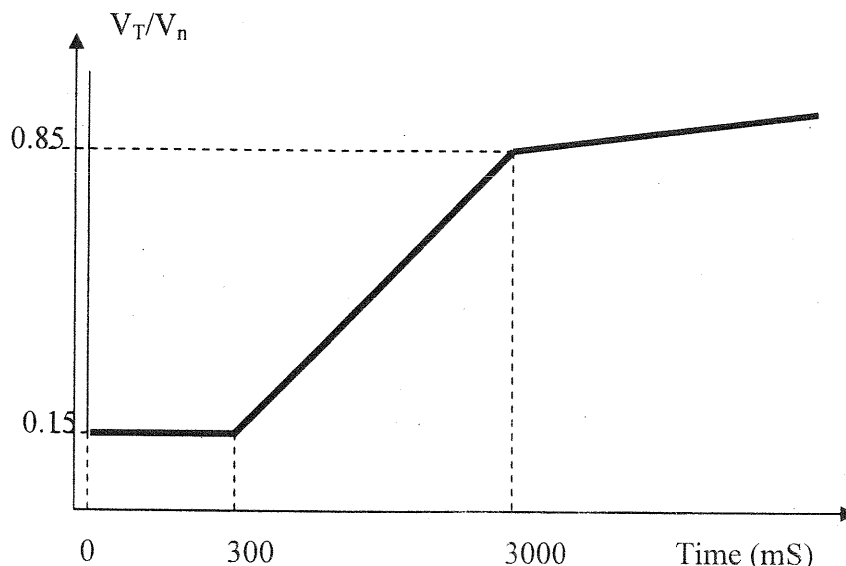
Provided that in addition to annual measurement, if distribution licensee or transmission licensee or the generating company, as the case may be, desires to measure harmonic content or DC injection or flicker, it shall inform the other party in writing and the measurement shall be carried out within 5 working days”;

**B2. For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.**

- (1) The generating station shall be capable of supplying dynamically varying reactive power support so as to maintain power factor within the limits of 0.95 lagging to 0.95 leading.
- (2) The generating units shall be capable of operating in the frequency range of 47.5 Hz to 52 Hz and shall be able to deliver rated output in the frequency range of 49.5 Hz to 50.5 Hz.

Provided that above performance shall be achieved with voltage variation of up to  $\pm 5\%$  subject to availability of commensurate wind speed in case of wind generating stations and solar insolation in case of solar generating stations.

- (3) Wind generating stations connected at voltage level of 66 kV and above shall remain connected to the grid when voltage at the interconnection point on any or all phases dips up to the levels depicted by the thick lines in the following curve:



Where

$V_T/V_n$  is the ratio of the actual voltage to the nominal system voltage at the interconnection point

Provided that during the voltage dip, the individual wind generating units in the generating station shall generate active power in proportion to the retained voltage;

Provided further that during the voltage dip, the generating station shall maximise supply of reactive current till the time voltage starts recovering or for 300 ms, whichever time is lower.

(4) Wind generating station connected at voltage level of 66 kV and above shall have facility to control active power injection in accordance with a set point, which shall be capable of being revised based on the directions of the appropriate Load Despatch Centre.

Provided that as far as possible, reduction in active power shall be done without shutting down an operational generating unit and with reduction being shared by all the operational generating units pro-rata to their capacity.

(5) The standards in respect of the switchyard associated with the generating stations shall be in accordance with the provisions specified in respect of 'Sub-stations' under Part III of these Standards.

**B3. For generating units which are connected before and upto 6 months after the date of publication of these Regulations in the Official Gazette**

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 standards specified in (B1) and (B2) subject to technical feasibility”;

(b) in Part IV for clause 6, the following clause shall be substituted, namely:-

**“6. Back-energization**

The bulk consumer shall not energize transmission or distribution system by injecting supply from his generators or any other source either by automatic controls or manually unless specifically provided for in the connection agreement with the Transmission or Distribution Licensee”.

M. S. PURI, Secy.

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

**Foot note :** The principal regulations were published in the Gazette of India vide number 12/X/STD(CONN)/GM/CEA dated the 21st February 2007.