

PUNJAB STATE ELECTRICITY REGULATORY COMMISSION

Draft Notification

The -----, March, 2020

No. PSERC/Secy/Regu. - In exercise of the powers conferred under Section 181 read with Sections 43, 44, 45, 46, 47, 48, 50, 55, 56, 57, 58, 59, 126, 127, 135, 152, 154 & 163 of the Electricity Act, 2003 (Central Act 36 of 2003) read with Electricity (Amendment) Act, 2007 (No. 26 of 2007) and all other powers enabling it in this behalf, the Punjab State Electricity Regulatory Commission hereby makes following regulations to amend Punjab State Electricity Regulatory Commission (Electricity Supply Code and Related Matters) Regulations, 2014 including the first to sixth amendments thereof (hereinafter referred to as “the Principal Regulations”):-

1. SHORT TITLE, COMMENCEMENT AND INTERPRETATION

- 1.1 These Regulations may be called the Punjab State Electricity Regulatory Commission (Electricity Supply Code and Related Matters) (7th Amendment) Regulations, 2020.
- 1.2 These Regulations shall be applicable to all licensees (including entities exempted under Section 13 of the Act) in their respective licensed/supply areas and all consumers/persons in the State of Punjab.
- 1.3 These Regulations shall come into force from the date of their publication in the official gazette of the State.

2) Amendments in Regulation 2 of the Principal Regulations-

Following definitions shall be inserted in Regulation 2 of the Principal Regulations

(ra) Designated Consumer' means consumer using or engaged in any of following processes i.e Arc Furnace, Induction Furnace, Chloro alkaline unit, Billet heater, Surface hardening Machine & Electrolytic process industry, IT/ITES, Malls, Petro-Chemical units, Railways, Pharmaceuticals or as may be specified by the Commission from time to time and connected at a supply voltage of 11 kV & above.

(zna) 'Maximum demand load current' means the current value at the point of common coupling calculated as the sum of the currents corresponding to the

maximum 15/30 minute demand during each of the twelve previous months divided by 12;

(zta) ‘Point of Common Coupling (PCC)’ means the point of metering, or any other point on supply system of distribution licensee, electrically nearest to the particular load at which other loads are, or could be, connected. For service to industrial users (i.e., manufacturing plants) via a dedicated service transformer, the PCC is usually at the HV side of the transformer. For commercial users (office parks, shopping malls, etc.) supplied through a common service transformer, the PCC is commonly at the LV side of the service transformer.

(zua) ‘Power Quality Meter’ means a device suitable for monitoring and recording of power quality. It shall be capable of accurate measurement, monitoring and recording of harmonics, sags, swells, flickers and other power quality parameters;

(zya) ‘Short-circuit ratio at a particular location means the ratio of the available short-circuit current, in amperes, to the load current, in amperes.

(zzda) ‘Total Demand Distortion (TDD)’ means the ratio of the root mean square of the harmonic content, considering harmonic components up to the 50th order, expressed as a percent of the maximum demand current;

(zzdb) ‘Total Harmonic Distortion (THD)’ means the ratio of the root mean square of the harmonic content, considering harmonic components up to the 50th order, expressed as a percent of the fundamental;

3) Amendments in Regulation 24 of the Principal Regulations-

The Regulation 24 of the Principal Regulations shall be substituted as under;

- 24.1 The distribution licensee and the designated consumers shall control the harmonics level at the Point of Common Coupling (PCC). The limits of voltage harmonics by the distribution licensee in its electrical network, the limit of injection of current harmonics by the designated consumers, Point of measurement i.e PCC and other related matters shall be as per the IEEE 519-2014 namely ‘IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems’, as modified from time to time.

24.2 The measurements undertaken to determine compliance shall be carried out in accordance with the requirements as specified in IEC 61000-4-7 and IEC 61000-4-30. There shall be continuous measurement of harmonics with permanent Power Quality meters complying with the IEC 61000-4-30 Class-A meters for all new installations/connections of identified locations. For existing installations/ connections at identified locations where CTs/PTs are of lower accuracy class than mandated by IEC 61000-4-30 Class-A meters, the meters complying with the IEC 61000-4-30 Class-B may be installed.

24.3 The data measured and metered as mentioned in regulation 24.2 with regard to the harmonics, shall be available with distribution licensee and it shall also be shared with the consumer periodically.

24.4 The designated consumers shall install power quality meter and share the recorded data thereof with the distribution licensee each week or as may be decided by the Commission.

Provided that the existing designated consumers shall comply with this provision within six months from the date of commencement of these regulations.

24.5 The distribution licensee shall install power quality meters within three years from the date of commencement of these regulations in a phased manner covering at least 33% of the total 33/66 kV feeders and selected 11 kV feeders each year as may be approved by the Commission.

24.6 **Harmonic limits**

Harmonic management in a power system is a joint responsibility involving both the end users and the distribution licensee, therefore harmonic limits are specified for both voltages and currents. The limits as mentioned below shall apply only at the Point of Common Coupling (PCC).

24.6.1 **VOLTAGE HARMONICS**

(a) The distribution licensee shall control the line-to-neutral voltage harmonics at the Point of Coupling. The voltage harmonic distortion of the supply voltage shall be assessed in terms of the Total Harmonic Distortion (THD_V) considering harmonic components up to the 50th order. THD_V shall be taken as square root of the sum

of squares of all voltage harmonics expressed as a percentage of the magnitude of the fundamental measured with following formula

$$THD_V = \sqrt{\sum_{h=2}^N V_h^2}$$

where

V_h represents the percent r.m.s value of the h^{th} harmonic voltage component, and N represents the highest harmonic order considered in the calculation.

(b) Voltage distortion limits

Bus Voltage V at PCC	Individual harmonic (%)	Total harmonic distortion THD (%)
$V \leq 1.0$ kV	5.0	8.0
$1 \text{ kV} < V \leq 161$ kV	3.0	5.0
$69 \text{ kV} < V \leq 161$ kV	1.5	2.5
$161 \text{ kV} < V$	1.0	1.5 ^a

^aHigh-voltage systems can have up to 2.0% THD where the cause is an HVDC terminal whose effects will have attenuated at points in the network where future users may be connected.

For statistical evaluation, voltage harmonics shall be assessed for the period not less than 7 continuous days. The short time 10 min values are accumulated over periods of one week and the 95th percentile values (i.e., those values that are exceeded for 5% of the measurement period) are calculated for each 7-day period for comparison with the recommended limits. The values are measured at PCC in normal operating condition.

24.6.2 CURRENT HARMONICS

The designated consumer shall limit the value of harmonic currents measured at Point of Common Coupling (PCC) measured over 10 minutes period to the values as given in table below:

(a) Current distortion limits (TDD) for system nominally rated through 120 V to 69 kV

Maximum harmonic current distortion in percent of I_L						
Individual harmonic order (odd harmonics)^{a, b}						
I_{SC}/I_L	$3 \leq h < 11$	$11 \leq h < 17$	$17 \leq h < 23$	$23 \leq h < 35$	$35 \leq h \leq 50$	TDD
<20*	4.0	2.0	1.5	0.6	0.3	5.0
20<50	7.0	3.5	2.5	1.0	0.5	8.0
50<100	10.0	4.5	4.0	1.5	0.7	12.0
100<1000	12.0	5.5	5.0	2.0	1.0	15.0
>1000	15.0	7.0	6.0	2.5	1.4	20.0

Note: * All power generation equipment is limited to these values of current distortion, regardless of actual I_{SC}/I_L ;

^aEven harmonics are limited to 25% of the odd harmonic limits above;

^bCurrent distortions that result in a dc offset, e.g., half-wave converters, are not allowed;

where

I_{SC} = maximum short-circuit current at PCC;

I_L = maximum demand load current (fundamental frequency component) at the PCC under normal load operating conditions;

(b) Values of Current distortion limits (TDD) for system rated above 69 kV through 161 kV

Maximum harmonic current distortion in percent of I_L						
Individual harmonic order (odd harmonics)^{a, b}						
I_{SC}/I_L	$3 \leq h < 11$	$11 \leq h < 17$	$17 \leq h < 23$	$23 \leq h < 35$	$35 \leq h \leq 50$	TDD
<20*	2.0	1.0	0.75	0.3	0.15	2.5
20<50	3.5	1.75	1.25	0.5	0.25	4.0
50<100	5.0	2.25	2.0	0.75	0.35	6.0
100<1000	6.0	2.75	2.5	1.0	0.5	7.5
>1000	7.5	3.5	3.0	1.25	0.7	10.0

Note: * All power generation equipment is limited to these values of current distortion, regardless of actual I_{SC}/I_L ;

^aEven harmonics are limited to 25% of the odd harmonic limits above;

^bCurrent distortions that result in a dc offset, e.g., half-wave converters, are not allowed;

where

I_{SC} = maximum short-circuit current at PCC;

I_L = maximum demand load current (fundamental frequency component) at the PCC under normal load operating conditions;

(c) Values of Current distortion limits (TDD) for system rated above 161 kV

Maximum harmonic current distortion in percent of I_L						
Individual harmonic order (odd harmonics)^{a, b}						
ISC/IL	$3 \leq h < 11$	$11 \leq h < 17$	$17 \leq h < 23$	$23 \leq h < 35$	$35 \leq h \leq 50$	TDD
<25*	1.0	0.5	0.38	0.15	0.1	1.5
25<50	2.0	1.0	0.75	0.3	0.15	2.5
≥ 50	3.0	1.5	1.15	0.45	0.22	3.75

Note: * All power generation equipment is limited to these values of current distortion, regardless of actual ISC/IL;

^aEven harmonics are limited to 25% of the odd harmonic limits above;

^bCurrent distortions that result in a dc offset, e.g., half-wave converters, are not allowed;

where

Is_c = maximum short-circuit current at PCC;

I_L = maximum demand load current (fundamental frequency component) at the PCC under normal load operating conditions;

For statistical evaluation, current harmonics shall be assessed for the period not less than 7 continuous days. The short time 10 min values are accumulated over periods of one week and the 95th & 99th percentile values (i.e., those values that are exceeded for 5% and 1% of the measurement period) are calculated for each 7- day period for comparison with the recommended limits. The values of TDD are measured at PCC in normal operating condition.

Provided that:

The weekly 95th percentile short time 10 min harmonic current values should be less than the value given in above Tables. However, the weekly 99th percentile short time 10 min harmonic current values should be less than 1.5 times the value given in above Table.

- 24.7 In case the designated consumer fails to install power quality meter within stipulated time or the injection of current harmonics exceeds the limits as specified in regulation 24.6.2 above, such consumer shall be liable to pay a penalty to the distribution licensee at the rate and in the manner as may be approved by the Commission from time to time. The penalty shall be without prejudice to the right of the distribution licensee to take other punitive action as may be approved by the Commission.

24.8 In case the voltage harmonics in the distribution system exceeds the limits specified in regulation 24.6.1 above, the distribution licensee shall be liable to compensate the affected consumers of the feeders at the rate and in the manner as may be approved by the Commission from time to time.

Secretary to the Commission

Note: The **Principal Regulations** were issued vide Notification No. PSERC/Secy./Regu.97 dated 05.11.2014 published in Punjab Govt. Gaz.(Extra) dated 5th Nov. 2014 and further amended vide:

The 1st amendment to the Principal Regulations issued vide Notification No./ PSERC/Secy./Regu.114 dated 22.06.2016 published in Punjab Govt. Gaz.(Extra) dated 23.06.2016.

The 2nd amendment to the Principal Regulations issued vide Notification No./ PSERC/Secy./Regu.116 dated 05.10.2016 published in Punjab Govt. Gaz.(Extra) dated 05.10.2016.

The 3rd amendment to the Principal Regulations issued vide Notification No./ PSERC/Secy./Regu.119 dated 21.03.2017 published in Punjab Govt. Gaz.(Extra) dated 22.03.2017.

The 4th amendment to the Principal Regulations issued vide Notification No./ PSERC/Secy./Regu.125 dated 17.05.2018 published in Punjab Govt. Gaz.(Extra) dated 17.05.2018 read with corrigendum issued vide notification no. PSERC/Secy./Regu.126 dated 06.06.2018 published in Punjab Govt. Gaz.(Extra) dated 06.06.2018.

The 5th amendment to the Principal Regulations issued vide Notification No./ PSERC/Secy./Regu.137 dated 28.01.2019 published in Punjab Govt. Gaz.(Extra) dated 28.01.2019

The 6th amendment to the Principal Regulations issued vide Notification No./ PSERC/Secy./Regu.146 dated 09.01.2020 published in Punjab Govt. Gaz.(Extra) dated 10.01.2020