

PUNJAB STATE ELECTRICITY REGULATORY COMMISSION

PLOT NO.3, MADHYA MARG, SECTOR 18-A, CHANDIGARH

ORDER

DATE: 21.03.2023

In the matter of

Punjab State Electricity Regulatory Commission (Power Quality) Regulations, 2023

1. INTRODUCTION

Section 57 of the Electricity Act, 2003 provides that the Appropriate Commission may, after consultation with the licensees and persons likely to be affected, specify standards of performance of a licensee or a class of licensees. Further, Section 57(2) of the Act provides for compensation to the persons affected, as may be determined by the Appropriate Commission, in case a licensee fails to meet the standards. Accordingly, the Commission specified various minimum Standards of Performance in the Supply Code. Most of these standards relates to timelines for various services, replacement of damaged equipment and restoration of supply etc. However, increased use of electronic equipments, micro-processor based technologies, non linear loads resulting in Harmonics and increasing penetration of RE power resulted in distortion of voltage/current waveform affecting quality of supply etc.. Poor quality of power leads to premature failure or reduced/degraded performance of equipment and increased system losses.

Section 86(1)(i) of the Act provides that the State Commission shall specify or enforce standards with respect to quality, continuity and reliability of service by licensees. The Forum of Regulators (FoR) in its 64th meeting held on 24.08.2018 approved the Model Regulations and report on Power Quality. Various Power Quality parameters such as supply voltage variations, flicker, dips and swells, harmonics and power supply interruption etc. which is to be controlled by the distribution licensees, have been included in the these model regulations. The model regulations also propose the level of current harmonics which is to be controlled by the designated consumers. The PQ parameters are to be implemented in phased manner.

After issue of Model PQ Regulations, Bureau of Indian Standards issued Indian Standards for Distribution System Supply Voltage” i.e IS 17036:2018 in October, 2018. As per clause (b) of section 73 of the Electricity Act, 2003 (The Act) Central Electricity Authority (CEA) has been empowered to specify the technical standards for construction of electrical plants, electric lines and **connectivity to the grid**. Accordingly, as per the powers conferred under clause(b) of section 73 read with section 177 of the Act, the Authority notified CEA(Technical Standards for connectivity to the Grid) Regulations, 2007. These regulations have been amended vide notification dated 06.02.2019. The paragraph 3 of part-IV of these regulations reads as under;

“(3) Voltage and Current Harmonics. –

(i) The limits of voltage harmonics by the distribution licensee in its electricity system, the limits of injection of current harmonics by bulk consumers, point of harmonic measurement, i.e., point of common coupling, method of harmonic measurement and other related matters, shall be in accordance with the IEEE 519-2014 standards, as amended from time to time;

(ii) Measuring and metering of harmonics shall be a continuous process with meters complying with provisions of IEC 61000-4-30 Class A.

(iii) The data measured and metered as mentioned in sub-paragraph (ii) with regard to the harmonics, shall be available with distribution licensee and it shall also be shared with the consumer periodically.

(iv) The bulk consumer shall install power quality meter and share the recorded data thereof with the distribution licensee with such periodicity as may be specified by the appropriate Electricity Regulatory Commission:

Provided that the existing bulk consumer shall comply with this provision within twelve months from the date of commencement of the Central Electricity Authority (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2018.

(v) In addition to harmonics, periodic measurement of other power quality parameters such as voltage sag, swell, flicker, disruptions shall be done as per relevant International Electrotechnical Commission Standards by the distribution licensee and the reports thereof shall be shared with the consumer.

(vi) The distribution licensee shall install power quality meters in a phased manner within three years from the date of commencement of the Central Electricity Authority (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2018 covering at least 33% of the 33 kV substations each year.”

The Central Electricity Authority also notified CEA(Technical Standards for Connectivity below 33 kV) Amendment Regulations, 2019 vide notification dated 06.02.2019 which are applicable to persons seeking connectivity to the electrical system below 33 kV. Regulation 11 A of these regulations provides as under;

“(1) -----

(2) *The limits of injection of current harmonics at the point of common coupling by the user, method of harmonic measurement and other such matters, shall be in accordance with the IEEE 519-2014 standards, as amended, from time to time.*

(3) *The measuring and metering of harmonics shall be a continuous process with power quality meters complying with the provisions of IEC 61000-4-30 Class A.*

(6) *The data measured and metered as mentioned in sub-regulation (5), shall be available with the distribution licensee and be shared with the consumer periodically.*

(7) *The applicant seeking connectivity at 11 kV or above shall install power quality meters and share the recorded data thereof with the distribution licensee with such periodicity as may be specified by the appropriate Electricity Regulatory Commission:*

Provided that the user connected at 11 kV and above shall comply with the provision of this sub-regulation within twelve months from the date of commencement of the Central Electricity Authority (Technical Standards for Connectivity of the Distributed Generation Resources) Amendment Regulations, 2018.

(8) *In addition to harmonics, periodic measurement of other power quality parameters such as voltage sag, swell, flicker, disruptions shall be done by the distribution licensee as per relevant IEC standard and the reports thereof shall be shared with the consumer.”*

2. BACKGROUND

- (i) In view of the provisions of Model Regulations on Power Quality approved by FoR and CEA connectivity regulations read with IEEE 519, the Commission in the Tariff Order for FY 2019-20 directed PSPCL to submit a complete plan by 1st August, 2019 regarding installation of necessary power quality meters for measurement of harmonics levels along with time frame for recording the harmonics. PSPCL was also directed to recommend penalty to be recovered from the PIU consumers contributing harmonics in excess of the specified standards. Thereafter, half day workshop on the issue of harmonics was arranged on 13.01.2020 which was attended by the officers of PSPCL.

(ii) In the Tariff Order for FY 2020-21, the issue was again discussed. The extract of the relevant para 5.4 of the Tariff Order for FY 2020-21 is reproduced as under:

“5.4 Power Intensive Unit (PIU) Tariff

5.4.1 In response to the suggestion made by some of the members of the State Advisory Committee and various consumers/stakeholders in their suggestions submitted on the ARR petition, to shift from a regime of separate tariff for Power Intensive Units and General Industry to the same Tariff with additional levy for harmonics producing units. PSPCL vide letter no 363 dated 14.02.2020 has submitted as under;

However, the demand of the industry for same tariff as that of General industry can be considered subject to installation of Power Quality Meters, for which the Commission may allow at least six to eight months to procure, install and training of personnel after the approval of proposal and formulation of Regulations on Power Quality. It is proposed that consumers may procure and install these meters after getting it tested from accredited laboratories.”

5.4.2 *The Commission agrees with the objector’s view that PIUs which are putting in efforts/investment to maintain their harmonics within the permissible levels need to be treated differently from the consumers who continue to inject harmonics in the system. But for this to happen, designated consumers have to install power quality meters. The requisite infrastructure and manpower training for collection and analysis of data captured from Power Quality meters /analyzers is also required to be put in place by PSPCL. The Commission is already in the process of specifying harmonic limits including its measurement after following the due process. The Commission also arranged a workshop on Power Quality, attended by PSPCL officers, where the concept of harmonics including the methodology of its measurement etc was discussed in detail. The PSPCL has submitted that, it requires at least six to eight months to procure, install and training of personnel after the approval of proposal and formulation of Regulations on Power Quality.*

Also, some of the objectors in response to the Public Notice issued in Petition

No. 12 of 2020 have submitted that the industry is closed due to lockdown imposed by the Central/ State Government to prevent spread of Covid-19 pandemic. The revival of manufacturing activity of the industry will take some time and it would not be possible to invest on harmonics filters and allied equipment at this time. As such, the objectors have requested for time for designated consumers to procure and install power quality meters at their premises/Point of Coupling.

Accordingly, separate instructions shall be issued in the matter.”

(iii) To educate the industrial consumers and PSPCL officers about various aspects of harmonics and to get feedback, an interactive session with subject experts was held on 08.09.2020 in the office of the Commission. After detail examination, interaction with the stakeholders and in accordance with CEA Regulations, Model PQ Regulations approved by FoR and IS 17039:2018, the limits for harmonics, procedure for measuring/analysis of the data and timelines for implementation were specified through 7th Amendment to the Supply Code, 2014 issued vide notification dated 18.09.2020. As per these regulations, the designated consumers were required to install power quality meters by 1st October, 2021 whereas the distribution licensee was required to install power quality meters within three years starting from 1st October, 2021 in a phased manner covering at least 20% of the total identified locations on 11/33/66 kV feeders as may be approved by the Commission, in the first year and 40% each in subsequent two years.

(iv) In the Tariff Order for FY 2021-22, it has been recorded in para 4.4 as under;

“4.4 Power Intensive Unit (PIU) Tariff

“-----To implement the above stated provisions of the Supply Code, 2014, PSPCL shall submit the list of designated consumers who have not complied with the provisions of Regulation 24.5 of the Supply Code, 2014 by 15.10.2021 . Further, PSPCL shall start capturing the power quality meter data of designated consumers w.e.f. 01.11.2021. On the basis of the harmonics injection data, PSPCL shall submit a comprehensive proposal for levy of suitable penalty for injecting harmonics above the

permissible limits as specified in the Supply Code, 2014. The proposal will be put up for public comments/suggestions before taking further action.

Accordingly, the Commission decides to retain separate tariff for Power Intensive Units and General Industry for FY 2021-22.”

(v) The Commission received a representation from Mandi Gobindgarh Induction Furnace association vide letter dated 13.09.2021, wherein it has been mentioned that the designated consumers have to install power quality meters of make and specification as approved by PSPCL and since till date PSPCL has not shortlisted the vendors for supply of power quality meters, so it is not possible for the consumers to procure and install power quality meters. It has further been mentioned that PSPCL requires sufficient time to put in place a system to capture and process the data of PQ meters. Accordingly, the Association suggested the following timelines:

- a. Shortlisting of the manufacturer of Power Quality Meters - Zero Date
- b. Consumers to install the meters - within 3 months from zero date
- c. Consumers to study the data generated by the meters - within 6 months from zero date
- d. Consumers to install Harmonic Filters - Within 9 months from zero date
- e. PSPCL to collect the data for generation of reports to be submitted to Hon'ble Commission - 12 months from zero date.

On the same lines, representations from following consumers/Associations were also received by the Commission.

- 1) Punjab Steel Forging & Agro Industries
- 2) Steel Furnace Association of India, Ludhiana
- 3) Punjab Alkalies & Chemicals Limited
- 4) APEX Chamber of Commerce & Industry
- 5) Oasis Enterprises Private Limited.
- 6) Jogindra Castings Private Limited
- 7) Madhav KRG Limited
- 8) PHD Chamber of Commerce and Industry

(vi) Keeping in view the suggestions of the consumers, delay in short listing of the vendors for supply of power quality meters by PSPCL, non-submission of

detailed proposal for levy of penalty by PSPCL and more time requested by the stakeholders for implementation of the 7th amendment to Supply Code, 2014, the Commission deferred the implementation of Regulation 24 of the Supply Code, 2014.

(vii) Now PSPCL has short listed two vendors for supply and sale of power quality meters and has also placed order for procurement of 114 PQ meters for installation at the identified 11/66 kV feeders. PSPCL is expected to short list more vendors for supply of PQ meters in the near future. PSPCL has installed PQ meters on ten selected feeders approved by the Commission and also submitted the data. The installation of remaining PQ meters for the first phase is expected to be completed shortly. PSPCL was also directed to install some PQ meters temporarily at the premises of PIU consumers to capture and analyse the current harmonic data to finalise the regulations. Initially PSPCL installed PQ meters on randomly selected 4 consumers and submitted the data. After receiving some more PQ meters, PSPCL has installed meters on another four consumers. Thus, it is an appropriate time to provide a roadmap for the consumers and the licensee to implement the provisions of the Regulations.

3. The draft notification regarding Punjab State Electricity Regulatory Commission (Power Quality) Regulations, 2023 along with Explanatory Memorandum was issued seeking comments/objections/suggestions from the stakeholders by 24.01.2023. In view of the requests received from various stakeholders, the date for submission of comments/objections was extended to 23.02.2023. A Public hearing was also held on 01.02.2023 and in the public hearing, oral submissions were made by the officers of PSPCL and other stakeholders. The comments/objections/suggestions from following ten stakeholders including PSPCL have been received;

Objection No. 1	Mandi Gobindgarh Induction Furnace Association. (Regd.)
Objection No. 2	Induction Furnace Association of North India (Regd.)
Objection No. 3	APEX Chamber of Commerce & Industry (Pb)
Objection No. 4	PQ Welfare Consortium

Objection No. 5	Secure Meters Limited
Objection No. 6	Steel Furnace Association of India
Objection No. 7	Punjab State Transmission Corporation Limited (PSTCL)
Objection No. 8	Bodal Chemicals Limited (Unit-XII)
Objection No. 9	Steel City Furnace Association
Objection No. 10	Punjab State Power Corporation Limited (PSPCL)
Objection No. 10A	Punjab State Power Corporation Limited (PSPCL)

4. Since the consumers had sought some clarifications on various operational/implementation issues in their objections so the Commission invited all the objectors and PSPCL officers for a meeting in the office of the Commission on 16.02.2023. In the meeting, it was decided that PSPCL shall hold workshops at main centres to educate the consumers on various aspects of the provisions of PQ Regulations. Accordingly, the workshops were held by PSPCL at Ludhiana on 27.02.2023, Mohali on 28.02.2023 and Jalandhar on 01.03.2023.

The objections/comments received from the stakeholders on the draft regulations, comments of PSPCL and the analysis & decisions of the Commission on these comments/objections/suggestions along with reasons for the same are as under:-

5. **Regulation 2-Definitions**

Comments Received

(i) **Objection no. 5-Secure meters**

The objector suggested that following industries may also be declared as 'Designated Consumers':

Metro rail, Textiles, Steel and rolling mills, Data Centers, Automobiles.

(ii) **Objection no.4 -PQWC:**

The gap available in the voltage level may be bridged as follows:

(17) **'High Voltage'** means the voltage whose nominal root mean square (r.m.s.) value is more than or equal to 33000 volts;

(23) **‘Medium Voltage (MV)’** means the voltage whose nominal r.m.s. value is more than 1000 volts but less than 33000 volts;

Further, the Isc may also be defined since it is the critical parameter to arrive the Isc/L value and to decide the TDD limits as per IEEE-519.

Response of PSPCL

The Commission may consider the suggestion.

(iii) Objection 10 A-PSPCL

(28) The point of common coupling (PCC) for commercial users (Office Parks, Shopping Malls etc.), supplied through common service transformer is commonly at the LV side of the service transformers. It is proposed that this definition of PCC needs to be relooked as on LV side of transformer, there will be number of users supplied from common service transformers and installation of PQM on LV side of service transformer will not be able to monitor the power quality parameters of each individual consumer.

(iv) Objection no. 5-Secure meters

Note below (44)

The typo mistake “(10 mins)”, need to update as 10msec

Commission’s Findings and Order

(i) As per second proviso to clause 1 of Regulation 5, the Commission shall decide the category of consumers to be covered under these regulations from the date as may be notified by the Commission keeping in view the implementation issues.

(ii) The voltage levels are as per IS 17036:2018. There is no gap as HV is defined as voltage above 33 kV whereas MV is the voltage more than 1 kV but less than or equal to 33 kV. The maximum short-circuit current (Isc) is a well defined electrical engineering term and is to calculated at the Point of Common Coupling.

(iii) The definition of PCC is as per IEEE 519. Moreover, the location for installation of PQ meters by the distribution licensee shall be 11/66 kV

feeders. Similarly, designated consumers connected at 11 kV and above are covered under these regulations.

(iv) The typo error has been corrected.

6. Regulation 5: Scope and extent of application

Comments Received

Objection 10 A-PSPCL

Solar Plants & Inverters are also source of harmonic generation. Apart from designated consumers, PQ meters should also be installed at Interconnection points of Solar Power Plants.

Commission's Findings and Order

Refer to Commission's Findings and Order at para 5(i) above.

7. Regulation 6: Roles and Responsibilities

Comments Received

(i) Objection no 4-PQWC

Since CEA regulations dated 6th and 8th February 2019, provides guidance to measure PQ compliance at feeders of Distribution licensees in respect of all consumers availing supply from the voltage level of 11kV supply onwards, the same may be followed in the State of Punjab also instead of making it applicable for a select type of consumers as designated consumers.

(ii) Objection no 5-Secure meters

6(2) Strategic location definition should be mentioned in regulation for guidance.

Commission's Findings and Order

- (i) The Power Quality parameters and the locations/designated consumers have been selected keeping in view the implementation issues. Other categories of consumers fed at the voltage level of 11 kV and above shall be covered in a phased manner.

- (ii) The strategic locations for installation of PQ meters shall be as approved by the Commission from time to time to optimize the investment on the project

8. Regulation 8: Supply Voltage Variations

Comments Received

Objection no 4-PQWC

The voltage quality standards as per IS17036 which EN50160 are to be mentioned explicitly for voltage and frequency variations and flicker. The harmonics content (upto 50th order) limits are specified in IEEE519 -2014 or as amended from time to time.

Commission's Findings and Order

The Supply Voltage variations specified in these regulations are as per IS 17036, which refers to EN 50160 for voltage characteristics. The frequency variations have not been specified in these regulations. The frequency band has been specified in Grid Code read with DSM regulations, which are amended from time to time by CERC. The harmonics limits have been specified as per CEA Connectivity Regulations read with IEEE 519:2014

9. Regulation 12: Voltage Swells

Comments Received

(i) Objection no 5-Secure Meters

Specific standard number should be mentioned as IS:17036.

(ii) Objection no 10-PSPCL

Till date BIS has not notified any standards for measurement of Sag, Swells and interruption in the report under Power Quality Meters. Therefore, Hon'ble PSERC may be requested to allow all manufacturers of Power Quality meters to follow EN50160 report for measurement of Voltage Sag, Swell and interruptions till the notification of BIS in this regard.

Commission's Findings and Order

- (i) BIS standard IS:17036:2018 has been mentioned.

- (ii) BIS has specified the supply voltage Sag or Dip limits and short interruption limits in IS 17036 and the same have been incorporated in these regulations. The Supply voltage swell limits are under consideration of BIS and have not been specified in IS 17036. As and when these are notified, the same will be incorporated in the regulations. It has been specified in Regulation 12 that till the time BIS notifies the standards, the Supply Voltage swell limits shall be as per EN 50160/IEC/IEEE standards.

10. Regulation 13: HARMONICS

Comments Received

(i) Objection no. 1,2,3, 6,8 and 9 (Industrial Consumers)

- (a) Study of the now proposed draft regulations on harmonics as well as those added vide Amendment No 7 of Supply Code 2014, it is observed that though both are claimed to be compliant of IEEE standards but in the regulations now propose monitoring of two deviations i.e. of 3 seconds for each 24 hours and of 10 minute each for 7 days whereas in the 7th amendment, only deviation of 10 minute duration over the week was to be recorded.
- (b) Compliance of this newly added provision of 3 seconds for 24 hours being very stringent and requires instantaneous filtering of undesirable component of current harmonics and will require costly equipment. Coupled with penalty of up to 15%, it will require, reliability and dependability for which we may have to install stand by set also thus doubling the cost.
- (c) In view of stringent requirement, the incentive (difference of General vs PIU tariff vis a vis installation and operational costs) also have to be checked for viability. It is also added here that we are unable to find any other state in the neighborhood of Punjab implementing this requirement.
- (d) PSPCL has also not clarified to us whether the already shortlisted power quality meters, of two vendors also cover the new regulations.
- (e) In case of mixed load the Point of Common Coupling for the measurement of power quality needs to be decided.
- (f) The applicability of tables for current harmonics in Regulation 13.7.2 is based on the I_{sc} (Maximum Short Circuit current at PCC) which has to be

calculated for each consumer It is not clear whether this is the SC current of PSPCL bus where consumer is connected or to be worked out as per the transformer in consumer switchyard. A working example for its calculation methodology needs to be given.

- (g) Similarly IL is defined as maximum demand load current (fundamental frequency component) at the PCC under normal load operating conditions. It needs to be clarified whether it is to be calculated from sanctioned demand, Monthly average demand, MDI or max demand separately for 10 min and 3 sec. period. Further, whether this will be measured by PQ. meter or DLMS meter.
- (h) as per the Industrial policy of GOP, payable energy charge both for General as well as PIU industry after considering the subsidy is Rs 5/- and thus the only incentive available to PIU consumer will be reduction of Fixed charge by about Rs 20 to 30 per KVA per month which is evidently very meagre incentive compared with the proposed penalty of up to 15% of fixed and Energy charge of the month.
- (i) The draft regulations at 6.4 and 17.2 state that the data of Power quality meters will be down loaded by consumers and shared with PSPCL whereas at 13.3, It is stated that the data will be downloaded by PSPCL. This also needs to be clarified.
- (j) it would have been better if in the initial stages THD should have been controlled, thereafter 7th amendment should have been implemented and the present regulations would have come in the last.
- (k) Though it is provided in clause 13.8 that the consumers may opt for these regulations before 9 months period and such consumer will be treated as General category consumer for all intents and purposes. However, the Regulations should also provide categorically that from the specified date of 9 months all consumers will be general category consumers and PIU category tariff will be applicable to only defaulters.
- (l) the penalty for noncompliance should be levy of PIU tariff and in case of compliance, it should be General tariff for at least next 3 years so that consumer does not become apprehensive.

- (m) There is no general solution for harmonics control. The points of generation of harmonics and their magnitude up to 50th cycle will vary for each consumer depending on many factors and solution will also be different for each. Firstly, harmonic generation points will have to be identified, their magnitude and deviation will have to be recorded and studies and solution will have to be decided on a hit and trial basis. This is not a simple exercise *and* no off the shelf equipment can be deployed for this. We may have to double equipment to avoid heavy penalty so that standby is available in case of failure of main equipment
- (n) The period of nine months is too short for introduction of such a new scheme for which expertise is available only on a limited scale and total absence of awareness in consumers in fact every consumer has to get a specific solution for its equipment.
- (o) the penalty for noncompliance should be a levy of PIU tariff and in case of compliance, it should be General tariff for at least next 3 years so that consumer does not become apprehensive.
- (p) at for the initial 3-4 years while complete eco system for implementing Harmonics Regulations is developed in the state of Punjab, liberal approach without the provision of penalty may be followed i.e. those consumers who install harmonics control mechanism in the factory may *be* given general tariff and on violation of harmonics, the PIU tariff be imposed.

(ii) **Objection no 5-Secure**

(13.7.1) This regulation talks about LV, MV and HV where HV definition applicable up to 150kV so voltage range and limit ($161 \text{ kV} < V$) not provides any significance in Table 7. Recommend to remove it if not relevant.

In addition to IEEE 519 report, highest value of TDD among daily and weekly should also consider in Energy billing profile data which is used for billing energy at monthly billing cycle. This helps in compensation of monthly consumption charges.

(iii) **Objection no 10-PSPCL**

(a) (13.5) The levy of penalty on consumer due to non-installation of PQ meter may be increased from proposed Rs. 50/kVA/month and further time

period for installation of PQ meter by consumer may be reduced from proposed 9 months.

(b) (13.6) - Being a very vast network of PSPCL & multiple levels involved in procurement of these meters, time period for installation of 20% PQ meters in PSPCL may be increased from a period of one year to two years.

(c) (13.7.1 & 13.7.2)- As per the above requirement, very short time (3s) data will be accumulated for 1 day and highest value from amongst the daily 99th percentile very short time (3s), weekly 99th percentile short time (10 min.) and weekly 95th percentile short time (10 min.) current and voltage harmonic values during a billing month shall be considered for calculating the compensation.

As per above clause very short time i.e. for 3 sec data is required to pick highest value from 99th -percentile and 95th percentile, which may result into overcrowding of data. To log and maintain this data, large server space will be required which may increase the expenditure of server and Power Quality meter. Therefore, to impose the compensation under Power Quality Regulations, 2023 Hon'ble PSERC may be requested to consider the short time 10 minutes values only.

(d) (13.11) - The proposed time period for disconnection in case of continuous default (in limiting the current harmonics injection within specified limits) by the consumer is 12 months and same may be reduced.

(iv) **Objection no 7-SLDC**

The compensation payable by the designated consumers to Distribution Licensee for exceeding TDD Limit, is based on the monthly consumption charges (Fixed and Energy Charges) billed by the distribution licensee.

However, such monthly billing of Fixed and Energy Charges is only being done by the distribution licensee for its consumers In case of Full Open Access Consumers/ Customers (Non-Consumers of distribution licensee) and Deemed Licensee, e.g. Northern Railways, no such monthly consumption charges are worked out.

As such, compensation to be payable by Full OA ' Consumers/ Customers and Deemed Licensee for exceeding TDD limit is also required to be incorporated/ defined under these Regulations.

It is proposed that a uniform charge as deemed fit by Hon'ble PSERC, may be defined/ incorporated in these regulations, which may be levied on total monthly consumption of Full OA Consumers/ Customers and Deemed Licensee for exceeding TDD limit. The model Power Quality Regulations, 2018, issued by Forum of Regulators (FoR) stipulates a charge of 50 Paise/ unit, which may be considered in such cases, if deemed fit by Hon'ble PSERC.

Response of PSPCL

Very short time i.e. for 3 sec data is required to pick highest value from 99th percentile and 95th percentile, which may result into over-crowding of data. To log and maintain this data, large server space will be required which may increase the expenditure of server and Power Quality meter.

Therefore, to impose the compensation under Power Quality Regulations, 2023, it is proposed that Hon'ble PSERC may consider the short time 10 minutes values only. However as per specification in ongoing tender enquiry, PQ meters have provision for logging 3 sec. internal data.

PSPCL has conducted workshops in Ludhiana, Mohali and Jalandhar for providing all the necessary information and for clarification of doubts of all industrialists. Public notice regarding same was published in leading newspapers and on public media.

Commission's Findings and Order

- (i) (a) to (c) The harmonic injection limits have been specified vide 7th amendment to Supply Code, 2014 and in these regulations as per IEEE 519-2014 in accordance with CEA Connectivity Regulations and Model Regulations approved by FoR. However, in the Supply Code, 2014, for Statistical evaluation, only the short time 10 min values accumulated over a period of one week (both 99th and 95th percentile) were specified for comparison with recommended limits. As explained in para 9(ii) of the order of the Commission dated 18.09.2020, the very short time 3 sec values

accumulated for each 24 hours was dispensed with to reduce monitoring cost without compromising on the outcome as per the recommendations in Model Regulations approved by the Forum of Regulators. Since PSPCL has already shortlisted vendors for supply of PQ meters as per the provisions notified through 7th amendment in Supply Code, 2014 so any additional features will increase the cost of PQ meters and may result in other implementation issues. Keeping in view the comments of the stakeholders including those of PSPCL regarding introduction of very short time (3sec) values, the Commission decides to dispense with the measurement of very short time (3 sec) values for statistical evaluation and levy of compensation. Necessary amendments in the regulations have been made. However, the meter must be class A Power Quality meter complying with IEC 61000-4-30 standards and capable of recording very short time values.

(d) As per Supply Code, 2014 as well these PQ regulations, the measurement of harmonics has to be with IEC 61000-4-30 Class A PQ meters and the meters supplied by the vendors are required to meet these standards.

(e) The PCC for any consumer whether using exclusive Power intensive load or mixed load shall be same as defined in clause (28) of Regulation 2 of these regulations.

(f) The measurements, as per IEEE 519:2014, shall be made at the Point of Common Coupling (PCC) which has been defined in clause (28) of Regulation 2. The short circuit current (I_{sc}) at PCC and maximum demand load current (I_l) as defined in clause (24) of regulation 2 shall be calculated for each designated consumer which shall depend on the characteristics of the electrical system feeding the load.

(g) Maximum demand load current has been defined in clause (24) of Regulation 2.

(h) The Commission determines the tariff for each category of consumers as per the provisions of MYT regulations without considering any subsidy to be paid to any class of consumers by GoP. The grant of subsidy by GoP is the prerogative of the government as per section 65 of the Act. The issue is not

cost benefit analysis of each industrial consumer but to fulfil the mandate of the Act and the regulations framed under the Act. The harmonics cause serious damage to the supply system affecting the quality of supply to other consumers connected on the same network and also the consumer's own installation. The voltage distortion caused by current harmonics injected by non-linear load increases the transformer losses due to hysteresis and eddy currents and cause overstressing of the insulation. Harmonics increases the apparent power (kVA) drawn from the supply. The higher load current due to harmonic currents require over-sized distribution system. There are numerous other ill effects of harmonics which cannot be explained in this order. So it is important to ensure that harmonics are within limits specified in these regulations as per CEA Connectivity regulations read with IEEE 519..

(i) Although as per CEA Connectivity regulations, it has been provided that consumer seeking connectivity at 11 kV and above shall install the PQ meter and share the recorded data with the distribution licensee. However, keeping in view the difficulties expressed by the consumers, the Commission decides that the licensee shall capture the data as per the billing cycle or as may be decided by the Commission and necessary amendments have been made in the regulations.

(j) The consumers are responsible for controlling current harmonics whereas the responsibility to control voltage harmonics is that of distribution licensee. The current harmonics results in voltage harmonics which impact the quality of supply to other consumers. In view of the suggestions/objections of the stakeholders and recommendations of the Model Regulations on Power Quality approved by the FoR, the Commission decides to retain the provisions notified through 7th amendment to Supply Code, 2014 in these regulations by dispensing with very short time (3s) values for statistical purpose. In these regulations, the Commission has specified the roadmap for implementation along with compensation mechanism for violation of the limits.

(k) However, the aim of the Commission is to merge the PIU and General industrial tariff and penalise only those consumers who inject harmonics above the specified limits and damage the power supply system.

(l) Presently PIU tariff is levied on all PIU consumers irrespective for the fact whether the consumer is injecting harmonics above the permissible limits or not. Now after the implementation of these regulations, only the defaulters shall be penalized that too as per the level of harmonics injection vis-à-vis the recommended limits. As specified in Regulation 13.8 of these regulations, once the designated consumer opts to be governed by the provisions of Regulation 13.11, such consumer shall be considered as General Category consumer for all intents and purposes.

(m) & (n) The solutions for controlling harmonic injection are well recognised and available in the market. Enough time is being granted to consumers to install PQ meters, capture the harmonic data and take remedial measures to limit the TDD value within specified limits, if required.

Attention is invited to paragraph 3 of part-IV of the CEA connectivity Regulation which provides that

*“(iv) **The bulk consumer shall install power quality meter and share the recorded data thereof with the distribution licensee with such periodicity as may be specified by the Appropriate Electricity Regulatory Commission:***

Provided that the existing bulk consumer shall comply with this provision within twelve months from the date of commencement of CEA (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2018.”

Similar provision has been provided in clause (7) of Regulation 11A of CEA(Technical Standards for Connectivity below 33 kV) Amendment Regulations, 2019. Thus even the CEA regulations provide for a maximum period of one year for implementation of the provisions regarding harmonics by the consumers.

As brought out in para 2 of this order, the issue regarding measuring harmonic injection by using power quality meters and implementation of compensation mechanism so that only defaulting consumers are penalised is being discussed and debated for the last about three years. After getting the feedback from all the stakeholders, the provision was introduced vide 7th

amendment to Supply Code, 2014 notified on 18.09.2020. The designated consumers were required to install PQ meters by 01.10.2021 and record the data to take remedial measures to control harmonic injection. The penal provisions were not specified as PSPCL had not short listed the vendors for procurement of power quality meters. The consumers were at liberty to get the study done from any agency during this period. As recorded in para 5.4 of the tariff order for FY 2022-23, the Industrial consumers themselves proposed timelines of 12 months from the date of shortlisting of PQ vendors by PSPCL for implementation of the regulations.

Keeping in view the suggestions of the stakeholders and the provisions of CEA Regulations, the Commission decides that the designated consumers shall install PQ meters within 6 months of the notification of these regulations and take remedial measures to control current harmonic injection within recommended limits by 31.03.2024. However, the designated consumer shall be at liberty to opt to be governed by the provisions of Regulation 13.11 before 31st March 2024 and such consumer shall be considered as General Category consumer for all intents and purposes.

(o) & (p) Keeping in view the suggestions of the stakeholders, the Commission has decided to cap the compensation level in steps to maximum of 10% of the monthly consumption charges instead of 15% proposed in the draft regulations. Presently PIU tariff is levied on all PIU consumer irrespective for the fact whether the consumer is injecting harmonics at lower levels to higher levels. Now after the implementation of these regulations, only the defaulters shall be penalized that too as per the level of harmonics injection vis-à-vis the recommended levels.

- (ii) Regulation 2 defines LV, MV and HV limits as per these regulations whereas voltage distortion limits in table 7 is as per IEEE. Since distribution voltage level in Punjab is 66 kV and below so THD level for PSPCL to achieve is only up to that level..
- (iii) (a) Considering the suggestion of the objector, the Commission decides that in case the designated consumer fails to install PQ meter within stipulated time of six months, a penalty @ Rs. 50/kVA/month on the sanctioned contract

demand or contracted demand under Open Access, as may be applicable, shall be levied. Part of the month shall be treated as full month.

If the default continues after 9 months from the date of notification of these regulations, then a penalty at the rate of Rs. 80/kVA/month on the sanctioned contract demand or contracted demand under Open Access, as may be applicable, shall be levied. After 31st March 2024, if the default still continue then such consumers shall be liable to pay compensation @ 10% of the total monthly consumption charges (fixed and energy charges) till installation of PQ meter. After installation of PQ meter by the consumer, in case the TDD values exceeds the specified limits then compensation as specified in Regulation 13.11 of these regulations shall be payable by the consumer as per the recorded data of harmonics injection.

(b) The PQ meters shall be installed only at identified locations as approved by the Commission. PSPCL has already procured 114 PQ meters and further roll out shall be decided by the Commission after evaluation of data.

(c) Refer Commission's Findings and Order at para (i) (a to c) above.

(iv) The Commission agrees with the suggestion of SLDC. Both the full open access consumers and deemed licensee using or engaged in the processes/industries defined for designated consumers and using the network of the licensee or other licensee to draw power through open access should be subjected to these regulations to control harmonic injection. In the petition no 58 of 2021 also, PSTCL requested the Commission to apply the provisions of regulation 24 of the Supply Code, 2014 for open access consumers including Railways. The Northern railways requested a time period of 6 to 12 months for implementation of the Regulations. The Commission directed Railways to implement the regulations and also directed licensee to ensure implementation of the regulations. Accordingly, the full open access consumers and deemed licensee using the intra-state transmission and/or distribution system of other licensee to source power through open access have been included in these Regulations.

Since full open access consumers and deemed licensee (like railways) are not served with regular energy bills for monthly consumption so the Commission decides to levy compensation for injecting harmonics above specified limits based on energy consumed (in kWh) through open access. In view of the graded approach adopted for other consumers, following compensation mechanism for Full OA consumers/deemed licensee has been approved;

TDD Excess over and above the limit	Compensation on the monthly energy consumed through open access (Paise/kWh)
Upto 2%	10
Above 2% but upto 4%	15
Above 4% but upto 6%	22
Above 6% but upto 8%	30
Above 8% but upto 10%	37
Above 10% but upto 15%	45
Above 15% but upto 20%	52
Above 20% but upto 25%	60
Above 25% but upto 30%	67
Above 30%	75

11. Regulation 14.Short Supply Voltage Interruptions

Comments Received

Objection no 10-PSPCL

Till date BIS has not notified any standards for measurement of Sag, Swells and interruption in the report under Power Quality Meters. Therefore, Hon'ble PSERC may be requested to allow all manufacturers of Power Quality meters to follow EN50160 report for measurement of Voltage Sag, Swell and interruptions till the notification of BIS in this regard.

Commission's Findings and Order

BIS has specified the supply voltage Sag or Dip limits and short interruption limits in IS 17036 and same have been incorporated in these regulations. IS 17036 also refers to EN 50160:2010 for voltage characteristics

12. Regulation 14. Long or Sustained Supply Voltage Interruptions

Comments Received

(i) Objection no 4- PQWC

The SAIDI and SAIFI Indices are to be calculated outside the purview of the Power quality meters as they can potentially load the micro controllers in PQ Meters. Also, the number of consumers is not fixed from time to time and requires external input, it is suggested to have indices calculated externally.

(ii) Objection no 5- Secure

(2) The objector suggested to include below points:

The distribution licensee shall provide customer information for calculation of SAIFI

(3) The distribution licensee shall provide Urban and Rural classification information for calculation of reliability indices

Please Incorporate below:

The distribution licensee shall provide outage information and integration need for segregation of outage information in order to avoid manual interventions.

Outages that are initiated by manually

Outages due to Force Majeure events

Outages that are initiated by the National Load

(iii) Objection 10 A-PSPCL

15.3- Interruptions due to scheduled or planned outages are proposed to be taken into account while calculating reliability indices. PSPCL proposes that scheduled/planned outages should not be taken into account while working out reliability indices.

PSPCL's Response to Objections

PSPCL IT department is already calculating the SAIDI, SAIFI Index from AMR compatible already installed tariff meters. SAIFI and SAIDI are required for measuring the performance parameters of PSPCL by PSERC. Therefore, there is no need to provide the customer information in public, However, same may be provided to empanelled vendors/ successful bidder of PSPCL.

Commission's Findings and Order

- (i) The SAIFI/SAIDI are important power quality indices and in order to have verifiable data of interruptions and duration and dispense with manual recording of data by distribution licensee's officials, it is important to use PQ meters to capture the data. The information regarding number of consumers shall be supplied by the distribution licensee.
- (ii) The urban and rural feeders have been classified by PSPCL and the identified feeders for installation of PQ meters shall be approved by the Commission. PSPCL shall take care of these requirements
- (iii) The non supply to consumers due to any reason should be accounted for.

13. Regulation 16: Monitoring of Power Quality

Comments Received

Objection no 4- PQWC

(5) As per CEA regulations and IEEE-519 Standards, the period of measurement shall be atleast 7 days with very short time and short Time measurement of current and voltage.

Objection no 5- Secure

(6) Definition and standards should be mentioned for the additional PQ temporarily meter

(7) Definition and standards should be mentioned for the smart grid meter.

PSPCL's Response

Since, the cost of Power Quality meters is high, therefore authenticity of customer complaint regarding power quality needs to be properly verified before installation of meter.

Commission's Findings and Order

- (5) The words "for a particular period' has been substituted with words 'as specified in these regulations'.

- (6) This is only an enabling clause to take care the need to install PQ meters at locations other than approved by the Commission to capture PQ parameters.
- (7) The standards for smart grid meters are outside the scope of these regulations

14. Regulation 18: Incentive/dis-incentive mechanism for Power Quality

Comments Received

(i) Objection no 5-Secure meters

In Table 14, the statement "part thereof for which voltage variation was beyond the specified limits" is not clear, should mention with example.

(ii) Objection 10 A-PSPCL

In Table-14 under Regulation 18, the upper limit of compensation by utility to consumers may be fixed as a yearly figure for a particular feeder irrespective of the no. of consumers and violations. The amount of compensation by PSPCL to the Consumer may be settled once in a year.

Commission's Findings and Order

- (i) The meaning of 'part thereof' is well understood in the billing procedure of the distribution licensee. However, to make the abundantly clear, it has been rephrased as "*Rs. X/week for which voltage variation was beyond specified limits. Part of the week shall be treated as one week for this purpose.*"

The Commission approves the Punjab State Electricity Regulatory Commission (Power Quality) Regulations, 2023 with the modifications as discussed above.

Sd/-

(Paramjeet Singh)
Member

Chandigarh
Dated: 21.03.2023

Sd/-

(Viswajeet Khanna)
Chairperson