



Policy 142: Harmonics
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Purpose: To establish satisfactory operational criteria as it relates to harmonics for all members and steps to be taken for non-compliance.

Definition:

1. Harmonics – In 60-hertz electric power systems, a harmonic is a sinusoidal component of the 60-hertz fundamental wave having a frequency that is an integral multiple of the fundamental frequency. Harmonics are caused by non-linear loads on a power system such as Variable Frequency Drives (VFD), switch mode power supplies, or rotating magnetic cores such as a motor.
2. Excessive Harmonics – In this policy, shall mean levels of current or voltage distortion at the point of common coupling between MEC and the member outside the levels recommended in IEEE Standard 519-2022, IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems.
3. Point of Common Coupling (PCC) – The point of interconnection to the member.
4. Total Demand Distortion (TDD) – It is a measure of the total harmonic current distortion at the PCC for the total connected load.
5. Total Harmonic Distortion (THD) – It is a measure of the total harmonic voltage distortion at the PCC for the total connected load.

Member Responsibility:

1. Member must maintain Total Demand Distortion (TDD) levels at or below the values identified in the table below:

Table 1—Voltage distortion limits

Bus voltage V at PCC	Individual harmonic (%)	Total harmonic distortion THD (%)
$V \leq 1.0$ kV	5.0	8.0
$1 \text{ kV} < V \leq 69$ 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.

Table 2—Current distortion limits for systems rated 120 V through 69 kV

Maximum harmonic current distortion in percent of I_L						
Individual harmonic order ^b						
I_{sc}/I_L	$2 \leq h < 11^a$	$11 \leq h < 17$	$17 \leq h < 23$	$23 \leq h < 35$	$35 \leq h \leq 50$	TDD
$< 20^c$	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

^aFor $h \leq 6$, even harmonics are limited to 50% of the harmonic limits shown in the table.

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

^cPower generation facilities are limited to these values of current distortion, regardless of actual I_{sc}/I_L unless covered by other standards with applicable scope.

where:

I_{sc} = maximum short-circuit current at PCC

I_L = maximum demand load current at PCC under normal load operating conditions

Notes:

- I_{sc} : Is the short circuit current available from MEC at the point of common coupling.
- I_L : Is the average maximum monthly demand or is forecasted demand for location. For irrigation accounts, MEC may consider only evaluating the months that are taking load.
- All power generation equipment is limited to these values of current distortion regardless of I_{sc}/I_L .

2. If the measured TDD or individual harmonic order values are greater than the above values, the member shall be required to take such corrective measures as necessary, including the installation of active or passive filtering, to guarantee a TDD or individual harmonic order value of not greater than the above values at the point of common coupling.

Procedure:

1. *Disconnection:* Any identified noncompliance with this policy may result in action up to and including immediate disconnection of electric service.
2. *Corrective Action:* Any member whose location or equipment has been disconnected or has not been connected due to non-compliance with this policy must show proof of corrective action before the location or equipment is reenergized.
3. *Applicable Standards:* In addressing harmonics problems, MEC and the member shall implement to the extent reasonably practicable, and in conformance with prudent operation, the practices outlined in IEEE Standard 519-2022, or any successor IEEE standard, to the extent not inconsistent with law, including state and federal statutes, orders, regulations, and applicable municipal regulations.
4. *Investigation and Corrective Action:* MEC shall investigate and determine the source of the excessive harmonics. If MEC determines that the member has created excessive harmonics that cause or are reasonably likely to cause another member to receive unsafe, unreliable, or inadequate electric service, MEC shall provide notice to the member creating the excessive harmonics. The notice shall state that MEC has determined that the member has violated this policy or IEEE Standard 519-2022. The member may, in MEC's discretion and depending on the immediacy of identified harm, be granted up to four (4) calendar weeks following notice to remedy the problem before disconnecting the service.
5. *Repeat Offenses:* Repeat offenses may be charged a service fee or penalty or be required to provide proof of compliance before initial energization of location.
6. *Harmonics on a Circuit:* If excessive harmonics are identified on a particular circuit/feeder, and MEC determines there are multiple sources, all contributing parties will be accountable to this policy. Any location(s) that are not in compliance may be disconnected. All investigation processes will be in compliance with IEE 519 standard.
7. *Connection:* MEC may, at its sole discretion, elect not to connect to a service with a nonfiltered variable speed drive service.
8. *VFD Specifications:* All variable speed/frequency drives (VFD's), whether single-phase or three-phase, must meet IEEE standards for harmonic limits.
9. *Dispute Resolution:* If a dispute arises as to the determination of a member creating excessive harmonics, the member and MEC first will follow the dispute resolution procedures prescribed in MEC's bylaws.

Responsibility:

The CEO, Director of Operations, and Director of Engineering shall each have the responsibility for the administration of this policy.