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Policy 116
Harmonics

SUBJECT:

Harmonic Distortion Limitation

OBJECTIVES:

All members within the service area of LYREC who take delivery of electric service are required to comply with this Rule and Regulation pertaining to harmonics.

POLICY:

A. Definitions:

a. 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.
b. Excessive Harmonics – In this policy, shall mean levels of current or voltage distortion at the point of common coupling between LYREC and the member outside the levels recommended in IEEE Standard 519-2014, IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems.
c. Point of Common Coupling (PCC) – The point of interconnection to the member either at the primary metering point or the high side of the transformer.
d. Total Demand Distortion (TDD) – It is a measure of the total harmonic current distortion at the PCC for the total connected load.
e. Total Harmonic Distortion (THD) – It is a measure of the total harmonic voltage distortion at the PCC for the total connected load.

B. Member Responsibility:

The member shall maintain Total Demand Distortion (TDD) less than the values identified in the following tables:

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 kV $< V \leq$ 69 kV	3.0	5.0
69 kV $< V \leq$ 161 kV	1.5	2.5
161 kV $< V$	1.0	1.5[a]

[a]High-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.

Current Distortion Limits for General Distribution Systems
(120 V through 69,000 V)

A. Maximum Harmonic Current Distortion

In Percent of I_L

	Individual Harmonic Order (Odd Harmonics)					
I_{sc}/I_L	$<11^{th}$	$11^{th}<17^{th}$	$17^{th}<23^{rd}$	$23^{rd}<35^{th}$	35^{th}	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

- Isc is the short circuit current available from LYREC at the point of common coupling.
- I_L is the average maximum monthly demand over a 12 month period. For irrigation accounts, LYREC 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.

Even harmonics are limited to 25% of the odd harmonic limits listed above. The current distortion limits apply to a demand interval of 15 minutes if demand metered, otherwise is the value recorded at the time of measurement. Current distortions that result in a direct current offset (e.g., half-wave converter) are not allowed. Failure to comply with the direct current offset conditions may result in a disconnection of the member's service. Before disconnecting, LYREC must provide written notice of its intent to disconnect at least five (5) working days before doing so. LYREC may disconnect the member five (5) working days after providing the notice, unless the member ceases using the direct current offset device.

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:

A. Application of Rules:
   a. Applicable Standards – in addressing harmonics problems, LYREC and the member shall implement to the extent reasonably practicable, and in conformance with prudent operation, the practices outlined in IEEE Standard 519-2014, or any successor IEEE standard, to the extent not inconsistent with law, including state and federal statutes, orders, regulations, and applicable municipal regulations.

   b. Investigation and Corrective Action – LYREC shall investigate and determine the cause of the excessive harmonics. If LYREC 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, LYREC shall provide written notice to the member creating the excessive harmonics. The notice shall state that LYREC has determined that the member has violated the IEEE Standard 519-2014 and it shall explain the consequences of the harmonic problem. In addition to the right to disconnect as set forth above, LYREC in its discretion may use the following options:
      1. The member may elect to cure the problem on its side of the meter, at its cost, but the remedy must be completed within six (6) calendar weeks after notice.

2. If the member does not cure the problem within six (6) weeks after notice, LYREC may cure the problem on its distribution system and assess all charges, including overheads, to the member. For facilities installed by LYREC for purposes of correcting a member's harmonic distortion, that member shall be responsible for a monthly maintenance fee. If corrections are necessary on the LYREC side of the meter, the monthly maintenance fee is 15% of the capitalized cost of the installed equipment that is needed as a result of the corrective actions undertaken by LYREC. The monthly minimum charge will not be less than $25.
3. If a dispute arises as to the determination of a member creating excessive harmonics, the member and LYREC will first attempt to mediate the dispute with a mutually acceptable third party. Mediation shall take place within 90 days of the dispute. If mediation is not successful, the member and LYREC shall have the right to seek any remedies provided by law.

c. Harmonics From More Than One Source – If, in its investigation of a harmonics problem, LYREC determines that two (2) or more members harmonic loads are individually within IEEE 519-1992 limits, but the sum of the loads are in excess of the IEEE 519-2014 limits, LYREC may require each customer to reduce its harmonic levels beyond the limits specified in IEEE 519-1992. However, in no event will any member be required to go below 5% TDD.

d. Harmonics On a Feeder – If, in its investigation of harmonics on a feeder, LYREC determines there are multiple sources contributing to the problem, LYREC may install primary voltage (12.47 or 24.9 kV) filters to bring the feeder TDD within specified values and assess all nonfiltered services, based on connected kVA capacity, a proportional share of the installation and maintenance costs as outlined in b1 and b2 above.

e. LYREC may, at its sole discretion, elect not to connect a non-filtered variable speed drive service.

f. All variable speed/frequency drives (VFD's), single-phase and three-phase must meet IEEE standards for harmonic limits.

RESPONSIBILITY

The CEO, COO, CIO, Operations Manager, and Operations Assistant shall each have the responsibility for the administration of this policy.