

Voltage limits evaluation procedure



The overall procedure for utility system harmonic evaluation is described here. This procedure is applicable to both existing and planned installations. Figure 6.2 shows a flowchart of the evaluation procedure.

1. Characterization of harmonic sources

Characteristics of harmonic sources on the system are best determined with measurements for existing installations. These measurements should be performed at facilities suspected of having offending nonlinear loads. The duration of measurements is usually at least 1 week so that all the cyclical load variations can be captured. For new or planned installations, harmonic characteristics provided by manufacturers may suffice.

2. System modeling

The system response to the harmonic currents injected at end-user locations or by nonlinear devices on the power system is determined by developing a computer model of the system. Distribution and transmission system models are developed as described in Sec. 6.4.

3. System frequency response

Possible system resonances should be determined by a frequency scan of the entire power delivery system. Frequency scans are performed for all capacitor bank configurations of interest since capacitor configuration is the main variable that will affect the resonant frequencies.

4. Evaluate expected distortion levels

Even with system resonance close to characteristic harmonics, the voltage distortion levels around the system may be acceptable. On distribution systems, most resonances are significantly damped by the resistances on the system, which reduces magnification of the harmonic currents. The estimated harmonic sources are used with the system configuration yielding the worst-case frequency-response characteristics to compute the highest expected harmonic distortion. This will indicate whether or not harmonic mitigation measures are necessary.

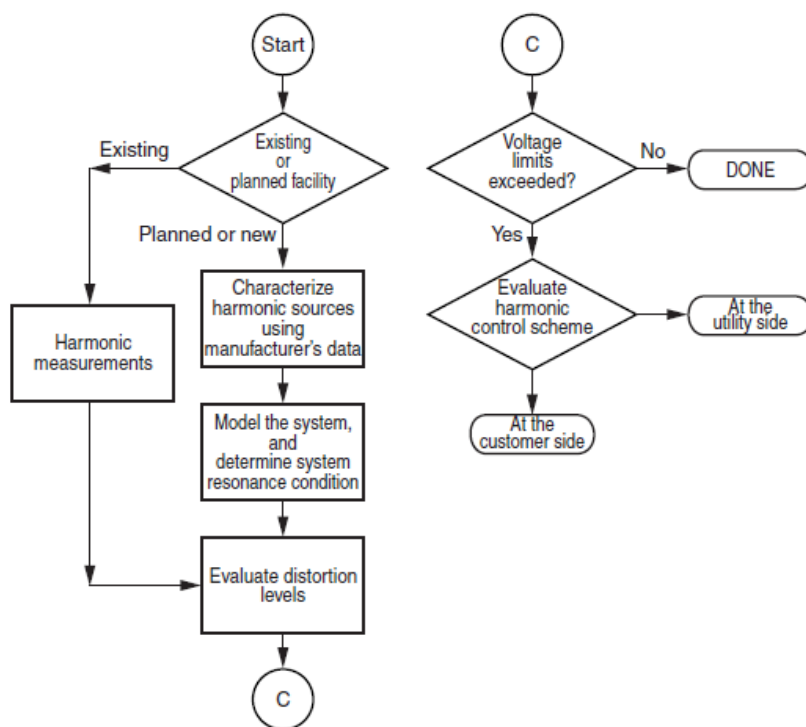


Figure 6.2 Voltage limit evaluation procedure

5. Evaluate harmonic control scheme

Harmonic control options consist of controlling the harmonic injection from nonlinear loads, changing the system frequency-response characteristics, or blocking the flow of harmonic currents by applying harmonic filters. Design of passive filters for some systems can be difficult because the system characteristics are constantly changing as loads vary and capacitor banks are switched. Section 6.2 discusses harmonic controls in detail.

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