1C.1—Power Quality Introduction

1. Scope

This document presents the views held by the company regarding the importance of power quality and introduces power quality standards for the company.

2. Quality of Delivered Power

An important part of the company's mission is to provide and maintain a high quality of electric service to its customers. The quality of the *power* delivered to a customer is an important part of that service quality. These power quality standards address:

- The quality of steady-state power delivered to customers. Quality attributes include voltage magnitude and balance, voltage and current distortion, and repetitive voltage fluctuations.
- The quality of power during disturbances. These include infrequent voltage fluctuations, voltage sags caused by short circuits, and voltage transients.

3. Importance of Voltage Regulation and Power Quality

The company views good voltage regulation and power quality as essential to the efficient and reliable operation of customer equipment. Steady-state voltage that is too high, too low, or not balanced, can cause inefficiencies and loss of equipment life. Likewise, too much harmonic distortion in a power system can cause equipment to overheat or operate incorrectly. Power disturbances such as high-speed transients can destroy or shorten the life of sensitive equipment resulting in expensive downtime and lost revenue. Some types of equipment and their use in a customer's facility can adversely affect the current and voltage on the distribution system so that sensitive equipment connected to the same circuit does not function as it was designed. Sensitive utility equipment is vulnerable as well. For example, a dip in voltage caused by a customer starting a motor can cause an adjacent piece of microprocessor-controlled equipment to mis-operate or shut down.

4. The Need for Standards and Guidelines

These power quality standards establish operational characteristics, tolerances, and limits which, when met, will allow facilities containing power sensitive and power disturbing loads to operate on the company's distribution system with a minimum of interference to utility equipment or customer loads.The company's customers, outside contractors and consultants, and its own engineering and operations personnel can use these standards to properly design, install, maintain, and operate facilities containing power disturbing loads or sensitive equipment requiring a high degree of power quality. They know what voltage range is required to operate equipment effectively. The standards are important in determining the degree of power quality of any electrical distribution system, whether utility feeder or facility circuit.

5. The Power Quality Standards

The company's power quality standards are listed and briefly described in Table 1.

Table 1—Power Quality Standards and Their Descriptions

Power Quality Standards	Descriptions
Voltage Levels and Ranges 1C.2.1	Normal voltage levels, overvoltage, undervoltage
Voltage Balance 1C.3.1	Limits of phase-phase variation in voltages
Harmonic Distortion 1C.4.1	Voltage and current waveform distortion
Voltage Fluctuation and Flicker 1C.5.1	Repetitive sags and other voltage variations
Voltage Disturbances 1C.6.1	Descriptions of brief voltage variations and the disturbance events that cause them
Stray Voltage 1C.7.1	Description of normal voltages, currents and voltage limits present in and near the ground
Voltage Frequency 1C.8.1	Variation in the frequency of supplied power

Close adherence to these standards by the electrical community will provide an acceptable level of power quality for both the power provider and the power user.

Achieving this acceptable level of power quality can be obtained through a cooperative effort among the power users, equipment manufacturers, and the company. The result will be longer service life for equipment and lower cost for electric service. For example, in using this *neighborhood* approach to quality power, the voltage harmonics on a circuit can meet national and international standards and should be accepted by all. This will result in a power system that will allow all connected load equipment to operate properly. Prevention is much better than finding a cure. In achieving a suitable level of power quality, the costs of implementing a solution using state-of-the-art engineering technology must be weighed against practical application and desired results.