Power quality (PQ) is a quantifiable measurement of service reliability. Nonlinear loads (such as motors and electronics) produce harmonics that negatively affect the grid. Industry standards regulate PQ. PQ metrics quantify PQ using current and voltage information from a PQ meter.

**Motivation:** Provide real time PQ information to customers to ensure quality power in the grid.

**Objective:** Gather data from a PQ meter in real time and run it through the updated LabVIEW program.

**Scope:** Display PQ metrics from an Eaton Xpert 8000 series meter in real time.

### Metric Detail

<table>
<thead>
<tr>
<th>Metric</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Harmonic Distortion</td>
<td>Harmonic presence based on FFT</td>
</tr>
<tr>
<td>CBEMA compliance</td>
<td>Voltage sag and swell magnitude</td>
</tr>
<tr>
<td>Asymmetry Factor</td>
<td>Even harmonic presence</td>
</tr>
</tbody>
</table>

### Testing

Simulated testing verifies the performance of each PQ metric:
- THD
- CBEMA compliance
- Asymmetry Factor

Meter data testing validates the interface between the meter and LabVIEW. PQ from meters should be high, so no alarms should be raised.

### Future Opportunities

- Universal PQ monitor for use with any PQ meter
- Smart phone application to monitor PQ remotely
- Add metrics to program

### Eaton Xpert 8000 series meter

- 10 meters around the CSU campus
- Captures current and voltage waveforms, saves to Excel file
- Access webpage using IP address
- Wired -Ethernet -Modbus
- Wireless

### AutoHotkey

Scriptable automation program uses hotkeys to interface between the meter and the LabVIEW program:
1. SAVES waveform data from meter website
2. Runs LabVIEW program with saved data

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