

Utility power systems continue to change, and some of these changes can impact the quality of power being delivered to utility customers. The CEATI Power Quality and Advanced Technologies (PQAT) program offers a forum for member utilities to stay on the leading edge of this change. This is done in four ways:

1. **Customer Power Quality:** The expectations of utility customers continue to rise such that it is becoming less acceptable for the utility representative to say, "I'll get back to you on the reason for your upsetting event." In PQAT we discuss and offer projects to improve the speed and accuracy of diagnosing these events. We also discuss ways to more productively address PQ problems and interact with customers.
2. **Power Quality Monitoring and Data Analysis:** As a society we are now drowning in data. This includes the data from power quality monitors. In PQAT we are exploring ways to organize, automatically automate the analysis, and quickly report event data for upsetting PQ events.
3. **Power Quality Impacts of DER Integration:** Distributed Energy Resources (DER) are the single biggest change to traditional utility infrastructures. DERs can also have tremendous impact on the quality of electric service offered by utilities. In PQAT we focus on the PQ impacts of DER topics such as smart inverters, energy storage, safely maximizing system hosting limits, and interacting with customers on DER topics.
4. **Transmission Power Quality:** As solid-state switching devices (SVCs, STATCOMs, Filters) find their way into utility transmission systems power quality issues that once were only felt in the distribution system are presenting themselves at higher voltages. In PQAT we focus on these systems by discussing approaches to transmission PQ issues such as harmonics, resonance, PQ standards as applied to transmission, and pitfalls of intermittent generation.

In addition to these areas of focus the PQAT group welcomes other issues that are sometimes assigned to PQAT members to address, but which are not wholly within the area of power quality.

Topics & Issues

1. Maintaining quality when hosting DERs
2. Improving response to customers for upsetting events
3. Automated analysis of large volumes of PQ and other data
4. Handling PQ Issues in the transmission system

Technical Advisor



Dennis Hansen worked with PacifiCorp where he was principal engineer over Engineering Technical Services (2010-2015). In this role, he managed a small group that handled a variety of issues for which engineering standards were marginal, emerging, or did not exist. This included distributed generation, energy storage devices, energy saving devices, audible noise, ac corrosion, stray voltage, and electrodynamic field effects. He has a deep background in power quality and reliability engineering for PacifiCorp (1994-2015), where he worked with large end-use customers, account managers, and field engineers to ensure that PacifiCorp maintained high quality in its power delivery. He also oversaw the development and use of high-resolution power monitoring systems, did reporting & analysis, provided a liaison with universities on technical projects, and represented PacifiCorp at IEEE and other industry meetings for technical standards development and similar work. Prior to this (1975-1994) he worked in entry-level management, generation engineering, research & development, and protective relaying.



Selected Collaborative Projects

Customer Power Quality

- Guide for Variable Frequency Drive Installations
- Conducting Distribution and Customer Facility Ferroresonance Studies
- Impact of Mass Penetration of LED Bulbs and Small Device Chargers on Distribution Networks
- Analysis of Parallel and Series Resonance on the Electrical Distribution System
- Software Application for Calculation of IEC Flicker Indices Using Measured Voltage Quantities
- Power Quality Reference Brochure (Guide) - For Customers and Utility Representatives
- Development of a Flicker Evaluation Program

Power Quality Monitoring and Data Analysis

- Determination of Distribution Network Characteristics Using PQ Waveform Data
- Electrical Utility Guide for Uniform and Consistent Practices in Defining, Monitoring, and Reporting Compliance with Steady-State Voltage Levels at Points of Common Coupling
- Assessing Power Quality Disturbances Using Power Quality Features of Distribution Network Equipment
- Review and Update of Power Quality Measurement Protocol
- Indices to Assess Voltage Sag Performance

Power Quality Impacts of DER Integration

- Electrical Energy Storage in Distribution Systems for Mitigation of Power Quality Issues
- Voltage Fluctuations Caused by Transient Clouds in Distribution Systems with a High Level of PV Installations
- Determination of Distribution Network Characteristics Using PQ Waveform Data
- Effective Collection and Management of Power Quality Data for Analysis and Detection of Incipient Distribution System Components' Faults and Identification of their Locations
- A Guide to Successful Accommodation of Mass Penetration of High-inrush Current Devices on the Distribution Network

Transmission Power Quality

- Impact of High Frequency Harmonics on Power Systems
- Alternative and Advanced Uses of PQ Disturbance Data
- Effectiveness of Mitigating Measurement/Techniques
- Power Quality Considerations for Wind Power - Application Guide
- Practical Guidelines for Evaluating Harmonics on Utility and Customer Systems
- Impact of Utility Voltage Variations on Customer Systems
- Practical Guidelines for Evaluating the Impact of Transients on Utility Customers

Annual Activities

- 2 Face-to-Face Meetings
- Workshops and Conferences
- Regular Conference Calls
- On-Demand Information Exchange/Training Webinars
- Technical Tours
- Collaborative Project Development

*Participation is open to Electrical Utilities and Independent Power Distributors.
For a complete project listing, please visit www.ceati.com/PQAT