STORAGE, CVR, AND CHP BLURRING THE LINES OF SUPPLY AND DEMAND

Moderator: Maureen McNamara, U.S. Environmental Protection Agency

PAPERS:

Conservation Voltage Reduction – On the Other Side of the Meter: An Evaluation Case Study

Frank Stern, Navigant Consulting, Inc.
Paul Higgins, Navigant Consulting, Inc.
Christopher Frye, Northwest Energy Efficiency Alliance
David Thompson, Avista

The Calm before the Storage Tsunami: Lessons Learned from Evaluating California's First Behind-the-Meter Advanced Energy Storage Project

Stephan Barsun, Itron Inc.
William Marin, Itron Inc.
George Simons, Itron Inc.

Understanding Early Retirement of Combined Head and Power (CHP) Systems: Going Beyond First Year Impacts Evaluations

William Marin, Itron Inc.
Myles O'Kelly, Itron Inc.
Kurt Scheuermann, Itron Inc.

SESSION SUMMARY:

The U.S. electric system has significant potential to become both more energy efficient and to more seamlessly integrate cleaner energy sources if designed and managed with these goals in mind. Traditionally, energy efficiency, demand response and the integration of distributed energy resources have been handled separately within the utility organization due to operational and regulatory factors.

New and emerging technologies and systems are beginning to blur the lines between traditional supply-side and demand-side management approaches creating new opportunities throughout the distribution system. This session will focus on evaluation methods and issues surrounding three emerging opportunities with significant potential to reduce energy use and greenhouse gas emissions and/or enhance electric reliability and grid stability: Conservation Voltage Reduction (CVR), Advanced Energy Storage (AES) Systems, and small-scale natural gas Combined Heat and Power (CHP) systems.

Throughout the United States, electricity is required to be delivered to most customers within a narrow range of voltages. For example, residential customer voltage is typically between 114 and 126 volts (for normal 120-volt service).[1] Delivering electricity closer to the lower end of this voltage range can reduce or delay energy consumption in homes and buildings because some equipment operates more efficiently at lower voltage (e.g., closer to 120 volts). For example, voltage reduction of incandescent lighting will generally reduce waste heat and therefore save energy, but not all customer devices will save energy by reducing voltage. As a result, energy savings are usually evaluated at the circuit level on

[1] ANSI C84.1, "Electric Power Systems and Equipment—Voltage Ratings (60 Hertz)," specifies the nominal voltage ratings and operating tolerances for 60-hertz electric power systems above 100 volts.

a circuit-by-circuit basis requiring some on-off cycling of voltage controls. Managing voltage within the lower band of acceptable voltage is known as CVR or Volt/VAR optimization[2]. The first paper in this session presents an evaluation case study of two Avista Utility Volt/VAR projects using the Northwest Regional Technical Forum Automated CVR protocol and an alternate approach, which is similar but less burdensome, to assess energy savings from these projects.

The two other papers in this session are part of a broader evaluation of the California Self-Generation Incentive Program (SGIP), which among other technologies provides financial support for behind-the-meter energy storage and CHP. "The Calm before the Storage Tsunami" provides a broad overview of the California AES installation market but focuses predominantly on the initial performance of four battery systems using AES charge, discharge, and load interval data to quantify efficiency and capacity factor results, peak demand reduction, customer bill impacts, and greenhouse gas emissions. This paper also discusses the different data streams required for different types of analyses.

The final paper, explores the importance of validating the performance of small-scale natural gas CHP systems on a regular basis. These small scale systems hold great promise for energy savings and reliability, grid stability and greenhouse gas emission reduction but the evaluation suggests that performance degradation is an important issue that needs to be addressed in program and incentive design to ensure installations deliver benefits for their full expected lifetime.

[2] **Volt/var optimization** refers to the simultaneous and optimized control of voltage and reactive power (var) on the distribution system to minimize system losses