Session 7A

SMART DATA: A MYRIAD OF USES

Moderator: Sharyn Barata, Itron

PAPERS:

***New Approach to Analyzing Hourly Energy Usage Data* to Obtain Fast, Accurate Savings Estimates**
William Miller, Lawrence Berkeley National Laboratory
Robert Van Buskirk, Lawrence Berkeley National Laboratory

Using Smart Meter Data to Identify Non-Performing Load Control Devices
Colin Kerrigan, Pacific Gas and Electric
Wendy Brummer, Pacific Gas and Electric
Christine Hartmann, Freeman, Sullivan & Co.
Josh L. Bode, Freeman, Sullivan & Co.

A Randomized Experiment in Direct Load Control Using Smart Meter Data
Jessei Kanagarajan, Ontario Power Authority
Dries Berghman, Freeman, Sullivan & Co.

SESSION SUMMARY:

Welcome to the new world of data. Smart data; from smart meters. It's here and it is now. This session highlights three ways that AMI data is being used across North America. These new approaches include the use of use of smart meter data to identify non performing premises; randomized experiments in Direct Load Control using smart meter data; and innovative approaches of analyzing hourly energy usage to obtain fast, accurate saving estimates.

The first presentation demonstrates how the use of hourly energy usage data can be applied to quickly determine energy use changes in residential households. As automatic meter infrastructure (AMI) spreads, increasing amounts of hourly usage data (AMI data) are available. This paper considers AMI data as basic time series and separates the noise in that series from evidence in a change in the pattern of usage using standard statistical techniques applied in a novel way. By applying a moving time window, step-wise changes in energy use patterns can be sensitively detected in very noisy data. This opens the possibility of being able to determine in a short time frame whether an energy efficiency action produced expected results rather than the one to two years now required.

Once a change has been identified, straightforward ranking techniques may be able quantify the change to a high degree of accuracy. In the case of non-weather dependent uses, this can be done with several weeks of data pre-change and post change. More complex techniques can account for the impact of temperature changes. The variations in usage in hourly data embody the same factors that separate metering or data acquisition (e.g. surveys) illuminated when analysis was conducted with only monthly data. AMI data may embody this information less perfectly than direct data acquisition, but the information it does contain comes is almost immediately available at no additional cost.

Our second presentation looks at the use of AMI data to identify non performing load control devices at PG&E. A common question among utilities has been to what degree we can understand the components of household loads by observing patterns in the aggregate household hourly load. In particular, for utilities operating direct load control programs with one-way communication, the question

is if we can use smart meter data to identify premises with unresponsive control devices? Unresponsive devices weaken the load impacts of load control programs, often times without the utility really having a grasp on the magnitude of issues. This paper describes methods to identify missing or non-performing load control devices using smart meter hourly household data. It also present the results of field study to assess the accuracy of diagnostic tests using hourly household data.

Our final paper will focus on using large randomized controlled trials (RCTs) as an affordable and highly accurate alternative to logger data for direct load control (DLC) impact estimation. The RCT method was applied to a provincial residential and small commercial load control program. This program involves the installation of programmable communicating thermostats (PCTs) and/or direct load control switches (switches) in households and small businesses with central air conditioning (CAC) in the service territory of more than forty local distribution companies (LDCs) across the province. In 2012, an RCT using a sample of 28,000 customers was used to estimate impacts for the program's 180,000 customers. Past evaluation efforts were only able to include a few hundred customers in two different LDCs, which only represent a small portion of the customer base.

During a load control event, a portion of the participant population received the treatment (in this case, load control) while the remainder of the participant population served as the control group and provides a reference load. The results of this direct comparison will be used to inform the choice of future load control strategies to improve program load impacts and cost effectiveness, while maintaining an acceptable level of comfort for program participants.