Session 7D

EVALUATION ZEN: HOW RESIDENTIAL RETROFIT CHALLENGES ARE MET WITH SMART METERS, ENGINEERING ANALYSIS AND BILLING ANALYSIS

Moderator: Matthew Nelson, Northeast Utilities

PAPERS:

Challenges of Estimating Hourly Baselines for Residential Customers
Collin Elliot, Itron
Jean Shelton, Itron
Dave Hanna, Itron

Getting our Ducts in a Row: A Billing Analysis of Duct Sealing and Heat Pumps in the Northwest
Jenny Yaillen, Evergreen Economics
Carrie Cobb, Bonneville Power Administration

Dynamic Duo: How Combining Billing Analysis and Engineering Simulation Methods Improves Evaluation Quality and Understanding
Kimberly Crossman, National Grid
Laura Tabor, Navigant
Matei Perussi, The Cadmus Group
David Basak, Navigant,

SESSION SUMMARY:

This session will focus on exploring techniques to improve residential baseline calculation and the ensuing savings for duct insulation and two Home Energy Retrofit (HER) programs. Establishing a baseline is the quintessential first step to measuring and evaluating the impact of energy efficiency activity. This session will highlight new techniques as well as innovative twists on standard practices in an effort to develop and establish reliable baselines and savings estimates in residential homes.

The first paper discusses the expansion of smart grid infrastructure, which offers new opportunities for utilities to implement demand response programs for their residential customers. However, the standard approaches for estimating the baseline profiles used to determine impacts come primarily from non-residential programs, which presents two major challenges. First, the number of participants in residential programs – potentially millions – can render standard methods computationally impractical. Second, the greater variability of residential loads can make the standard approaches insufficiently accurate for producing reasonable estimates of program impacts. This first paper and presentation will summarize analysis of interval data for residential participants in SCE's SmartConnect program to assess the accuracy for estimating impacts for individual residential customers, and whether the use of aggregate customer load models offer a reliable and more efficient alternative.

The second paper investigates northwest energy efficiency programs that include duct sealing and heat pumps, two critical sources of program savings for almost a decade. This study is the first impact evaluation of this program and, in part, was designed to measure the effectiveness of the program specifications. The evaluation also included collecting customer billing data; developing a comparable control group; using a stakeholder advisory committee to assist in reviewing results; and using a number of different regression models to estimate savings.

This evaluation attempted to surmount the challenge of collecting billing and program tracking data from 42 public utilities spanning 15,490 households in Oregon, Washington, Montana, and Idaho. Multiple regression models were developed including differences-in-differences, fixed-effects, and statistically adjusted engineering (SAE) model specifications. This paper describes why the fixed-effects specification was selected over other models and how the model selection was influenced by the dataset. The paper encompasses critical lessons learned, from both stakeholder feedback and modeling scenarios, when developing baselines and impact savings in a multi-state coordinating effort.

The third paper leverages two competing impact evaluation methodologies, billing analysis and engineering analysis, to offer powerful insights. These methods were combined to determine savings for a range of weatherization and direct-install measures implemented through the Massachusetts Home Energy Savings (HES) and Low Income Weatherization (LI) programs. The purpose of the evaluation was to quantify electric, gas and oil energy savings associated with both programs. These are residential retrofit programs that offer a wide range of weatherization measures and direct-install measures, as well as heating system replacements for qualified participants of the LI program.

In both evaluations, key assumptions and inputs within each methodology were influenced by that of the alternative methodology, which led to results that were largely in agreement. Another benefit to this approach was the ability to use the engineering analysis to delve into the reasons for discrepancies between claimed and verified savings across the programs' measures. For example, engineering results were used to split out individual insulation measures from bundled household savings, and the evaluation was able to compare CFL unit savings from billing analysis to engineering calculations. In addition, the paper shows how the analysis was able to extrapolate evaluation findings of program participants with oil heating systems, for which billing analysis was not available. The use of multiple harmonized evaluation techniques enabled the team to provide greater insight into the data trends behind the results, and confidently address regulatory requirements.