SHEDDING LIGHT ON HOURS OF USE

Moderator: Scott Dimetrosky, President, Apex Analytics, LLC

PAPERS *(in order of appearance)*:

Getting Over the Hump: Leveraging Multi-Year Site-Specific Impact Evaluation to Derive C&I Lighting Parameters

Ryan Powanda, Navigant
Heather Lisle, Navigant
Justin Spencer, Navigant
Jes Rivas, Navigant

A Lighting Study to Stand the Test of Time: Exploring the Results of a Residential Lighting Study Designed to Produce Lasting Data

David Barclay, NMR Group, Inc.
Matt Nelson, Eversource Energy
Ralph Prahl, Prahl and Associates
Scott Walker, NMR Group, Inc.
Kiersten von Trapp, NMR Group
Andrew Correia, NMR Group, Inc.
Lynn Hoefgen, NMR Group, Inc.
Scott Dimetrosky, Apex Analytics

Are You Turned On? A Hierarchical Modeling Approach for Estimating Lighting Hours of Use

Lisa Wilson-Wright, NMR Group, Inc.
David Barclay, NMR Group, Inc.
Andrew Correia, SessionM

SESSION SUMMARY:

This session presents results from a number of recent residential and commercial lighting studies that leveraged large sample sizes and rigorous statistical analysis to develop hours-of-use and peak coincidence factors. Authors will highlight both their research methods and findings, providing useful information to evaluators and program implementers interested in estimating savings from lighting programs.

The three papers to be presented are summarized below.

Getting Over the Hump: Leveraging Multi-Year Site-Specific Impact Evaluation to Derive C&I Lighting Parameters

The objective of this paper is to highlight a successful method for developing lighting metering values for use in high-rigor evaluation. The evaluation team developed annual hours-of-use (HOU), utility and PJM-specific coincidence factors (CFs), and customer self-report ratio (CSRR) space-level lighting parameters as part of this study.

In partnership with the EmPOWER utilities in the state of Maryland, the evaluation team sought to develop a rigorous set of lighting parameters to meet multiple objectives. The solution had to meet PJM requirements for summer metering of program installations to bid into the PJM forward capacity market and had to be flexible for application to future program years, all while minimizing long-term evaluation and metering costs by eliminating the need for yearly site-specific metering.

Based on previous evaluation work in Maryland, the team found that lighting retrofits often experience variability in lighting fixture installations between space-types from year-to-year. For lighting metering results to be applicable to future program years with variable distributions of installations by building-space type, the evaluation team needed to characterize the lighting parameters based on these unique building-space types.

Ultimately, the evaluation team leveraged four years of site-specific metering to develop building and space-level combinations for C&I lighting parameters. This approach improved the flexibility for use in future programs years as participation changes within the C&I building stock.

A Lighting Study to Stand the Test of Time: Exploring the Results of a Residential Lighting Study Designed to Produce Lasting Data

The Energy Independence and Security Act of 2007 (EISA) and the increasing presence in the market of new lighting technologies like LEDs and EISA-compliant halogens are two factors that will likely lead to rapid change in the residential lighting market in the coming years—change that means hours-of-use (HOU) estimates based on specific lighting technologies are likely to become obsolete very quickly. This presents evaluators with a conundrum: how to design a study that applies to current market conditions and program designs, while allowing for the development of HOU data that will adapt to changing technologies and regulations in the future. In short, how can we design a study that will stand the test of time?

By developing estimates at the room level and logging both efficient and inefficient bulbs, the Northeast Residential Lighting HOU study was designed to develop HOU estimates that are not tied to specific technologies and can be updated over time by combining location-specific HOU estimates with data on where energy-efficient bulbs are being installed. Using this approach, the study increases its shelf life by eliminating the need for additional costly HOU studies in response to new technologies or changes in where households are installing bulbs. This paper presents HOU data for eight different combinations of income and housing types across eight areas for both efficient and inefficient bulb types. It also explores findings regarding snapback or "take back" behavior, which can be difficult to measure in upstream programs.

Are You Turned On? A Hierarchical Modeling Approach for Estimating Lighting Hours of Use

When fitting statistical models to data that span multiple geographic areas for an evaluation, the researcher often prefers to provide both an overall regional savings or consumption estimate and a separate estimate for each individual area represented in the data. This works well when each area is represented by a large sample. However, project budgets and time often dictate smaller sample sizes which may be insufficient in some areas. In this scenario, the evaluator is faced with a handful of options about what data to use to report an estimate in the under-represented areas.

This paper presents a more attractive alternative using hierarchical regression models to obtain both overall and area-specific estimates for the data structure described above. Under the distributional assumptions of this approach, the model is able to use the information from each area to form the basis for the estimate in that area, while also borrowing information from each of the other areas in the study to help inform the estimate. In this way, the authors obtain more robust estimates than would have been the case had they fit separate models to each area, yet also allowed each area to maintain its own unique characteristics in the model. The study, one of the largest metering studies of its kind, relied on a sample of over 4,600 loggers from 845 homes across four states. Other regional evaluations may wish to consider the approach, increasing opportunities to leverage resources while preserving information on individual areas.