White Paper

Big Data Means Big Savings for Utility Program QA/QC

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Shareables

- Comparing modeled HVAC system runtimes to smart thermostat runtime data can quickly identify sites with potential errors or anomalies.
- This can allow utilities to identify specific homes for QA/QC, providing a targeted, rather than random, selection process of which sites to review.
- This can translate into a higher degree of quality with reduced levels of effort, since time is not used checking homes with a low likelihood of issues.

Executive Summary

QA/QC efforts are essential in the implementation of utility DSM programs. These practices validate that measures have been installed properly, accurately reported, and leave the utility customer in a healthy and safe building environment. Home performance, weatherization, and new construction programs often utilize field inspections as part of their quality management plan. While these visits provide a valuable boots-on-the-ground look at a particular project, they increase overall implementation costs and typically inconvenience the utility customer by requiring an additional visit from a utility representative.

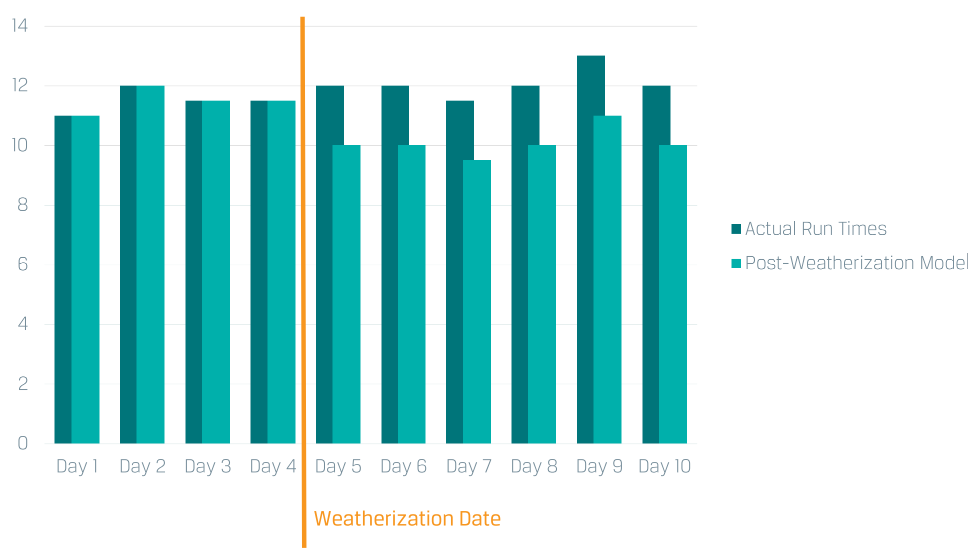
As utility programs continue to progress, implementers will need to find new ways to improve program efficiency and lower costs. Next generation programs integrating smart thermostat and smart home technology provide a number of valuable benefits for both utilities and customers.

Significant energy savings, demand savings, and improved customer engagement are among the most commonly discussed value streams of smart thermostats. But this technology also provides new avenues for optimizing program operations and reducing implementation costs.

Why? Smart thermostats can deliver temperature set-point information and HVAC system runtime information directly to an implementer. As a result, the implementer can remotely monitor the HVAC system performance. In programs where smart thermostats are installed and home energy modeling is required, analytics can then be used to compare actual system performance to modeled projections. Misalignment can indicate a variety of quality issues, including: inaccurate modeling, misreported field results, or ineffective installations. Integrating this type of analytical framework into the field QA/QC process can help implementers identify a more targeted selection of homes for inspection. And because the field inspections are specifically targeting to homes with a high discrepancy between metered and modeled data, time is not spent inspecting homes with a low likelihood of quality issues. This can allow for fewer inspections, directly translating into reduced implementation costs for the program.

In weatherization/retrofit program designs, if a smart thermostat is installed during the audit process, normalized runtimes can be compared before and after any shell or envelope measure, such as attic insulation, is completed. If a large discrepancy is seen between modeled and metered HVAC system runtime, this could indicate potential issues such as the effective R-value of the insulation being inaccurately reported, or a significant change in customer behavior post-installation, known as the "rebound effect".

NORMALIZED RUNTIME ANALYSIS



Source: ICF

Unlike most firms that specialize in either program implementation or analytics, ICF is uniquely positioned to provide this type of advanced analytical capability within a packaged solution for program implementation. As an implementer of over 150 programs nationwide, and a provider of analytical services to over 30 different clients, we have the experience and in-house experts needed to drive innovation. The nexus of modeling and metered data is a new frontier in improving program efficiency, and ICF is at the forefront for providing solutions that can employ rigorous analytics, reduce costs, and increase customer satisfaction.

About the Authors

Justin Mackovyak has a specialized background in residential construction and energy efficiency, and is currently supporting a number of utility-based DSM program designs including smart thermostats, demand response, and smart homes. His hands-on background in building science combined with a naturally inquisitive attitude towards data analytics has helped successfully evolve a number of leading edge program designs for various utility clients.

David Pudleiner has over 4-years of experience working in the field of building energy analysis, and has worked in both academic and consulting environments. While at ICF, he has contributed significantly to a projects in a variety of fields including econometric analysis, optimization, energy modeling, and demand side management. Since joining ICF, he has helped to launch 7 new tools to improve modeling and analysis methods within the company.

Haider Khan leads a team that is responsible for distributed energy resource engineering, and data analytics support to our utility clients for demand side management all over North America. He is a seasoned engineer with more than 16 years of experience in energy & econometric modeling, simulation, and optimization & machine learning. Mr. Khan earned his Bachelor's of Science degree in Mechanical Engineering from University of Engineering & Technology, Lahore and his Master's of Science degree in Mechanical Engineering, Oklahoma State University.

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