



Do You Know What's in Your Basement? Comparing Self-reported Data with Reality

Is that a boiler or a furnace? As energy-efficiency evaluators, we quickly learn that homeowners often have little knowledge about the energy using equipment in their home or the characteristics of the building. However, visiting homes to inspect and catalog equipment is expensive. This post explores how we can overcome customers' knowledge gaps about their homes and cost-effectively leverage existing data to make effective use of customer self-reports for baseline studies.

In 2017 and 2018, the authors fielded web-based residential appliance saturation surveys (RASS) with thousands of customers in two neighboring Northeast states – 900 surveys in the smaller state and over 2,400 in the larger state. Respondents reported on a wide variety of end-use equipment in their homes, enabling us to measure end-use penetration and characterize other energy-related details in their homes. Our trained technicians then visited subsets of those customers' homes where they verified and supplemented customers' reports based on actual observations. Comparing the subset of on-site-visit customers' survey responses with our on-site observations yielded adjustment factors (i.e., observed penetration divided by reported penetration). Applying these factors to the full web-survey sample refines the full population's self-reports. Looking at the results from one state, it was clear that for some end uses, customers provided good data on the equipment in their homes. For example, customers correctly reported water heating fuel type and presence of cooling systems. For other end uses, verification visits revealed that customers simply were unaware of the types of equipment in their homes – especially types of heating and water heating systems. Most notably, customers over-reported the presence of advanced power strips, even after being shown images of them.

These differences are very informative for evaluation purposes. This poster (1) includes comparative charts to identify the types of information that customers simply do not know and should be omitted from customer surveys to conserve survey "real estate" and (2) illustrates how to use adjustment factors for years to come by applying adjustment factors to relatively inexpensive web survey results. All data collection is complete.

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METHODS



3,300+ surveys 300+ on-sites

NMR conducted a web survey on residential end uses, including appliances, consumer electronics, heating and cooling equipment, thermostats, water heating, and building characteristics.

After fielding web surveys, NMR followed up at a sample of respondents' homes for on-site verification.

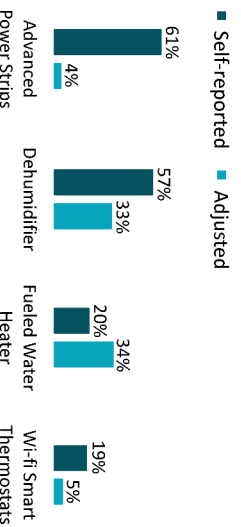
ADJUSTMENT FACTORS

When a statistically significant difference between reported and verified penetration was observed, we applied an adjustment factor to survey results.

% of on-site households with verified end use _____ = **Adjustment Factor**
 % of on-site households reporting end use

END USES

Penetration Differences



What do customers know?

- Presence of equipment
- Fuel type
- Number of appliances

What are the knowledge gaps?

- Mechanical equipment details
- Age of appliances and equipment
- Counts for large quantity items
- Type of thermostat (programmable vs smart)
- Advanced Power Strip vs regular power strip

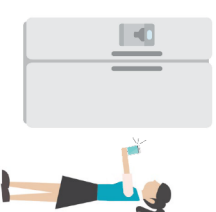
Conclusions

- Reduce customer burden by shortening surveys
- Focus on key questions
- On-sites are necessary
- Adjustment factor magnitude and direction differ by state
- Web survey respondents can not reliably ID Advanced Power Strips from pictures

POTENTIAL SOLUTION

Mobile Device Survey

NMR has developed an innovative self-directed mobile device survey that can be used to increase the accuracy around measures of interest.



The mobile device survey has questions that we know respondents can reliably answer and lets them submit photos of other equipment and devices that provide verifiable information.

This allows us to collect data that are much more reliable than self-reported values, at a lower cost than an on-site visit. We are also able to collect detailed efficiency data from customers who would not agree to a site visit.

