

## **Lessons Learned and Next Steps in Energy Efficiency Measurement and Attribution: Energy Savings, Net to Gross, Non-Energy Benefits, and Persistence of Energy Efficiency Behavior<sup>1</sup>**

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**December 2009**

This white paper examines four topics addressing evaluation, measurement, and attribution of direct and indirect effects to energy efficiency and behavioral programs:

- Estimates of program savings (gross);
- Net savings derivation through free ridership / net to gross analyses;
- Indirect non-energy benefits / impacts (e.g., comfort, convenience, emissions, jobs); and
- Persistence of savings.

Evaluation and attribution methods have reached a point that they must evolve in order to provide credible results for the next generation of programs. Two primary factors have complicated the methodologies that have been applied to energy efficiency programs:

- Transition to more behavioral, outreach and other non-measure-based programs (education, advertising), making it especially hard to “count” impacts, and
- Increased chatter in the marketplace, in which consumers may be influenced by any number of utility programs by the host/territorial utility (the “portfolio”) as well as influences from outside the territorial utility (national, neighboring programs, movies/media).

We reviewed hundreds of conference papers and interviewed scores of professional researchers to identify improved techniques (and associated policy issues) for quantifying the share of direct and indirect effects that can be attributed to the influence of program interventions above and beyond what would have occurred without the intervention – either naturally or due to the sway of other market influences or trends. We reviewed evaluation methods from around the US and Canada and examined evaluation practices in different states. We analyzed: issues / problems / gaps from current approaches; priority applications for the results and potential alternatives proposed or considered (and associated data needs); and proposed next steps in a research agenda. Finally, we also present near- and long-term implications for program design, evaluation, outreach, and benefit-cost for programs across the US; and best practices for key elements of evaluation of direct and indirect energy efficiency and behavioral program effects.

New program generations have complicated evaluation. Education, outreach, training, and market-based approaches make it harder to count “widgets” and assign savings for energy

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<sup>1</sup> This paper was prepared for the California Institute for Energy and Environment and the California Public Utilities Commission. The report is available at: <http://uc-ciece.org/energyeff/energyeff.html>.

efficiency programs. New and multiple actors providing programs and outreach within utility territories increases the influence “chatter” and make it harder to isolate the impacts associated with one agency’s program, or even the influence of one vs. another program from one utility or entity. These important evaluation complexities have become harder to ignore.

Some have argued that traditional evaluation approaches are failing and not worth conducting. Others have proposed modifications and patches. It may be the case that varying and evolving programs may not be suited to “one size fits all evaluation protocols” and need tailored evaluations, but, to paraphrase, not measuring is not the best answer. The best programs will not be identified – or valued and taken seriously by system planners and regulators – unless they are measured and verified.

A review of the state of evaluation in these areas – gross and attributable net savings, and non-energy benefits – suggests some lessons are old lessons (up-front evaluation design and random assignment may seem difficult, but there is no reliable “after the fact” substitute). Some are new possibilities (for example, reflecting market share through price decomposition, revisions to the regulatory tests to incorporate NEBs). Some concessions to chatter and overlaps may be needed (portfolio-level decision-making or scenarios may be an appropriate evolution). There needs to be more up-front market assessment and baseline attention (saturation studies, perhaps augmented with behavioral aspects) to support evaluation of effects at least at the portfolio level. In some cases, deemed estimates associated with template program types may be appropriate if they are updated based on periodic measurement. Most importantly, evaluations need to continue and to loop back to program design to assure that the public dollars are being well-spent and “wrong” program decisions are avoided.