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BREAKING OUT OF THE NET SAVINGS BOX

By Jeff Ihnen and Jake Millette

It has been said that if you ask ten engineers what the energy savings are for a project, they will provide ten different answers. If that is true, a million evaluators asked to determine the net-to-gross ratio for an efficiency program will provide a million different answers, which is quite astounding when the answer is can be found in just three significant figures. This is no surprise: trying to put a numeric counterfactual value on a complex decision-making process is challenging.

Net savings determination for programs serving large commercial and industrial sectors is hard, expensive, and controversial - and implementation contractors (ICs) never like the results. This article explores critical issues and identifies needs in an effort to better assess net savings for large capital-intensive programs including custom efficiency and commercial and industrial new construction programs.

LET'S BE CLEAR ABOUT THE TERMINOLOGY

Defining terms is always important to bring newer folks in the industry up to speed.

Gross Savings: Changes in energy use resulting from program-related actions taken by participants and their agents, regardless of why they participated.

Net Savings: Only those changes in energy use that are attributable to the program. Net savings account for free riders, free drivers, and market effects.

Free Rider: Program participant who would have done their efficiency project the same way in absence of the program.

Free Driver: A customer who completes an energy-saving project outside of the program. This may include past participants or customers who have no history with the program. Savings from these projects are called *spillover*.

Market Effects: The impact efficiency programs have on the inducement of product options and availability in the market, prices, product or practice acceptance, customer expectations, and the knowledge, services, and practices of market actors. Long lasting market effects are described as market transformation.

Net-to-Gross: The ratio of net savings to gross savings, which averages about 80-90% for all programs, from year to year.¹

Net Savings = Gross Savings – Free-Ridership Savings + Spillover Savings + Market Effects Savings

¹ ACEEE's Annual State Energy Efficiency Scorecard.

PROVIDING CONTEXT

The basic foundations of various net savings approaches can be found in chapter 21 of the Uniform Methods Project (UMP),² "Estimating Net Savings: Common Practices."

The reasons why attribution research is important include:

- Improving program performance by effectively directing and setting program funds; and
- Assessing market transformation as free-ridership and spillover change over time.

While the UMP describes many approaches for determining net savings or attribution, from randomized control trials to expert panel methods, this article focuses on survey approaches, which are among the most frequently used for large commercial and industrial programs.

At just over 70 pages, chapter 21 is merely a guide for establishing net savings and attribution. It includes guidance such as survey question development (e.g., open or closed ended), cross examining and triangulation of responses, and aiding recall of survey participants.

There are other approaches beyond those listed in the UMP specifically targeted at large capital-intensive projects that involve many influencers and long-time scales.

Through sharing of best practices, evaluators have been able to incrementally improve net-to-gross (NTG) methodology although important work remains. Some concerns these groups are addressing include:

- Question development. Are questions phrased so participants understand the concept being measured? Can they answer the questions and are appropriate scales or response options included?
- Numerical algorithms. Are survey responses appropriately translated into estimates of free-ridership and spillover? How should responses be weighted when combined?
- Market actor influence. How are program-sponsored actions for designers and contractors weighed into the results?

LARGE CAPITAL PROJECTS – ISSUES AND BEST PRACTICES

The UMP focuses on the mechanics, question development, sequencing, timing, and other things. However, details of complex, long-term project processes are beyond the scope of the UMP. Details for survey development, deployment and analysis for specific programs are left to the evaluation practitioner to handle.

Below, we discuss some of the issues and best practices to consider in attempt to quantify savings attributable to a program for large capital projects.

Origins

Ideas, projects, and program participation start at some place and time and with a person. Successful programs have lasting market effects, which include changes in market structures and increased adoption of efficient products, design, or practices. These effects can span many years, projects, and customers. Designers and contractors learn that new technologies and approaches provide non-energy benefits like greater margins, upselling, and client/customer satisfaction. Evaluators must move upstream to find the origin of the system design and equipment selection. It might not be the project in question, but some other project that was 100% influenced by the program. That attribution from market effects may last several years before the market is transformed.

For example, strategic energy management programs should include a multi-year capital improvement map or plan. An audit or assessment of a customer facility outlining efficiency upgrade options, even for analysis later, is evidence of intervention and influence.

Decision-Makers

Everyone knows an interview with the customer's decision-maker is essential for determining attribution. However, the definition of "decision-maker" is grossly oversimplified. Decision-making for large commercial projects is more complex than for smaller commercial or residential equipment purchases. Big decision-making typically includes a large team (five or more) of influencers and, if necessary, a final decision-maker to make the call. This is how utilities select implementation contractors and evaluation teams. At Michaels, we have a similar process for big decisions.

There are project champions, influencers, and decision-makers in any organization. The "decision-maker" may rarely make decisions, and instead, simply accept what the team, champion, and influencers put forth. A decision-maker may know nothing about the program or how the project originated and was developed. Rarely would one person be able to provide half the story. Multiple perspectives are needed.

Market Actors

Market actors for capital-intensive projects include engineers, architects, contractors, suppliers, and manufacturers. Program implementation contractors are wise to attack barriers and exploit opportunities where they are, and this is largely with market actors. Designers and contractors often make or break big gains in efficiency through systems design – trying new technologies and design approaches. The project may succeed spectacularly while the "decision-maker" knows nothing about the program's impact on their project. Therefore, surveying a swath of market actors to document the full picture is necessary.

Some NTG frameworks include market actor responses to supplement the participant survey. However, this is not standard practice for commercial or industrial projects and is only triggered if the participant identifies the contractor as a major influence. Subtle influences from market actors such as selling the non-energy benefits of efficient equipment may be completely overlooked by the participant when recalling the program or market actor's influence on their project.

Counterfactuals

The UMP states that survey questions begin with determining why the customer did what they did and what they would have done otherwise. What was the timing of program intervention relative to decisions made? How would you rate the influence of the program compared to other factors?

That may be how evaluators think but average folks are unable to give accurate or even serious responses to these inquiries. Effective people and organizations decide and move on rather than remember hypotheticals. Moreover, customers are busy. In addition to honestly not knowing the counterfactual, they are subject to social desirability and "get me out of here" biases that result in inaccurate conclusions.

If a customer can identify and discuss the counterfactual, evaluators must make sure they understand the baseline considered in the customer's mind because that is often different than what the program uses to calculate savings. Programs may assume a federal minimum efficiency standard as a baseline instead of local market conditions or they may assume the baseline is the most recent energy code which has low compliance. In each case, the disconnect between the customer's and program's baselines would lead to faulty attribution values. We must understand the true market baseline and how it changed over time to accurately determine program influence.

² <https://www.nrel.gov/docs/fy17osti/68578.pdf>

Real Time

The best time to ask about decisions is immediately after they are made. Many decisions are made with emotions and validated by data. Emotions change by the day and time of day. For example, judges have a much higher rate of granting parole early in the morning and right after lunch.³ Consider that these people are public servants with sworn obligations to the public and their profession to be impartial. How do efficiency decisions compare to judicial parole decisions? Can a facility manager remember details of their interaction with a program a year later, particularly if they have worked with the program for many projects over many years?

Documentation

Attribution research must be a team effort between the implementation contractor and evaluator. Too frequently, evaluators work in a vacuum determining the score like grading an exam. But it's not an exam. It's a discussion with all relevant parties – customer influencers, champions, decision-makers, contractors, designers, and the IC.

To support the evaluator's project-specific research, the IC must document all contact points and information exchange, including names, dates, places, and quotes, going back as far as possible, and provide this to the evaluator. The evaluator must ask clarifying questions, interview the stakeholders, and ultimately triangulate all the information for the most-likely result. There will be conflicting or inconsistent information because everyone has a unique perspective. Any railroad approach with the same questions for the same stakeholders with the same data dumped into a spreadsheet for every project will result in misleading results.

Information v. Money

Is a customer a free rider if the program incentive made no impact on their decision, but the program identified and led them to premium efficiency? As our industry moves beyond widgets, namely lighting, into holistic design and operational enhancement programs, informing decisions - not cash inducements to the customer - become more important. Maybe incentives should move up the chain to designers or contractors to pay for their research and risk for trying new technologies and approaches.

³ <https://www.theguardian.com/law/2011/apr/11/judges-lenient-break>

Interviewing

We saved the best for last. The well-suited NTG researcher for capital-intensive programs has dual degrees in engineering and psychology. We don't know any such people so they may be formally educated in one topic area and learn the other as a hobby.

Deploying the guidance in this article requires in-depth interviews with those stakeholders mentioned: a cross-section of customer staff, design professionals, and contractors. Getting the facts and prompting people to recall accurate activity is guided by well-documented touchpoints through the customer journey, and cross-examining interviewees with additional questions. The best way to assess whether people are accurate with their responses is to ask for details and sequences.

PUTTING IT ALL TOGETHER

Experienced NTG researchers likely noticed that some of the ideas included above, particularly those related to market effects, are not allowed in existing NTG frameworks. It is important for working groups to continuously examine and incrementally improve NTG methodologies and not be held to past approaches when they do not work.

It is easy to visualize gross savings as a pie, with the program getting one slice of credit and "other factors" another. If multiple factors are involved in the decision, the size of the gross savings pie does not change, it is just cut up into more slices of credit. However, especially with large capital projects with complex and lengthy decision processes, this approach is too simplistic because factors likely interact. To fully understand a program's impact, we should look at it from multiple perspectives and time periods, which does not fit nicely into a simple algorithm.

Too often, NTG research is seen as the final step of impact evaluations that "trues up" savings from a theoretical maximum to the level for which the program is responsible. However, this mindset can prevent further investigation into the customer's motivation. Focusing less on falsely precise NTG values and more on participants' decision-making process will allow all parties to focus more on helping program administrators improve the design of programs and increase savings.

About the authors



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Jeff Ihnen is the CEO of Michaels Energy. Net savings and attribution analyses have been catnip and poison ivy to him for most of 20 years.



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