A National Work-Around: Estimating Incremental Costs for the National Evaluation of the State Energy Programs (SEP)

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Introduction

This poster presents an alternate method of calculating incremental costs of energy efficient equipment when obtaining the actual cost of the efficient and baseline equipment is not feasible given the scale and scope of the study. This alternate method was used for the national evaluation of the State Energy Program (SEP) operated by the United States Department of Energy (DOE). The SEP program provides grants and technical assistance to U.S. states and territories to promote and support energy efficiency and renewable energy activities. SEP received $3.1 billion of American Reinvestment and Recovery Act (ARRA) funds from 2009 through 2013. As part of the ARRA funding, DOE commissioned an evaluation of SEP, both for the ARRA-period and the pre-ARRA period in 2008. DNV GL led the evaluation under the direction of Oak Ridge National Laboratory. The evaluation team studied 81 different programmatic activities part of this evaluation, each one consisting of a separate program evaluation with its own survey, data collection, and analysis. The evaluation calculated the impact of four major outcomes: energy impacts (energy savings and renewable generation), labor impacts (jobs created), carbon impacts (avoided carbon emissions and avoided social costs of carbon), and cost-effectiveness.

As part of the labor analysis for this evaluation, the team needed to estimate incremental cost, which is the cost of installing an efficient piece of equipment compared to the cost of installing the baseline piece of equipment the customer would have otherwise installed [1]. Incremental cost is calculated as the cost of an efficient device minus the cost of the baseline device. When you have the cost of the efficient and standard equipment, calculating the incremental cost is simple. However, when these costs are not immediately available, the calculation becomes more difficult.

Estimating incremental costs of energy efficiency and renewable energy programs is a challenge for many reasons. Primary data collection of the costs paid by the participants for the efficient technology and what they would have paid for the standard equipment is costly. Incremental costs vary by measure type, baseline technology, and geographic locations within programs and markets, where costs are often based on program specifications [2]. While secondary sources do exist, they have limited transferability across jurisdictions due to variability in equipment and labor costs. These challenges become magnified when estimating incremental costs for a national evaluation, such as SEP. To solve this problem, the SEP evaluators researched alternate methods and developed a tool to estimate incremental costs.

The purpose of this tool was to estimate incremental labor and equipment costs for program evaluations when this information was unavailable from original documentation or surveys. There are few trusted methods available to estimate incremental costs of programs using a top-down approach. DOE uses engineering cost estimates of a typical upgrade to model cost-effectiveness of energy codes and standards [3]. However, given the scale of the analysis, developing a measure-level solution was not feasible. To overcome this lack of cost data, the evaluators based the model to estimate the incremental project costs using available data, which included program incentives, estimated bill savings, and assumed payback periods for each technology group. This approach to calculating incremental costs relied on maximizing use of collected program data and using assumptions on typical participant simple payback. DOE defines a simple payback as the number of years required for energy cost savings to exceed the initial incremental costs [3]. One key assumption is related to the expected payback period of the program or technology, which is grounded in industry research and evaluation experience. The overarching theory behind the incremental cost calculator can be summarized by the following formula:

$$\textit{Total Incremental Cost} = \textit{Total Incentives} + \textit{Total Savings during payback period}$$

Given an assumed typical payback period, the calculator solves for incremental costs using participant out-of-pocket expenses after rebates. In short, the incremental cost calculations combined incentives and payback from a measure to provide an estimate of the incremental difference between what the participant would have done in the absence of the program (baseline), and the amount of money needed to encourage the participant to implement the measure installed. The evaluators realize that certain energy efficient measures can have lower costs in relation to the baseline technology. However, in the context of evaluating incentive/rebate programs, overall incremental costs are assumed to be positive at the aggregated program level.

The calculator uses standard payback years for each program subcategory included in the evaluation. This means on a measure-by-measure basis, the calculator may systematically over- or under-represent the incremental cost. For the subcategory on the whole, however, the incremental cost will even out. As payback periods can vary substantially by type of renewable technology, for the renewable projects subcategory, the team used payback periods specific to the type of technologies found in each program under review rather than using one assumption for all renewable projects.

This incremental cost calculator was used when there was not sufficient data to calculate actual incremental cost; when information was available and documented for a specific programmatic activity, those data were incorporated into the incremental equipment and labor calculations. While having the primary data is always preferable, this incremental cost calculator provides a useful tool for large-scale projects that involve many types of measures, geographic locations, and sectors.

Sources:

[1] National Action Plan for Energy Efficiency (2008). *Understanding Cost-Effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods, and Emerging Issues for Policy-Makers*. Energy and Environmental Economics, Inc. and Regulatory Assistance Project. Accessed June 11, 2015. http://www.epa.gov/cleanenergy/documents/suca/cost-effectiveness.pdf

[2] Energy Information Administration (2013). *Incremental costs of higher efficiency can vary by appliance*. U.S. Department of Energy. Accessed June 11, 2015. http://www.eia.gov/todayinenergy/detail.cfm?id=11431

[3] Building Energy Codes Program (). *Commercial Energy and Cost Analysis Methodology*. U.S. Department of Energy. Accessed June 11, 2015. https://www.energycodes.gov/commercial-energy-and-cost-analysis-methodology