THE CADMUS GROUP, INC.

Date: April 19, 2010

To: Rob Ozar, MPSC

From: M. Sami, Khawaja, and Steve Cofer, Cadmus

Re: Typical steps to conduct impact evaluation for DSM programs

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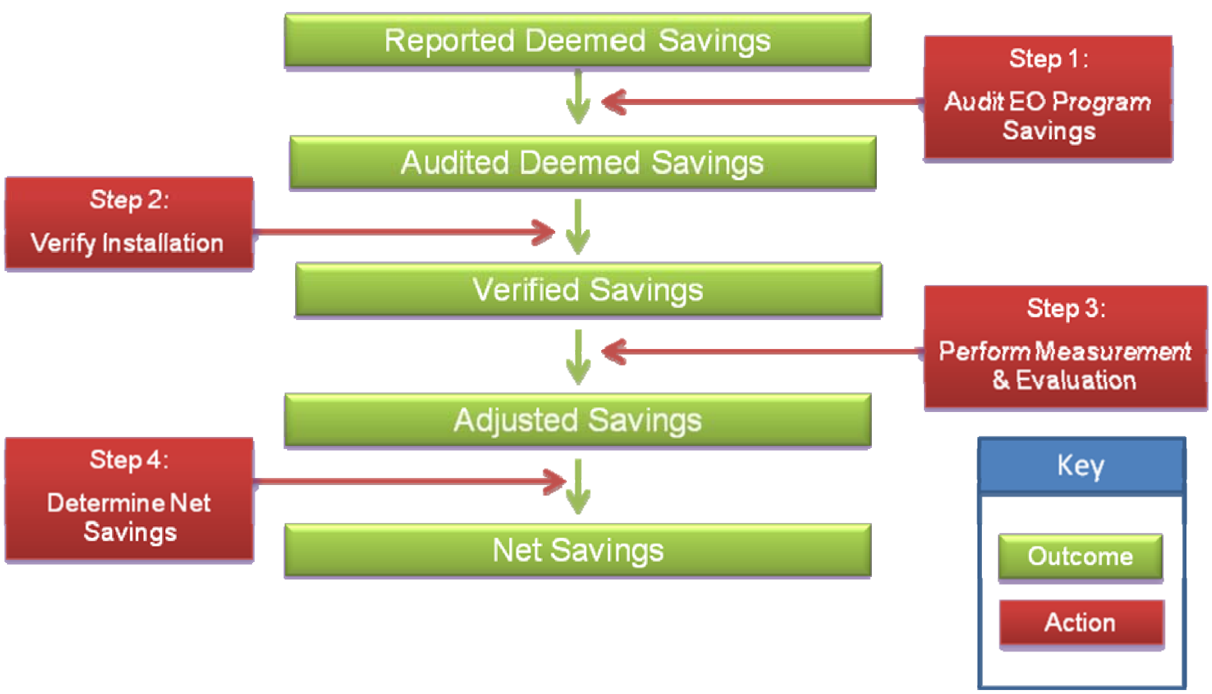
This memorandum explains the typical steps taken in conducting impact evaluations of demand-side management (DSM) programs.

Figure 1. DSM Impact Evaluation Steps



Step 1: Audit Energy Optimization Program Savings

Validation of each Energy Optimization (EO) provider's program energy savings is performed by a third-party evaluator. The methodology involves the following steps:

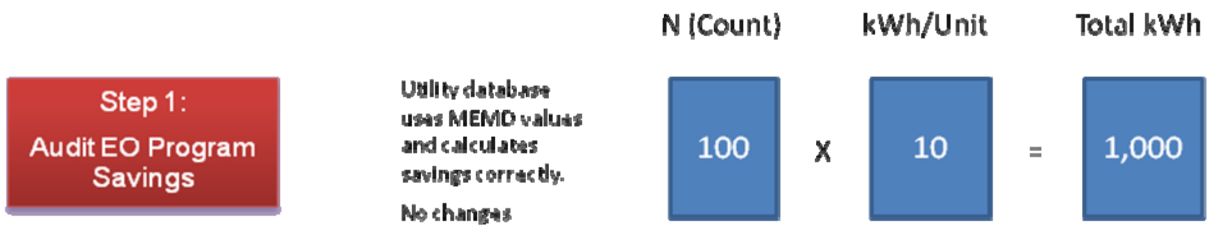
1. Compare utility program to implementation contractors (IC) tracking data
2. Check utility savings calculations for use of the correct MEMD algorithm and inputs
3. Sample from utility database population and request application data from the IC

4. Review hardcopy program applications from the sample to verify consistency with data recorded in program tracking databases
5. Adjust program tracking data as necessary to correct any errors, omissions identified in above
6. Recalculate utility total program savings based on the adjusted program tracking data

Where custom measures are installed and not part of the MEMD, engineering assumptions may be reviewed for a statistically representative sample of projects.

Figure 2 provides a simplified example of Step 1. The database review indicates: (1) measure counts are accurate; (2) correct MEMD saving values are used; and (3) total savings are properly calculated.

Figure 2. Audit EO Saving Example



This step results in **Audited Deemed** savings. Step 1, performed annually, will be part of the 2009's—and subsequent—evaluation activities.

Step 2: Verify Installation

Step 2 confirms measures have been installed and are operating. This step uses a random sample of installations selected for detailed analysis. Typical methods for collecting necessary data include the following:

1) Telephone Surveys
2) Site Visits

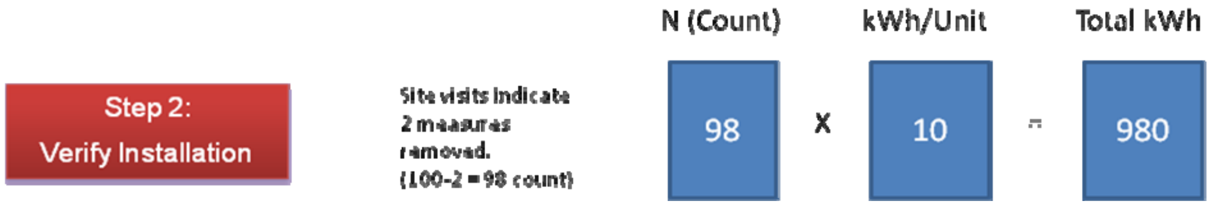
This step may be adjusted to address issues such as:

- Measures rebated but never installed;
- Measures installed outside the utility's territory;
- Measures installed but later removed; or
- Measures improperly installed.

Findings from this step produce **Verified Savings (**see Figure 3**).** ***Note adjustments shown here impact the number of measures reported but do not adjust the deemed MEMD saving value.***

Typically, Step 2 is performed annually. However, depending on the program schedule and budgetary constraints, verification may not occur this frequently.

Figure 3. Verify Installation Example



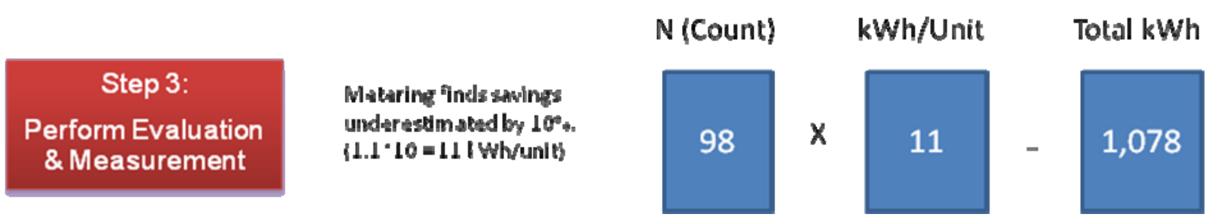
Step 3: Perform Measurement and Evaluation

At this stage, either engineering, statistical methods (e.g., billing analysis), or both are used to determine **Adjusted Savings (**see Figure 4**)**. Adjustments may include: changes to the baseline assumption; adjustments for weather; adjustments to occupancy levels; adjustments to decreased or increased production levels; and so on. This step often occurs every other year. For Michigan, this means any saving adjustments made through this step will also be made to the MEMD for the next program year cycle.

In all cases, the evaluator may use secondary or primary data to perform this step. Secondary data refer to using results from another, similar program, then making minor adjustments for local conditions and installation rates. An example might be using compact fluorescent lamps (CFL) installation rates from a neighboring utility to adjust the number of bulbs actually installed and saving energy. A significant body of knowledge, derived from evaluation of DSM programs over the last three decades, is readily accessible. Secondary data should always be explored as a cost-effective method for adjusting gross savings.

Primary data involves collecting information the evaluation requires through surveying program participants, conducting site visits, or metering existing and installed equipment.

Figure 4. Measurement and Evaluation Example



Typically, this step includes the following methods.

Engineering Models

Engineering models include a family of approaches, ranging from simple engineering calculations to complex building simulations. These methods may use simple algorithms, such as the following CFL energy-savings equation:

$$Savings(kWh) = \frac{\Delta Watt * HoursofUse * 365}{1{,}000}$$

They may, however, utilize complex simulation tools, such as DOE2. Simple engineering calculations are best suited for where energy savings can be computed through predictable inputs, such as changes in wattage and usage hours for lighting measures.

Statistical Models

Statistical models attempt to estimate demand and energy savings by analyzing variances in data (such as through monthly bills or end-use metered data). Through analyses of variances, statistical models attribute observed changes to various explanatory variables, such as weather, occupancy, or participation in DSM programs.

Step 4: Determine Net Savings

"Net savings" refers to savings directly attributable to a program. Net savings are determined by adjusting actual gross savings estimates to account for a variety of circumstances, including freeriders and spillover.

Freeriders

"Freeriders" are program participants who would have installed measures independently of the program. As they are likely to make desired changes without inducement, the argument suggests the program is irrelevant to new behavior, and their actions cannot be attributed to the program being evaluated. Different freeridership levels (such as deferred and partial freeriders) introduce further complexity into this key factor differentiating gross savings from net savings.

Freeriders can be accounted for using a number of methods. Most evaluations use self-reports through surveys. However, upstream programs (like Consumers Energy's and DTE's CFL programs) pose particular challenges in this regard and require an altogether different approach to understanding freeriders.

Freerider ratios are both a measure of program implementation efficiency and a measure of cost-effectiveness from a utility's perspective. They are less relevant from societal or TRC perspectives.

Spillover

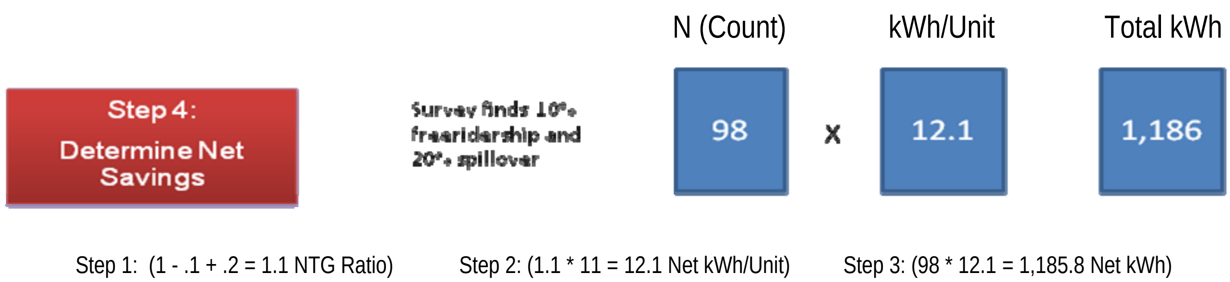
"Spillover" refers to actions taken outside the program but directly attributable to the program participation. Several types of spillover have been defined; the most common include:

- Participant spillover—attributable actions taken by a program participant, typically at the same site (may be taken by the participant at another site within the utility's territory); and
- Nonparticipant spillover, which refers to actions taken by nonparticipants due to the program and which may result from increased availability of efficient products, training of participating trade allies, and so on.

Spillover from energy-efficiency programs serves as an additional impact to be added to a program's valid results.

Freeridership and spillover, combined into a net-to-gross (NTG) ratio, are applied to the *Adjusted Savings* value to produce estimates of **Net Savings (**see Figure 5**).**

Figure 5. Determining Net Savings Example



In the above example, evaluation determined 10% of customers would have purchased the measure without program assistance (freeridership), and that the program had a 20% positive impact on customers regarding the purchase more of a particular measure (spillover). The following equation is used to calculate the program's NTG ratio:

Net-to-Gross Ratio = (1- freerider + spillover)

Determining the NTG ratio is not required every year, but, at a minimum, it should be evaluated every three years.

Summary

Table 1 summarizes the four impact evaluation steps and recommended frequency.

Table 1. Steps and Suggested Frequency

Steps in Impact Evaluation	Recommended Frequency
Audit EO reported savings	Annually
Verify installation	Annually (though not always)
Perform measurement and evaluation	Every couple years
Determine net savings	Every three years