

MEMORANDUM

TO: Karen Kansfield and Jonathon Jackson, Ameren Illinois Company (AIC)
FROM: Opinion Dynamics Evaluation Team
DATE: March 11, 2013
RE: Effective Useful Life for Behavioral Programs

The evaluation team provides the following memo in response to an AIC request for guidance on how to treat savings from behavioral programs if those savings extend beyond one year. The currently accepted practice for behavioral programs is to claim the savings found for one year – the year of program implementation. However, there is also discussion within the industry about whether this is the most appropriate value given that behavioral programs are known to encourage equipment installations, which provide energy efficiency savings longer than one year. As a result, in this memo, we discuss considerations for estimating (and potentially claiming) how long energy savings persist for behavioral programs.

It is important to note at the outset the complexities in answering this question and the lack of empirical evidence to serve as the foundation of a proposed approach to claiming savings over multiple years (e.g., “deeming” a percentage of behavioral program savings as installed measures). As a result, the majority of this memo provides background information on the potential estimation of an effective useful life for behavioral programs, as well as the data that is available to date. Further, our recommendations focus on how an effective useful life (EUL) for behavioral programs might be developed over time as opposed how savings can currently be treated over multiple years. Given the state of industry knowledge, we did not feel we could provide a specific value or mechanism to handle these savings at the present time, and generally recommend that AIC continue using a one year EUL with analysis each year.

Background

First, we provide background on EULs and behavioral programs to give context to our recommendations

Effective Useful Life

An EUL is an estimate of the median number of years that a measure installed under a program is still in place and operable. Another way to say this is that at least half of any measures installed in year one of a program are still in place (and working) when the EUL is reached. The value is used within a benefit cost analysis to calculate the number of years for which benefits extend. The full first year savings are seen as benefits until the year of the EUL, at which point all savings move to zero.

This definition has been used within the industry for decades. The definition is clear and makes sense for tangible equipment, but is less clear when considering actions taken by participants due

to behavioral programs specifically when those actions are not equipment purchases or may constitute multiple equipment installations.

Analysis of Behavioral Programs

The relatively recent advent of behavioral programs that use social norms or other information to attempt to influence both non-purchase behaviors, as well as purchase behaviors have used experimental designs to assess annual savings. Analysis uses billing data from large cohorts of participants and nonparticipants to estimate net energy impacts due to the program. Additionally, there is a “database cross-check” that methodically goes through program tracking databases to remove any possible double-counting of program estimated savings. However, aside from the database cross-check, the analysis cannot tease out what is actually occurring in the home that brings about these savings. Based on telephone surveys to participants and nonparticipants that have occurred within evaluations of behavioral programs, evaluators agree that savings arise from a mixture of changes in non-purchase type behaviors leading to a reduction in energy use, as well as purchases of energy efficient equipment.

Estimating an Effective Useful Life for Behavioral Programs

Determining an EUL for behavioral programs is currently confounded by two issues:

- (1) Uncertainty as to what occurs with non-purchase energy efficiency actions without continued program intervention
- (2) The practical application of an EUL given how these programs are implemented

Uncertainty on the Source of Energy Savings

To date, evaluators have chosen to verify the energy savings for behavioral programs through billing analyses for each program year. This is done because the specific behavioral effects (and thus savings) of behavioral programs are known to vary.¹ A number of factors contribute to this variation. First, there is no definitive and reliable method way to determine the specific actions taken as a result of the program. For this reason, it is unclear what specific actions are driving energy savings, and as a result, how long these savings might persist. Second, the study of people and how they behave is not an exact science. Behavior is known to persist without continued prompting from outside sources once that behavior has been internalized. However, we also know that behaviors are not habituated indefinitely and can decay (or relapse) over time. In the case of behavioral programs, this means that non-purchase actions that help improve the energy efficiency within a home may either persist or not. Third, if these non-purchase behaviors do persist, we have no empirical evidence about the length of time they persist.

Coupled with our uncertainty about whether the savings seen within this type of analysis is based on non-purchase behavior or equipment purchases, it is currently difficult to determine the most likely EUL for behavioral programs.

Practical Application of an EUL in Claimed Savings

Standard resource measures have a clear date where the intervention began and the intervention ended: install date. By contrast, behavioral programs treat customers over periods of time, usually multiple program years, in which customers can take a wide range of actions (discussed throughout this memo). This complicates the how a program team might claim savings that extend

¹ Additionally, this type of analysis follows the experimental design of the implementation of the program to provide net impacts.

beyond one year. Consider the two examples below for claiming an EUL of more than one year (3 years is used to serve as an example):

- (1) If we are to claim an EUL analogous to standard programs, savings from one year of treatment would be claimed across three years. Under this scenario, program teams would have no incentive to continue treatment after one year. While this might make sense from a resource planning standpoint, it may cause complications with respect to customer engagement and program rollout.
- (2) If an EUL was claimed for each year of *continued* treatment, savings would be effectively double counted year-over-year. The table below demonstrates how the savings could be double counted for a single cohort. Those areas shaded in red represent double counted savings for customers who are present the first year, as well as in subsequent years.

Table 1. Example of Potential for Double Counting of Savings

		Years Savings are Claimed				
		PY1	PY2	PY3	PY4	PY5
Actual Treatment Year	PY1					
	PY2					
	PY2					

Next we present information from recent analyses of different behavioral programs to help add content to this discussion.

The State of Current Evidence from Analyses

First, we begin by discussing two different forms of energy savings persistence. The savings persistence of behavioral energy programs has been thought of as: (1) persistence of savings with treatment, and (2) persistence without treatment.

Persistence with Treatment: Our review of behavior-based programs demonstrates that savings continue to persist with treatment year-over-year when the program continues to provide information to participants. In other words, people either have internalized the message and continue to perform actions, or at the least, do not become inured to the program messages. Below, we provide a summary table of the savings observed in multiple evaluation efforts of the Opower report-based program for both electric and gas savings.

Table 2. Summary of Select Opower HER Program Savings Estimates Over Time

Persistence with Treatment	SMUD ^a		National Grid ^b			Puget Sound Energy ^{c,d}	
	Wave 1	Wave 2	2009 Electric	2010 Electric	2009 Gas	Electric	Gas
Cohort							
Year 1	1.80%	1.60%	1.61%	1.25%	0.81%	1.71%	1.17%
Year 2	2.40%	NA	2.06%	1.63%	1.25%	2.00%	1.46%
Year 3	2.40%	NA	NA	NA	NA	-	-
Year 4	2.10%	NA	NA	NA	NA	2.60%	1.30%

^aWu, May. *Impact & Persistence Evaluation Report Sacramento Municipal Utility District Home Energy Report Program*. November 2012.

^bOpinion Dynamics, Navigant Consulting. *Massachusetts Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report*. July 2012

^cKEMA. *Puget Sound Energy's Home Energy Reports Program 20 Month Impact Evaluation*. Madison, Wisconsin, October 26, 2010.

^dDNV KEMA Energy & Sustainability. *Puget Sound Energy's Home Energy Reports Program Three Year Impact, Behavioral and Process Evaluation*. Madison, Wisconsin, April 20, 2012.

Persistence without Treatment: To date, there have been few publically available studies that have examined the persistence of savings from behavioral programs once the treatment (i.e., the messages from the program) has been stopped. A recent SMUD study² has demonstrated the savings changes over time once reports were halted. The report states:

"In July, 2010, reports were halted to a portion of the remaining pilot group in order to test the persistence of energy savings that may endure after recipients stop receiving reports. Before reports were halted, this sub group yielded 22 kWh saving per month, equivalent to 2.3% savings. After reports were halted, savings gradually dropped over the course of 12 months, yielding average monthly savings over the succeeding 12 months of 15 kWh, equivalent to 1.6%. The savings appears to be slowly degrading over time.(p. 34)"

Similar to other study findings, including our own, SMUD did find self-reported measure-based actions among this group of participants. However, it is unclear what proportion of the savings measured above is due to these actions. As a result, SMUD cannot definitively estimate the persistence of these savings without continuing to measure this subgroup over time. To summarize, the current analyses within the industry indicates that savings persist for longer than a year, but these analyses do not help answer how long they last.

Needed Industry Research on EUL

In order to estimate an evidence-based EUL for behavioral programs, the persistence of savings without treatment (described above) must be more thoroughly examined to estimate the persistence of behavior changes and the persistence of measure-based savings over time. We believe that AIC will have dropped some cohorts between the origination of the HER program and when our PY6 research occurs. If this happens, we have already planned to assess persistence of savings after participants no longer receive treatment. Additionally, we plan to survey both participants and non-participants in PY6 to obtain information about specific equipment installation actions taken. Aside from our current primary research for AIC, our team will continue to monitor other evaluation activity throughout the nation and pull in relevant research over time.

There are two primary ways to determine the EUL of these programs:

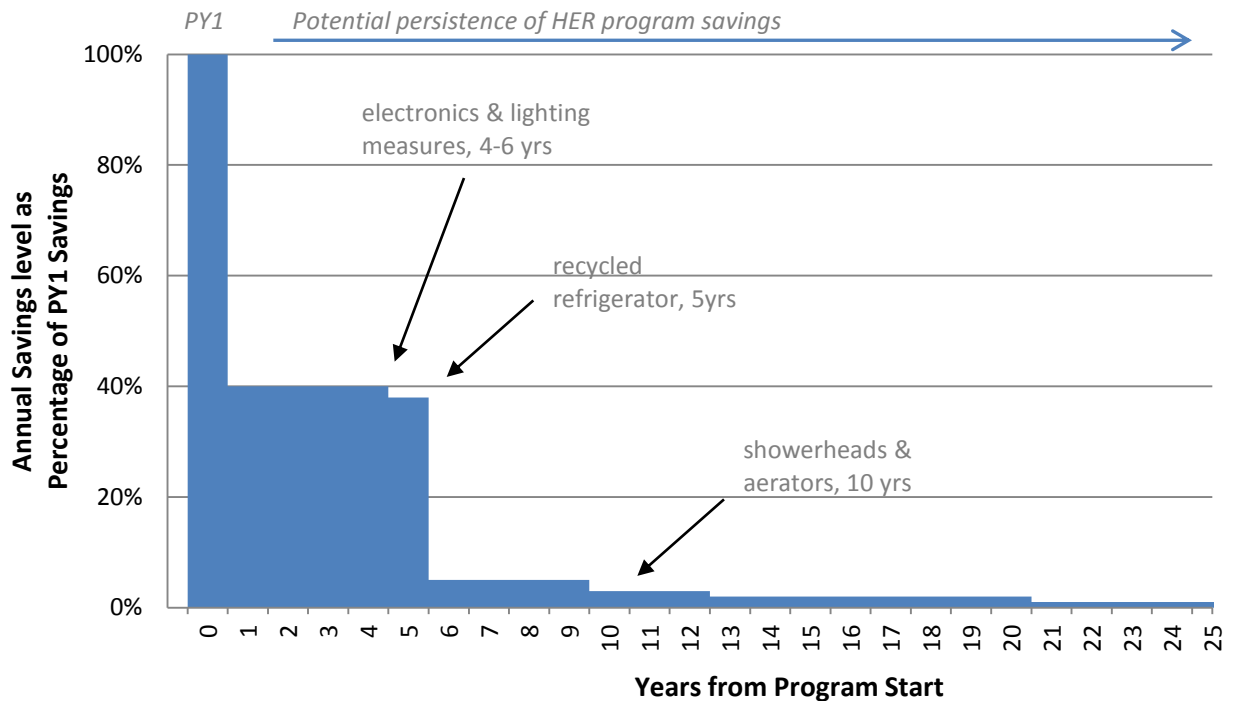
(1) **Conduct a longitudinal persistence test**, which removes treatment of reports and observes how savings change over time. This study is currently planned for PY6 and is similar to the study that produced the SMUD results outlined in Table 2. Obviously, this research by itself does not help disaggregate purchase versus non-purchase savings, but is necessary for combining with information on measures (next point).

(2) **Conduct annual survey research** to determine measure installations due to the program. This is best augmented with onsite verification to confirm customers' installation of reported measures, although the onsite component is expensive. This research allows an

² Wu, May. *Impact & Persistence Evaluation Report Sacramento Municipal Utility District Home Energy Report Program*. November 2012

estimate of the potential EUL of the observed savings using EUL estimates from the reported measures. The figure below reports how this might look.

Figure 1. Example of Potential Behavioral Savings over Time due to the EUL of Measures



However, as shown above, savings from measures most likely have a sharp drop from the first year of savings. This is due to a large number of savings perhaps coming from non-purchase behaviors and a relatively low number of purchase behaviors (compared to the overall number in treatment cohorts). To appropriately apply an EUL with a profile similar to what is shown in Figure 1, the kWh across all years would need to be calculated and then the median point of total kWh savings determined.

Below we provide additional information about methods for determining an EUL.

Longitudinal Persistence Test

Analyzing cohorts after removal of treatment provides empirical evidence that an EUL should (or should not) be longer than a year. At a minimum, these studies will require at least 3 years of annual observation to examine whether or not a proposed EUL extension is appropriate. As stated previously, this type of analysis cannot tell you the measure-mix driving the persistence of savings (and therefore how long any EUL should last). A survey of participants and nonparticipants can give you an indication of the measure-mix, but will not fully represent the changes observed over time and may overstate the measure life of the program as there are many complicating factors associated with using survey-based research to estimate a “typical” EUL of measure-based installations.

Conduct Annual Survey Research

We have observed through our own survey research that the reported measures installed can vary across treatment groups, regions, and fuel types which will have important effects on estimating an EUL. For this reason, a survey may be able to estimate the measures installed and determine an EUL for a *specific cohort*, but not necessarily all cohorts. This is likely due to:

- Differences in measure uptake in different markets and regions
- Differences in measure uptake and responsiveness from treatment cohort to treatment cohort

For these reasons, we recommend conducting cohort-specific survey research to estimate an EUL until discernible and definitive trends are identified in such a way that the researchers feel confident that there is a “typical” profile of actions taken as a result of the program.

Conclusions and Recommendations for Current EUL Application

Given all these issues, our recommendation for what EUL to use and how to apply it are as follows:

- To date, we do not feel that there is sufficient evidence to support a specific EUL estimate.
 - Notably, our own studies, including those cited by C3, do not provide conclusive evidence of standard, predictable actions taken as result of the programs.
 - Further, it is important to note that any EUL estimate provided cannot be applied to all behavioral programs irrespective of their implementation approaches. Empirical research has demonstrated that savings magnitude and persistence with treatment varies based on target population and program model (opt-in vs. opt-out).
- Further, applying an EUL year-over-year for continually treated cohorts could result in double counting of program savings (see Figure 1 above).
- However, we recognize that there are measure-based savings associate with these programs and there may be political will to identify a value. In this case, we recommend:
 - Gaining consensus with the stakeholder advisory group to agree on an EUL that can be used for these programs that does not compromise or over-state the savings associated with these programs. Aforementioned issues of double counting are of central importance.
 - Clarify *how* these savings can be claimed over time.
 - Maintaining implementer-specific EUL estimates or using the EUL estimate gained from the program with the lowest persistence values.
 - C3 had provided a memo that recommended 3.2 years as an appropriate EUL, which may be a starting point (although we do not necessarily support this value).

Behavioral programs have been in place throughout the nation for less than five years. Questions around an EUL are just starting to be investigated through empirical research. We expect the primary research will occur in our industry over the next five years or so that will enable an evidence-based EUL value. Until this time, we recommend conducting on-going Illinois-specific research on persistence to verify an appropriate EUL adjustment through measuring savings as a result of halting program treatment.