### Adjustments to Behavior Savings to Account for Persistence

###### Description

Energy efficiency program administrators are increasingly including behavior programs as part of their portfolios. These programs are characterized by various kinds of outreach, education, and customer engagement designed to motivate increases in conservation and energy management behaviors, and most commonly include participant-specific energy usage information. Savings impacts are evaluated by ex-post billing analysis comparing consumption before and after (or with and without) program intervention, and require M&V methods that include customer-specific energy usage regression analysis and random controlled trial experimental designs, among others. As such, calculation of savings is treated as a custom protocol.

An important issue for many stakeholders is whether energy savings from behavior programs continue over time (i.e., whether they persist beyond the initial program year). Behavior programs have now been delivered for a number of years in many jurisdictions[[1]](#footnote-1). The weight of evaluation evidence indicates that the energy-saving behaviors influenced through these programs can persist beyond the initial period of program intervention, even without continued program participation. This post-treatment savings persistence has implications for calculations of first year savings, measure life, and cost-effectiveness testing. Accounting for persistence will yield savings and cost-effectiveness estimates that more accurately reflect the true benefits of these programs. Because annual goals are based on first-year savings, programs should only count savings attributable to first-year spending. The effect of persistence of savings beyond the first year should be included in lifetime savings calculations and cost-effectiveness testing.

The protocol below was developed to outline the adjustments that should be made to account for the persistence of savings beyond the year of program delivery. This protocol is applicable to behavior programs of any type, delivered to residential or C&I customers, that has evaluated evidence of program persistence.

This protocol will become effective as of June 1, 2017 - it is provided here for program planning purposes.

###### Definition of Efficient Equipment

###### Behavior programs focus primarily on reducing electricity consumption through behavioral changes; this reduction is measured through ex-post billing analysis after program intervention. Specific energy conservation and management behaviors are not usually directly observable.

###### Definition of Baseline Equipment

The ideal baseline for behavior programs is the energy usage without the program intervention. Various types of experimental, quasi-experimental, and regression-based EM&V approaches are used to present statistically valid approximations to this without-program baseline.

###### Deemed Lifetime/Persistence of Savings

Evaluations in Illinois have shown that savings from behavior programs can persist into the year following program delivery[[2]](#footnote-2), though savings levels decay in the second year. For the behavior programs evaluated to date (residential RCT programs), savings have been shown to persist in the year following program delivery. Measure life for these program is thus set at 2 years; a mid-life adjustment is required in the second year to appropriately record the reduction in savings seen in evaluations.

###### Deemed Measure Cost

It is assumed that most behavior changes in residential settings can be accomplished with homeowner labor only and without investment in new equipment; measure costs in such programs may be defined as $0. Costs for C&I programs may include additional staffing, software purchases, etc. Cost is therefore program specific and is determined on a custom basis.

###### Loadshape

###### Electric savings for residential programs are assumed to be dominated by indoor lighting savings – Loadshape R06 – Residential Indoor Lighting is applied to those programs.

###### Coincidence Factor

Consistent with the coincidence factor for TOS residential CFL measures in unknown location, coincidence factor is 8.1%[[3]](#footnote-3).

Algorithm

###### Calculation of Savings

###### Electric Energy Savings

The algorithm shown below for this measure was developed to calculate the annual electric savings in year T after adjustment to account for the proportion of the measured savings for that program year that reflects persistent savings from the prior year’s (T-1) program activities.

ΔkWhT = (ΔkWhAvg, T \* #PartT) – [ΔkWhAvg, T-1 \* (#PartT-1 \* RRT) \* PF]

Where:

ΔkWhAvg, X = Average per-participant savings; measured from custom calculation/billing analysis of participants in program during year X (input value)

#PartX = Number of program participants in year X (input value)

RRX = Program retention rate in year X (input value)

= % of program participants in year X-1 that are still in program in year X

PF = Persistence factor (deemed value)

= % savings from year X that continue into year X+1

= use table below to select the appropriate value

|  |  |
| --- | --- |
| **Behavior Program Type[[4]](#footnote-4)** | **Persistence Factor (PF)** |
| **Electric** |
| Residential RTC (Opower) | 89%[[5]](#footnote-5) |

For example, a Home Energy Reports program with 60,000 participants in year T-1 and 55,000 returning and 8,000 new participants in year T records savings of 3,500 MWh in year T-1 and 4,000 MWh in year T:

ΔkWhT = (63.49 \* 63,000) – [58.33 \* (60,000 \* 0.917) \* 0.89]

= 4,000,000 – [3,208,333 \* 0.89]

= 4,000,000 – 2,859,417

= 1,144,583 kWh

Second and third year install savings should be calculated using the appropriate ISR and the delta watts and hours from the install year.

###### Summer Coincident Peak Demand Savings

Coincident peak demand savings in year T should also be adjusted to account for persistence from year T-1 using a similar algorithm.

ΔKWT = {(ΔkWAvg, T \* #PartT) – [ΔkWAvg, T-1 \* (#PartT-1 \* RRT) \* PF]} \* CF

Where:

ΔkWAvg, X = Average per-participant peak savings; measured from custom calculation/billing analysis of participants in program during year X (input value)

CF = Summer Peak Coincidence Factor for measure

= 0.081[[6]](#footnote-6)

Other variables as defined above

###### Natural Gas Energy Savings

The algorithm shown below for this measure was developed to calculate the annual Therm savings in year T after adjustment to account for the proportion of the measured savings for that program year that reflects persistent savings from the prior year’s program activities.

ΔThermsT = (ΔThermsAvg, T \* #PartT) – [ΔThermsAvg, T-1 \* (#PartT-1 \* RRT) \* PF]

Where:

ΔThermsAvg, X = Average per-participant savings; measured from custom calculation/billing analysis of participants in program during year X (input value)

PF = Persistence factor (deemed value)

= % savings from year X that continue into year X+1

|  |  |
| --- | --- |
| **Behavior Program Type[[7]](#footnote-7)** | **Persistence Factor (PF)** |
| **Natural Gas** |
| Residential RTC (Opower) | 91%[[8]](#footnote-8) |

Other variables as defined above

***Mid-life Adjustments***

For calculation of lifetime savings and cost-effectiveness, the following savings should be recorded for this measure for the year following program delivery:

ΔkWhT+1 = ΔkWhT \* PF

ΔkWT+1 = ΔkWT \* PF

ΔThermsT+1 = ΔThermsT \* PF

###### Water Impact Descriptions and Calculation

N/A

###### Deemed O&M Cost Adjustment Calculation

N/A

###### Measure Code: CU-BEH-XXXX-V01-170601

1. Long-Run Savings and Cost-Effectiveness of Home Energy Reports Programs, Cadmus, October 2014. [↑](#footnote-ref-1)
2. ComEd Home Energy Reports Program PY6 Evaluation Report, Navigant, January 2015; Nicor Behavioral Energy Savings Programs: Home Energy Reports Persistence Study Part 1, Navigant, July 2015. [↑](#footnote-ref-2)
3. Consistent with values applied to “unknown” residential CFL lamp measures; based on lighting logger study conducted as part of the PY5/6 ComEd Residential Lighting Program evaluation. [↑](#footnote-ref-3)
4. Different program designs will result in different savings persistence – program-specific persistence values should be determined. [↑](#footnote-ref-4)
5. ComEd Home Energy Reports Program PY6 Evaluation Report, Navigant, January 2015, showing average savings from customers in the year following direct treatment with behavior change program interventions. The 89% PF represents a weighted average of three treatment waves. [↑](#footnote-ref-5)
6. Consistent with values applied to “unknown” residential CFL lamp measures; based on lighting logger study conducted as part of the PY5/6 ComEd Residential Lighting Program evaluation. [↑](#footnote-ref-6)
7. Different program designs will result in different savings persistence – program-specific persistence values should be determined. [↑](#footnote-ref-7)
8. Nicor Behavioral Energy Savings Programs: Home Energy Reports Persistence Study Part 1, Navigant, July 2015, showing average savings from customers in the year following direct treatment with behavior change program interventions. [↑](#footnote-ref-8)