NAVIGANT

Energy Efficiency / Demand Response Plan: Plan Year 4 (6/1/2011-5/31/2012)

Evaluation Report:

Third Party Efficiency Program – RLD Resources LLC Commercial and Retail Internet Protocol Thermostat and Controller Program

FINAL

Presented to
Commonwealth Edison Company

1/30/2013

Prepared by:
Randy Gunn
Managing Director
Navigant Consulting
30 S. Wacker Drive, Suite 3100
Chicago, IL 60606

Phone 312.583.5700
Fax 312.583.5701

www.navigant.com

Itron

Opinion Dynamics

MichaelsEnergy

NAVIGANT

Submitted to:

ComEd
Three Lincoln Centre
Oakbrook Terrace, IL 60181

Submitted by:

Navigant Consulting, Inc.
30 S. Wacker Drive, Suite 3100
Chicago, IL 60606
Phone 312.583.5700
Fax 312.583.5701

Contact:

Randy Gunn, Managing Director
312.938.4242
randy.gunn@navigant.com

Jeff Erickson, Director
608.497.2322
jeff.erickson@navigant.com

Prepared by:

Patricia Plympton, Associate Director
202.253.9356
pplympton@navigant.com

NAVIGANT

Table of Contents

List of Figures and Tables

Tables:

NAVIGANT

E. Executive Summary

This section summarizes the evaluation objectives, methods and key impact and process findings and recommendations.

E.1 Evaluation Objectives

The objective of the evaluation is to review and verify savings estimates for Electric Program Year Four (EPY4) for the Third Party Efficiency Program Commercial and Retail Internet Protocol Thermostat and Controller Program (C&R IP Thermostat Program) that RLD Resources, LLC (RLD) is implementing to reduce electric air conditioning usage in small and medium sized commercial and retail facilities. Seven installations occurred in the last month of EPY4 (May 2012) following RLD's recruiting and training contractors for the program. For EPY4, Navigant focused on reviewing the savings from these first seven installations since the program was in a nascent phase of development. Accurately calculating demand savings would require data loggers with pre- and post-installation data which was not appropriate given the amount of participation in the first program year. In EPY5, Navigant plans to conduct more extensive verification and due diligence and tracking system analysis as well as other targeted process and impact efforts. Navigant will calculate energy savings using a matched comparison customers with a regression bias adjustment approach, as detailed in October 10, 2012 memo to ComEd. In order to calculate energy savings per the approach outlined in the October 10, 2012 memo to ComEd, Navigant will collect data for both participating facilities and non-participating facilities (with similar data usage patterns to the participating facilities) following the end of the program year."

E.2 Evaluation Methods

The impact analysis was an engineering review of the savings calculations provided by the implementation contractor of the gross kWh savings and savings calculation algorithms. Regarding net-to-gross ratio (NTG), since this is a new program which has not been evaluated before, the NTG is to be applied retroactively according to the NTG Framework[1].

> "For existing and new programs not yet evaluated, and previously evaluated programs undergoing significant changes — either in the program design or delivery, or changes in the market itself[2] — NTG ratios established through evaluations would be used retroactively, but could also then be used prospectively if the program does not undergo continued significant changes."

E.3 Key Impact Findings and Recommendations

Navigant reviewed the estimated savings and savings calculations for the seven installations in EPY4 and determined that industry standard protocols and approaches were used in the savings calculations. The seven installations completed in EPY4 produced 34,433 kWh of evaluation-verified gross savings.

---

[1] Memo from Philip Mosenthal, OEI and Susan Hedman, OAG, to Stakeholder Advisory Group, "Proposed Framework for Counting Net Savings in Illinois", January 13, 2010, revised March 12, 2010.

[2] An example of a market change might be where baselines have improved significantly and the likely free riders are growing substantially because of it.

Since there was too few participants to warrant a free ridership study the evaluation applied a net-to-gross rate of 1.0 to calculate net savings.

Table E-1. Savings Calculation Parameters

Parameter	Evaluation-Verified Value	Source Notes
Evaluation–Verified Gross Savings kWh/Participant	4,919	RLD Data extract and savings calculations, 10/3/2012
Participants	7	RLD Data extract and savings calculations, 10/3/2012
Evaluation–Verified Gross Total Savings kWh	34,433	RLD Data extract and savings calculations, 10/3/2012
Net-to-Gross Ratio	1	Default assumption lacking any evidence to the contrary
Evaluation–Verified Net Total Savings kWh	34,433	Calculation

E.4 Key Process Findings and Recommendations

Since the C&R IP Thermostat Program launched at the end of EPY4, Navigant focused on reviewing the calculated savings for the limited number of installations that occurred in May of EPY4. Since the program is operating and has additional participants and established protocols, Navigant will conduct a process evaluation for EPY5 including interviewing key staff, implementation contractor staff, and trade allies as well as conducting a participant survey.

NAVIGANT

1. Introduction to the Program

This section includes a description of the program and the questions Navigant used in our EPY4 evaluation.

1.1 Program Description

C&R IP Thermostat Program targets small to mid-size office buildings and retail stores (100 kW– 400 kW) as well as local Heating Ventilation and Air Conditioning (HVAC) contractors and Building Automation System (BAS) contractors. For the contractors, the C&R IP Thermostat Program provides marketing and technical training, devices (kits) and monitoring. RLD administers incentives to the contractors for installing IP thermostat kits. An incentive of $0.04/kWh saved up to $500 is offered for participation in the program.

The energy savings target for EPY4 was 1,250,000 kWh, 10,000,000 kWh for EPY5, and 13,750,000 kWh for EPY6.

The C&R IP Thermostat Program offers low-cost automation with monitoring and proactive control of HVAC systems. The benefits for the building owners (as well as property managers or tenants) include cost-savings in energy and more scientific (data-driven) HVAC maintenance. The program provides classroom and on-line training, outreach programs and technical support, including marketing support to help business partners reach new customers and build on existing relationships with clients through innovative, value-added services. The program also identifies inefficient buildings that can benefit most from the program.

1.2 Evaluation Questions

For EPY4, the evaluation sought to answer the following researchable questions:

1. What are the gross impacts from this program via a review verifying that savings were calculated according to industry standard methodology?

2. Did the program meet its energy savings goals? If not, why not?

2. Evaluation Methods

This section describes the evaluation methods used in the EPY4 evaluation for the C&R IP Thermostat Program including data collection and impact evaluation methods.

2.1 Primary Data Collection

Navigant reviewed an Excel spread sheet[3] containing the usage data for seven participating facilities, and cooling degree days for 2011, 2012 and a 30 year average. Navigant also reviewed the calculations in the spreadsheet using the normalized difference in usage from August 2011 verses August 2012 to calculate annual energy savings in participating facilities.

2.2 Impact Evaluation Methods

Energy savings were due to reduced electrical consumption for air conditioning following the installation and usage of an IP Thermostat. The air conditioning usage was calculated from the total usage minus the base load usage. Navigant reviewed the data extract and calculated savings sent by RLD on October 3, 2012, using the following assumptions[4]:

1. The minimum monthly energy use for the year was used for the base load.
2. Reduced air conditioning usage is calculated by total usage minus base load usage.
3. Annual cooling degree days (855) is a thirty-year average.
4. Calculating the savings for a weather normal year includes calculating the savings due to reduced air conditioning usage, dividing by cooling degree days and multiplying by the thirty-year average annual cooling degree days.
5. In other words, energy savings is calculated:
    a. ((August 2011 energy use - base load)/ Cooling Degree Days for 30 year Average for August) x Cooling Degree Days for August 2011) - ((August 2012 energy use - base load/ Cooling Degree Days for 30 year Average for August) x Cooling Degree Days for August 2012)= Saving per Cooling Degree Day
    b. Savings per Cooling Degree Day x Annual Cooling Degree Days for 30 year Average = Annual energy savings due to programmable thermostat
6. Annual cooling degree days (855) is a thirty-year average. Energy savings is calculated:

[3] Excel spreadsheet sent by Kelly Shelton, Shelton Solutions, "PY4 Savings to Navigant with Coppin.xls," October 3, 2012.
[4] Email from Kelly Shelton, Shelton Solutions, October 18, 2012.

a. ((August 2011 energy use - base load)/ Cooling Degree Days for 30 year Average for August) x Cooling Degree Days for August 2011) - ((August 2012 energy use - base load)/ Cooling Degree Days for 30 year Average for August) x Cooling Degree Days for August 2012)= Saving per Cooling Degree Day

7. Savings per Cooling Degree Day x Annual Cooling Degree Days for 30 year Average = Annual energy savings due to programmable thermostat[5]

[5] Excel spreadsheet sent by Kelly Shelton, Shelton Solutions, "PY4 Savings to Navigant with Coppin.xls," October 3, 2012.

3. Evaluation Results

This section describes the results from Navigant's EPY4, evaluation including gross impacts. In addition, this section provides the highlights of the EPY5 planned evaluation activities.

3.1 Impact Evaluation Results

3.1.1 Verification and Due Diligence Procedure Review

Since the program was in a nascent phase in EPY4, Navigant will conduct a verification and due diligence and procedure review in EPY5.

3.1.2 Tracking System Review

Since the program was in a nascent phase in EPY4, Navigant will conduct a tracking system review in EPY5.

3.1.3 Gross Program Impact Results

Navigant verified that the calculations were performed using industry standard protocols. Although not a strong indicator of persistent savings, the calculations were done one using one-month of available savings data which was all that was available at the time of the calculations.[6] The total of energy savings from the seven installations was estimated to be 34,433 kWh.

3.1.4 Net Program Impact Results

Since there was too few participants to warrant a free ridership study the evaluation applied a net-to-gross rate of 1.0 to calculate net savings. Navigant will conduct a participant survey including net-to-gross impacts in EPY5.

3.2 Process Evaluation Results

Since the program was launched in late EPY4, Navigant did not conduct process evaluation activities. In EPY5, Navigant will conduct interviews with key staff, implementation contractor staff, trade allies and other process evaluation activities

[6] Email from Kelly Shelton, Shelton Solutions, September 13, 2012.

4. Findings and Recommendations

This section describes the key findings and recommendations from our EPY4 evaluation activities.

4.1 Key Impact Findings and Recommendations

Finding. Navigant reviewed the estimated savings and savings calculations for the seven installations in EPY4 and determined that industry standard protocols and approaches were used in the savings calculations. Although the program had a goal of 1,250,000 kWh savings it began too late in the program year to reach that goal, starting in May 2012. The seven installations completed in EPY4 produced 34,433 kWh of evaluation-verified gross savings. Since there were too few participants to warrant a free ridership study the evaluation applied a net-to-gross rate of 1.0 to calculate net savings.

Recommendation. Navigant recommends an impact evaluation for EPY5 that will use a matched comparison group of customers with regression bias adjustment that occurs in two steps: (1) each program participant is matched to a set of non-program participants based on monthly consumption in the pre-program year and (2) savings are bias-adjusted using regression analysis.

4.2 Key Process Findings and Recommendations

Since the program was launched in late EPY4, Navigant did not conduct process evaluation activities. In EPY5, Navigant will conduct interviews with key staff, implementation contractor staff, trade allies (as applicable) as well as conduct surveys of participants, and explore best practices of similar programs.

5. Appendix

5.1 Glossary

High Level Concepts

Program Year

- EPY1, EPY2, etc. Electric Program Year where EPY1 is June 1, 2008 to May 31, 2009, EPY2 is June 1, 2009 to May 31, 2010, etc.
- GPY1, GPY2, etc. Gas Program Year where GPY1 is June 1, 2011 to May 31, 2012, GPY2 is June 1, 2012 to May 31, 2013.

There are two main tracks for reporting impact evaluation results, called Verified Savings and Impact Evaluation Research Findings.

Verified Savings composed of

- Verified Gross Energy Savings
- Verified Gross Demand Savings
- Verified Net Energy Savings
- Verified Net Demand Savings

These are savings using deemed savings parameters when available and after evaluation adjustments to those parameters that are subject to retrospective adjustment for the purposes of measuring savings that will be compared to the utility's goals. Parameters that are subject to retrospective adjustment will vary by program but typically will include the quantity of measures installed. In EPY4/GPY1 ComEd's deemed parameters were defined in its filing with the ICC. The Gas utilities agreed to use the parameters defined in the TRM, which came into official force for EPY5/GPY2.

Application: When a program has deemed parameters then the Verified Savings are to be placed in the body of the report. When it does not (e.g., Business Custom, Retrocommissioning), the evaluated impact results will be the Impact Evaluation Research Findings.

Impact Evaluation Research Findings composed of

- Research Findings Gross Energy Savings
- Research Findings Gross Demand Savings
- Research Findings Net Energy Savings
- Research Findings Net Demand Savings

These are savings reflecting evaluation adjustments to any of the savings parameters (when supported by research) regardless of whether the parameter is deemed for the verified savings analysis. Parameters that are adjusted will vary by program and depend on the specifics of the research that was performed during the evaluation effort.

Application: When a program has deemed parameters then the Impact Evaluation Research Findings are to be placed in an appendix. That Appendix (or group of appendices) should be labeled Impact Evaluation Research Findings and designated as "ER" for short. When a program does not have deemed parameters (e.g., Business Custom, Retrocommissioning), the Research Findings are to

be in the body of the report as the only impact findings. (However, impact findings may be summarized in the body of the report and more detailed findings put in an appendix to make the body of the report more concise.)

Program-Level Savings Estimates Terms

N	Term Category	Term to Be Used in Reports‡	Application†	Definition	Otherwise Known As (terms formerly used for this concept)§
1	Gross Savings	Ex-ante gross savings	Verification and Research	Savings as recorded by the program tracking system, unadjusted by realization rates, free ridership, or spillover.	Tracking system gross
2	Gross Savings	Verified gross savings	Verification	Gross program savings after applying adjustments based on evaluation findings for only those items subject to verification review for the Verification Savings analysis	Ex post gross, Evaluation adjusted gross
3	Gross Savings	Verified gross realization rate	Verification	Verified gross / tracking system gross	Realization rate
4	Gross Savings	Research Findings gross savings	Research	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
5	Gross Savings	Research Findings gross realization rate	Research	Research findings gross / ex-ante gross	Realization rate
6	Gross Savings	Evaluation-Adjusted gross savings	Non-Deemed	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
7	Gross Savings	Gross realization rate	Non-Deemed	Evaluation-Adjusted gross / ex-ante gross	Realization rate
1	Net Savings	Net-to-Gross Ratio (NTGR)	Verification and Research	1 – Free Ridership + Spillover	NTG, Attribution
2	Net Savings	Verified net savings	Verification	Verified gross savings times NTGR	Ex post net
3	Net Savings	Research Findings net savings	Research	Research findings gross savings times NTGR	Ex post net
4	Net Savings	Evaluation Net Savings	Non-Deemed	Evaluation-Adjusted gross savings times NTGR	Ex post net
5	Net Savings	Ex-ante net savings	Verification and Research	Savings as recorded by the program tracking system, after adjusting for realization rates, free ridership, or spillover and any other factors the program may choose to use.	Program-reported net savings

‡ "Energy" and "Demand" may be inserted in the phrase to differentiate between energy (kWh, Therms) and demand (kW) savings.

† **Verification** = Verified Savings; **Research** = Impact Evaluation Research Findings; **Non-Deemed** = impact findings for programs without deemed parameters. We anticipate that any one report will either have the first two terms or the third term, but never all three.
§ Terms in this column are not mutually exclusive and thus can cause confusion. As a result, they should not be used in the reports (unless they appear in the "Terms to be Used in Reports" column).

Individual Values and Subscript Nomenclature

The calculations that compose the larger categories defined above are typically composed of individual parameter values and savings calculation results. Definitions for use in those components, particularly within tables, are as follows:

Deemed Value – a value that has been assumed to be representative of the average condition of an input parameter and documented in the Illinois TRM or ComEd's approved deemed values. Values that are based upon a deemed measure shall use the superscript "D" (e.g., delta watts^{D}, HOU-Residential^{D}).

Non-Deemed Value – a value that has not been assumed to be representative of the average condition of an input parameter and has not been documented in the Illinois TRM or ComEd's approved deemed values. Values that are based upon a non-deemed, researched measure or value shall use the superscript "E" for "evaluated" (e.g., delta watts^{E}, HOU-Residential^{E}).

Default Value – when an input to a prescriptive saving algorithm may take on a range of values, an average value may be provided as well. This value is considered the default input to the algorithm, and should be used when the other alternatives listed for the measure are not applicable. This is designated with the superscript "DV" as in X^{DV} (meaning "Default Value").

Adjusted Value – when a deemed value is available and the utility uses some other value and the evaluation subsequently adjusts this value. This is designated with the superscript "AV" as in X^{AV}

Glossary Incorporated From the TRM

Below is the full Glossary section from the TRM Policy Document as of October 31, 2012[7].

Evaluation: Evaluation is an applied inquiry process for collecting and synthesizing evidence that culminates in conclusions about the state of affairs, accomplishments, value, merit, worth, significance, or quality of a program, product, person, policy, proposal, or plan. Impact evaluation in the energy efficiency arena is an investigation process to determine energy or demand impacts achieved through the program activities, encompassing, but not limited to: *savings verification*, *measure level research*, and *program level research*. Additionally, evaluation may occur outside of the bounds of this TRM structure to assess the design and implementation of the program.

Synonym: **Evaluation, Measurement and Verification (EM&V)**

[7] IL-TRM_Policy_Document_10-31-12_Final.docx

Measure Level Research: An evaluation process that takes a deeper look into measure level savings achieved through program activities driven by the goal of providing Illinois-specific research to facilitate updating measure specific TRM input values or algorithms. The focus of this process will primarily be driven by measures with high savings within Program Administrator portfolios, measures with high uncertainty in TRM input values or algorithms (typically informed by previous savings verification activities or program level research), or measures where the TRM is lacking Illinois-specific, current or relevant data.

Program Level Research: An evaluation process that takes an alternate look into achieved program level savings across multiple measures. This type of research may or may not be specific enough to inform future TRM updates because it is done at the program level rather than measure level. An example of such research would be a program billing analysis.

Savings Verification: An evaluation process that independently verifies program savings achieved through prescriptive measures. This process verifies that the TRM was applied correctly and consistently by the program being investigated, that the measure level inputs to the algorithm were correct, and that the quantity of measures claimed through the program are correct and in place and operating. The results of savings verification may be expressed as a program savings realization rate (verified ex post savings / ex ante savings). Savings verification may also result in recommendations for further evaluation research and/or field (metering) studies to increase the accuracy of the TRM savings estimate going forward.

Measure Type: Measures are categorized into two subcategories: custom and prescriptive.

Custom: Custom measures are not covered by the TRM and a Program Administrator's savings estimates are subject to retrospective evaluation risk (retroactive adjustments to savings based on evaluation findings). Custom measures refer to undefined measures that are site specific and not offered through energy efficiency programs in a prescriptive way with standardized rebates. Custom measures are often processed through a Program Administrator's business custom energy efficiency program. Because any efficiency technology can apply, savings calculations are generally dependent on site-specific conditions.

Prescriptive: The TRM is intended to define all prescriptive measures. Prescriptive measures refer to measures offered through a standard offering within programs. The TRM establishes energy savings algorithm and inputs that are defined within the TRM and may not be changed by the Program Administrator, except as indicated within the TRM. Two main subcategories of prescriptive measures included in the TRM:

Fully Deemed: Measures whose savings are expressed on a per unit basis in the TRM and are not subject to change or choice by the Program Administrator.

Partially Deemed: Measures whose energy savings algorithms are deemed in the TRM, with input values that may be selected to some degree by the Program Administrator, typically based on a customer-specific input.

In addition, a third category is allowed as a deviation from the prescriptive TRM in certain circumstances, as indicated in Section 3.2:

> **Customized basis:** Measures where a prescriptive algorithm exists in the TRM but a Program Administrator chooses to use a customized basis in lieu of the partially or fully deemed inputs. These measures reflect more customized, site-specific calculations (e.g., through a simulation model) to estimate savings, consistent with Section 3.2.