Coordinated Retro-Commissioning

CY2019 Process Evaluation Results - Final

NAVIGANT

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Participants from all paths are concerned with issues of persistence, and have expressed interest in leavebehind materials and training to enhance persistence.

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Investigation Reports lack material for non-technical decision makers looking for a business case to support funding the recommended projects.

RECOMMENDATION 1

EESPs should be selective in approaching potential customers, and advance only those projects that offer reasonable savings with a payback period in line with the program.

RECOMMENDATION 2

EESPs should be offered a system to refer facilities that are not appropriate for Tune-Up, but have energy efficiency needs that can be addressed by other programs.

RECOMMENDATION 3

Current practices should be leveraged to provide leave-behind checklists and references that will support participants' efforts to maintain persistence.

RECOMMENDATION 4

BOC and other training should be offered and/or re-offered at the end of the project to help facility staff understand implemented measures, how to use checklists and read the data, and how to return the optimized measures from temporary or seasonal changes, and provide EESP contact information as a resource.

RECOMMENDATION 5

The Executive Summary should feature accessible language, images and tables to effectively communicate to non-technical decision makers.

RECOMMENDATION 6

Financial metrics should be expanded to offer a business case for the project.

The RCx Program helps customers improve building performance and reduce energy consumption

ComEd has been operating the Northern Illinois Coordinated Utility Retro-Commissioning (RCx) Program for nine program years. CY2019 also marked the eighth program year ComEd coordinated program operations with the gas utilities that have service areas which overlap ComEd's service area.

The program helps commercial and industrial customers improve performance and reduce energy consumption of their facilities through the systematic evaluation of existing building systems and the implementation of low- and nocost energy efficiency solutions.



There are four paths in the program:

> Generally, the program pays for 100% of a detailed study, contingent upon a participant's commitment to spend a defined amount of their own money to implement a bundle of improvements recommended through the study with a simple payback of 18 months or less. The resulting Investigation Report promotes the recommended improvements and may detail additional capital improvement projects.

The RCx Building Tune-Up (Tune-Up) path features the option to immediately implement some common measures during the investigation visit by the Energy Efficiency Service Provider (EESP) in addition to a cash incentive for implementing savings following receipt of the Investigation Report.

Monitoring based commissioning (MBCx) utilizes a building automation system (BAS) to monitor energy use and detect potential areas for optimization. 5

CY2018 savings by fuel type within utility service territories

	MBCx	RCx	RCxpress	Tune-Up	DCEO
Projects	21	6	22	74	44
ComEd, kWh	11,713,535	5,837,900	7,511,685	6,997,731	7,497,253
Nicor Gas, therms	-	71,497	7,256	96,512	379,175
Peoples Gas, therms	267,278	14,864	72,612	31,083	424,811
North Shore Gas, therms	-	-	4,369	16,263	137,256

Savings not necessarily indicative of savings purchased or claimed by individual utilities

Process Research

Process research conducted between October, 2018 and June, 2019 addressed three of the four Retro-commissioning paths: RCx, RCxpress and Tune-Up. Navigant researched three topics requested by the program manager and implementer:

Why did Tune-Up participants drop out after receiving their Investigation Reports?

How can the program help participants improve the persistence of savings from the measures they addressed during their project?

How can the Investigation Reports drive greater adoption of recommended measures and channeling of capital improvement projects?

Navigant activities included interviews with program participants and industry experts, secondary research of industry best practices, document review, and analysis of prior participant and service provider survey results.

Tune-Up Path Drop Outs

02

Evaluation Questions

The Tune-Up path is expected to grow as the program encourages greater participation of smaller facilities outside Chicago.

However, this path historically struggled with EESP reluctance due to low margins and smaller savings available to smaller facilities, as well as customer confusion and drop outs.

The evaluation team identified the following key evaluation questions:

Why did Tune-Up participants drop out of the program between receiving the Investigation Report and implementation of the recommended measures?

What could be done to bring drop outs back into the program or avoid dropouts in the future?

The team answered these questions through the following research:

- · Interviewing of former participants who dropped out
- · Reviewing Investigation Reports for participants who dropped out

The following slides provide a contextual timeline of the Tune-Up path evaluation, verbatim quotes from ComEd customers, and Navigant's findings and recommendations based on PY9 and CY2018 participants.

Tune-Up path program design evolved from PY7 – CY2019.

The Tune-Up path evolved to address various deficiencies, from lack of EESP interest due to low fees or margins, customer lack of awareness or frustration over what they interpreted as a prescriptive treatment when they expected a custom service.

The following timeline depicts major changes to the implementation and design of the Tune-Up path and the number of interview respondents.

PY7	PY8	PY9	CY2018	CY2019		
(4 Interview Respondents) Outreach based on Remote Building Audits of 200 likely candidates Low EESP fees	(0 Interview Respondents) Outreach not targeted Negative EESP feedback, PY8 had low participation	 (9 Interview Respondents) Initiated calling campaign by EnVINTA promoting Tune-Up as a free audit, but it was not free Leads were low quality based on the implementer interview Increased EESP and participant incentives 	 (3 Interview Respondents) Increased EESP and participant fees, including incentive for in-house labor Cease EnVINTA campaign EESPs develop own leads, found to be higher quality Public sector facilities 	Implemented cancellation policy Increased screening of prospective participants Limited projects to no more than three from a customer (e.g., school district)		
		of 45%	eligible for program			

Participants who dropped out reported highest satisfaction with minimal staff time required.

The **lowest satisfaction** was experienced by those participants who entered the program in PY9.

Greatest satisfaction overall was associated with required staff time, assistance in finding a contractor and ability to maintain savings. "The program made them able to say whether they [implement the measures], which gave them confidence."

"We had to find a HVAC contractor. It would help if ComEd would have [a] list of building automation contractors"

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Greatest Variation in Satisfaction with Program Components by Year of Entry

Accuracy of cost estimates to implement

Amount of low-cost savings identified





Customer responses where 0 indicates not at all aware and 10 indicates fully aware of program details going into the investigation. Source: Navigant interviews of Tune Up Drop Outs, conducted in May, 2019

Participants who dropped out had enrolled to save money & energy, and improve equipment performance.

The majority (59%) of firms entered the program to lower their utility bills or save energy.

Nearly one third (31%) entered the program for non-energy benefits, chiefly to improve equipment performance or to make the facility more comfortable or improve air quality.



PY9 participants who dropped out were less familiar with the program requirements than those entering in either prior or subsequent years.

Participating customers in PY7 and CY2018 demonstrated a greater understanding of the program requirements than did those who entered the program in PY9. The EnVINTA calling campaign recruited customers in PY9.

"We didn't know [that this was not just a free study] right away." "The paybacks were not within our timeframe."

Awareness of Program Requirements by Year of Entry

Participant pays to implement some measures



RCx addresses no-cost or low-cost measures, not capital improvements



Not a free study, implementation required

Implementation required for measures <18 month payback



Customer responses where 0 indicates not at all aware and 10 indicates fully aware of program details going into the investigation.

Participants dropped out because they did not find the recommended improvements to fit their business needs.

The most commonly mentioned reasons for dropping out were EESP actions, including that the EESP aborted the project, never provided an Investigation Report, or did not find enough opportunity to continue (29%).

A similar number of respondents reported that they either completed their Tune Up project (18%) or intended to complete the project (12%).

Those participants who decided to drop out did so because the recommendations were not what they expected with payback periods too long or short (23%).

One public participant's internal budgetary cycle forced them out of the project because the Investigation Report arrived at the wrong time in their budget cycle.



"5 year payback is our standard and we expected to see measures that would meet that."

"We intended to complete the project but it was tied to the budget cycle and by the time we got the project recommendations, our fiscal year budget was closed so couldn't proceed."

Some facilities that received a RCx study may not have been strong candidates – candidates were not vetted properly.

Two sample reports, on this and the following page, illustrate issues Navigant found with some Investigation Reports and the appropriateness of the facility as a Tune-Up candidate, primarily that the payback for the recommendations was too long and the savings too small.

 This PY7 Investigation Report bundles three measures for the RCx project, two with appropriate payback periods for RCx, and a third that qualifies as a capital improvement.

Executive Summary

A detailed retro-commissioning investigation was performed by wherein they met with facility operators, reviewed historical energy usage data, and investigated existing facility operations, systems, equipment, and controls. Based on that investigation the SP identified three (3) Energy Conservation Measures (ECMs) that, if implemented, could result in annual electrical energy savings of 132,346 kWh and annual cost savings of \$10,588. Program incentives offered could reduce the total customer out-of-pocket implementation cost for these ECMs by \$1947, yielding a simple payback of 1.1 years.

The next step is for the customer to use the Customer Selection Form (CSF) to approve an implementation plan for selected ECMs. The CSF should be completed and submitted to the Program Administrator within 30 days from the date of this investigation report.

would like to thank

Inc, for assisting with the investigation and implementation during the project. Additional assistance from facility, operation, or management staff is also greatly appreciated.

The tables below summarize the investigated ECMs.



	ECM #	Measure Description	Peak Demand Savings (kW)	Annual Energy Savings (kWh/yr)	E	lectrical Cost Savings (\$/yr)	N Inc (leasure remental Cost (\$)	Simple Payback (xts) (Without Incentive)
	1	Schedule the AHU and RTUs	-	84,633	s	6,771	s	240	0.0
	2	Reset the Static Pressure on the RTUs	-	11,033	s	883	s	240	0.3
	3	Occupancy Sensors in the Offices	-	36,680	\$	2,934	\$	12,692	4.3
Totals		-	132,346	\$	10,588	\$	13,172	1.2	
*All measure costs was estimated and subject to change									

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Some facilities that received a RCx study may be better candidates for other ComEd programs (continued from previous page).

 This CY2018 Investigation Report uncovered only one measure, a capital improvement with a payback of 9.4 years, exceeding the definition of RCx.

Investigation Reports do not indicate over how many years the electrical cost savings for each measure will be enjoyed, a vital piece of information to make an informed business decision about the proposed project.

These PY7 and CY2018 Investigation Reports both suggest that the facilities studied were not good candidates for RCx, and could have been referred to other programs in the ComEd portfolio.



Participants who dropped out said they may return to the program if their facility has more impactful or higher incented measures and they receive additional follow-up.

Respondents said that more follow-up, either regarding their original project or promoting new opportunities, would bring them back to complete their projects.

An equal number asked for measures with greater impact or payback periods made shorter through higher incentives.

"Address long payback periods that incentives don't bring down enough by increasing incentives"

"Move to next tier and do actual retro-commissioning – the impacts were in some ways a waste of time – didn't get all the info needed from just Tune-Up"



Improving Persistence

03

Evaluation Questions

PY9 participants in the RCx, RCxpress and Tune-Up paths reported an eagerness for leave behind materials and training to help them maintain persistence of the savings achieved through their RCx project.

Although the RCx and RCxpress participants send staff to Building Operator Certification training, they, too, started to express interest in training and materials to support efforts at maintaining persistence.

The evaluation team identified the following key evaluation questions:

What are industry best practices to maintain persistence at retro-commissioned facilities?

Which of those best practices would translate easily to the existing ComEd program?

The team answered these questions through the following research:

- Secondary research of best practices
- Analysis of prior participant and EESP survey results

Changes in operations, personnel and facilities challenge successful persistence of savings for RCx measures.

"We learned that our building engineers made a system change to rectify immediate problems which in turn made problems later."

PY9 RCx PARTICIPANT

"[We urge caution] about making changes without fully under-standing the needs of the building or the systems that they are dealing with."

PY9 TUNE UP PARTICIPANT

Retro-commissioning benefits are susceptible to the degradation of persistence for multiple reasons or manual operations or overrides that become permanent that occur as part of day-to-day operations, including:

- Temporary schedule changes
- Churn in personnel, from tenants to custodians, control and service contractors
- Facility and physical plant changes

Some industry best practices exceed the current design of most current ComEd RCx Program offerings, including:

- Equipment lists
 - In-depth information on all equipment at a facility
- Operations & Maintenance manuals
 - Additional reference and record of maintenance practices and history for all equipment at a facility
- Control System documents
 - Reference documents including points, as-built sequences of operations and system diagrams

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Source: Navigant Net to Gross and Process surveys of PY9 participants and interviews of PY9 Service Providers

Source of secondary research: A Retro-commissioning Guide for Building Owners, EPA, 2007. <u>http://www.sandiegorcx.com/docs/epa-rcx-guide-building-owners.pdf</u>

Source of secondary research: Energy Star <u>https://www.energystar.gov/sites/default/files/buildings/tools/EPA_BUM_CH5_RetroComm.pdf</u> Source of secondary research: Retro-commissioning Program Toolkit for Local Governments, A Project of the California Sustainability Alliance, November 2012. http://sustainca.org/sites/default/files/Alliance_LG_Rcx_Toolkit.pdf Checklists and training will help participants maintain persistence of savings.

"[We would like material that details the] pitfalls of resorting back to our same ways, the benefit to reduce maintenance cost due to system usage."

PY9 RCxPRESS PARTICIPANT

Program participants are asking for material to help them achieve greater persistence. Applying best practices to the RCx Program operations, a series of checklists may best serve to enhance persistence for participants who contract out controls and service work as well as those who experience churn and multiple demands on their in-house maintenance staff.

The checklists present limited data to offer a rationale for the improvements, instruction on maintaining the improvements and a record of observations or activity.

Current practices may be leveraged to ease the burden of creating a checklist and may not increase program costs.

For example:



Rationales for improvements may be found in Investigation Reports



Certain temperature resets may have boilerplate rationale that is easily adopted



Tune-Up calculators may offer desired controls ranges and settings



BOC training, required for RCx and RCxpress participants, may feature the creation of checklists as part of the training. These lists may be used in coordination or replacement of programcreated checklists.

Persistence of savings is likely to be improved with operations and trouble-shooting checklists.

Provide checklists that:

List monthly, seasonal and annual tasks and system parameters specific to the equipment and systems changes addressed during the RCx project including acceptable ranges for:

- Temperature parameters
- Static air pressure
- Pumps
- Constant or variable volumetric air pressure
- · Chilled water

Reference or incorporate equipment lists, training material and rationale for the improvements.

Offer the EESP contact information as a resource should questions arise.

Deliver a form, excel template or data-entry system to record actions taken, results observed, challenges experienced.

Feature a troubleshooting page for each piece of equipment addressed in the RCx project that includes equipment details and reasons for observed settings.

- Expected values or range of values for summer, winter, spring and fall
- · Operating parameters
- · Possible reasons values may exceed the expected range
- Possible actions to restore expected operations

""[We would like] any information that would help to keep the optimization in place and working."

PY9 TUNE-UP PARTICIPANT

"Reminder of the actions we took, and maybe items for further evaluation or further consideration."

PY9 TUNE-UP PARTICIPANT

"[We need material] about the equipment ... in my building and how to maintain it. [For example,] if something goes wrong it could show what to look at such as humidity, temperature and sunrise and sunset or if it is a sunny day or a cloudy day."

PY9 RCx PARTICIPANT

Participants request training to understand the data and improvements delivered through their projects as well how to maintain persistence of savings from projects.

"[We would like appropriate] ... training for our contractors and our staff at different levels with twenty hours of training."

PY9 RCx PARTICIPANT

"[We would like training on] how to use the data."

PY9 TUNE UP PARTICIPANT

"[The ideal training] would provide my building maintenance staff with information on what to look for and the perimeters of what they should look for in the equipment."

PY9 TUNE UP PARTICIPANT

"[We could use training on] seasonal adjustments, and red flags to inefficiency and how to maintain optimal efficiency."

PY9 TUNE UP PARTICIPANT

Participants are requesting training for their staff in addition to the BOC training required for RCx and RCxpress.

EESPs could offer training that is constrained to improvements and data delivered through the RCx project, as appropriate to the audience:

- cursory for controls and service contractors
- high level for facility managers
- suitable to sustain operations, collect data and observe trends for facility staff charged with maintenance and operations

A recording of the training session may serve as a reference for those who attended, and training for future staff.

Source: Navigant Net to Gross and Process surveys of PY9 participants and interviews of PY9 Service Providers

Investigation Reports

Evaluation Questions

Investigation Reports detailing findings from the facility study are designed to explain the recommended improvements, and often communicate more potential than the required minimum for participation.

As such, these reports must present a business case to win funding of the projects.

However, the reports are better suited to a technical audience, and lack drivers for non-technical decision makers to fund recommended improvements.

The evaluation team identified the following key evaluation questions:

How can the Investigation Reports be more valuable, generating:

Higher adoption of the recommended measures beyond those that are required?

Higher adoption of the capital improvement recommendations?

The team answered these questions with:

- Interviews with industry experts representing service providers, implementers, and the ASHRAE Technical Committee, responsible for creating the ASHRAE Audits
- Review of existing Investigation Reports for all RCx offering tracks

Navigant reviewed the Investigation Report structure and content. The following results are a compilation of this review and insights from our research.

ComEd Investigation Reports could be improved to better communicate with non-technical decision makers.

This sample opening of a ComEd Executive Summary from a RCx Investigation Report may communicate well to engineers and others with a technical background, but challenges the non-technical audience likely responsible for business decisions about the funding and advancement of proposed projects.



Generally, the content is offered in a block with little white space to attract a scanning eye.



While pleasantly complimenting client staff, the report does not suggest a familiarity with or address the client's needs: why should they fund the project?

Grammatical errors in a paragraph with a number discourage reading.

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What does 825,000 kWh mean, and why does it matter to this company that predicted savings are exceeding that goal?

- 5 The references to measures are not accessible to the non-technical, who are unlikely to be pulled in by a technology they do not understand.
- 6

The logic behind this order is mysterious, lending confusion to the decision making process.

Measure life and financial metrics do not demonstrate the longevity of the measures' savings, necessary to build a business case promoting the project.

Source: Navigant Research, ComEd RCx CY2018 Investigation Report.



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Investigation Reports should feature actionable Executive Summaries.



Navigant's business practice is to include executive summaries in memos and reports so that reader fully understands the content upon reading a document.

McKinsey and Company found that up to 13% of top management want to immerse their firms in energy efficiency and sustainability initiatives, while 17% are completely disengaged.

For mature programs like RCx that may have already served most of the highly motivated firms, 70% of the potential market waits to be convinced that the proposed energy efficiency project presents the best overall use of their limited funds.

Since all projects are in competition for funding, Investigation Reports should address risk versus reward in the Executive Summary, allowing a straight forward business decision to be made about funding the project.

The remainder of the Investigation Report and Appendix may be written for engineers, facility managers and technical audience.

Reports that best communicate a business case to implement the recommended measures are most likely to be funded.

Key components of an actionable Executive Summary:

High-level project detail

Possibly as few as 3 - 4 bulleted key points

Outline the key points so they are actionable

A summary targeted to the non-technical decision maker should assess risk versus reward and build a business case for approving the recommended projects.

An Executive Summary should be ready to distribute to top management for funding and buy-in.

Key features of an actionable summary include:

- Content relevant to the reader, free of technical terms and easy to understand
- Show an appreciation of the firm's needs
 - Scheduling constraints presented by operational needs or budget cycles
 - Multiple needs addressed by recommended improvements, where possible
- Financial metrics that promote the full benefit of implementation over the measure life
- Scannable copy broken up with images, figures and tables for quick communication that attracts the eye
- Recommended improvements in a hierarchical order based on delivering the most benefit to the customer
- A second set of data for recommended capital improvement projects, with references to channel to other ComEd programs

Technical and specific content may follow the Executive Summary and include content targeted for a technical audience such as facility engineers and managers.

ComEd RCx Investigation Reports should consider expanding metrics to help advance a project.

ComEd investigation reports present energy savings, project cost, potential incentives, and the payback period.

Additional metrics will help satisfy various corporate requirements, and could help advance proposals to become funded projects.

As shown in this sample Executive Summary from a RCxpress Investigation Report, the metrics offered are:

- Savings in kWh and therms per year
- Savings by energy cost per year
- 3 Project cost
- 4 Simple payback

Capital improvement recommendations ⁵ are offered in a different format, without similar metrics, which may serve to leave their consideration out and discourage their adoption.

Tune-Up Investigation Reports, shown on Slide 16, present limited data on a project basis, rather than by measure.

Source: Navigant Research, ComEd RCxpress CY2018 Investigation Report.

Executive Summary

is a 554,000 sq. ft. 427-bed hospital that has been providing quality healthcare in the near western suburbs and the city of Chicago for nearly a century. comprises of approximately twenty-three (23) primary air handling units (AHUs). They are a mix of constant volume and variable air volume AHUs. Steam heating coils and chilled water cooling coils are utilized. 4 measures were identified in the investigation phase. 447,070 kWH in electrical savings have been identified along with 1,328 therms of natural gas savings. It is recommended to proceed with the project to implementation and verification.

	Table 1 Investigati 1 gy 2 val 1 a 2 3 3 4						
ECM No.	Measure Description	Ele Energy Savings (KWhiyr)	Electrical Costs Savings (\$/yt)	Gas Energy Savings (therms/year)	Gas cost Savings (S/year)	Implementation Cost (\$)	Simple Payback (years)
1	Schedule AHU for Space	182,903	\$ 12,803	625	\$ 313	\$ 3,485	0.3
2	Schedule AHU for Space - Nighttime Airflow Reduction	141,134	\$ 9,879	703	\$ 352	\$ 1,635	0.2
3	Other - Cooling Coll Leakby	25,899	\$ 1,799	-	\$ -	\$ 525	0.3
4	Condenser Water Temperature Reset	97,334	\$ 6,813		s -	\$ 1,095	0.2
	Totals	447,070	\$ 31,294	1,328	\$ 665	\$ 6,740	0.2

Several opportunities have been identified which do not qualify as retro-commissioning measures based on the preliminary information. The measures are either capital in nature or considered maintenance recommendations. Capital investment type measures are not considered part of the RCx service and cannot be further investigated through this program. However, is encouraged to pursue these opportunities through the available utility incentive programs where applicable.

In addition, capital measure costs outlined in this section are not to be included toward the Minimum Customer Implementation Commitment.

	5	Table 2 Additional Measures					
Ì		Measure Description	Recommendation				
Additional Measure #1 - Chilled Water Bypass Valve Operation		itional Measure #1 - Chilled Water Bypass Valve Operation	Modify control sequence to improve operation				
I	Additional Measure #2 - South Building Chilled Water System Flow Issues		Recommend a study be completed to determine root cause(s) of the issue.				

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Financial Metrics make the business case.

Businesses consider multiple metrics, and often have a minimum threshold to approve a project. Delivery of these metrics in a manner that the project contact can simply cut-and-paste into a report or request for funds would make their task easier, and help to develop buy-in throughout the company.

Because businesses may differ in the metrics of greatest importance, we recommend that all appropriate measurements be offered to answer decision makers' questions before they have to ask them, including:

- · Operations and Maintenance Savings
- Measure Life
- Internal Rate of Return (IRR)
- Net Present Value (NPV)

Deliver metrics that support adoption of the proposed projects in an easily accessible format to decision makers.

Financial Metrics offer information decision makers need.

This example of a table detailing Energy Conservation Measures in an Executive Summary offers a number of metrics, including:





Internal rate of return (IRR)

Measure life

Net present value (NPV)

Identified Energy Conservation Measures Table 2: ECM Summary 1 2 Paybac Gas/Fuel Electricit Measure Description Potentia leasure RR (ove Simple Total Cos Life of NPV* Utility Life Payback Savings Cost (MMBTUs) Measure ncentiv ENERGY STAR® Clothes Washers \$ -N/A \$ EEM-1 19 464 \$ 256 1.885 0.0 Energy Savings) 14 Increase Corridor Unit Supply EEM-2 15,462 \$ 2,800 \$ N/A \$ 17,207 0.0 -10 Temperature Set Point Low-flow Fixtures (Energy and Water EEM-3 38 \$ 3,572 \$ 770 464% \$ 21.177 0.2 10 Savings) Install Weatherstripping on all Exterior EEM-4 29 \$ 261 \$ 200 129% S 791 0.8 Doors 5 3,600 \$ EEM-5 461 4,129 \$ 1,800 15% \$ 154 0.9 \$ Optimize Heating & DHW System 1 EEM-6 (118)9,383 \$ (2,833) \$ 11.589 \$ 5.795 81% \$ 57.535 1.2 Common Area Lighting 51,811 \$ 15 Install VFDs on Heating Distribution Pumps and Optimize Warm Weather 31,956 \$ 5.787 11,002 53% \$ EEM-7 \$ 33,017 1.9 Shut Down 15 EEM-8 Cold Water Booster Pump -16,337 \$ 2,959 \$ 6,464 46% \$ 16,041 2.2 15 \$ \$ 14% \$ EEM-9 61 227 \$ 588 2.000 36 231 3.4 Reduce Fan Operating Hours 5 **EEM-10** Trash Chute Fan Addition 74 (540)\$ 569 \$ 3,000 17% \$ 1,325 5.3 15 EEM-11 Appliance Replacement 29,441 \$ 5,332 \$ 65,400 0% \$ (29.070)12.3 12 (2,833) \$ 104,025 TOTALS (Recommended Measures) 565 145.159 35.637 7,631 30% \$ 120.291 2.9 * NPV assumes a discount rate of 10%

Source: Greater Allen Cathedral Senior Residence Energy Audit, Quadlogic Controls Corporation

Photographs and layout help pull decision makers into reports.

Photographs of the customer's facility serve to bring the proposal home and make it seem customized.

EESPs can take photos with their tablets on an early facility visit, and enter them into a database to simply create these reports.

Report layout that features images, tables, bulleted lists and white space is accessible and encourages continued reading



improvements in addition to key energy conservation opportunities.

strategic opportunities including those eligible for rate discounts, areas for energy-related process

Source: Minnesota Turn Key Sample Assessment Report, Excel Energy

107-37 166th Street Energy Audit Report

The boilers are controlled by two aquastat, one maintaining the water temperature in the boiler at 250°F and a Honeywell aquastat maintaining the building supply temperature at 180°F on the operating boiler and 164°F on the standby boiler. There is an outdoor sensor, supply sensor, and return sensor that monitor the outdoor, supply, and return temperatures, respectively, to adjust boiler runtime. There is a set of Siemens controllers in the boiler room that control the various pumps of the heating system.



Figure 5: Heating System Pump Controllers

Data loggers were installed in the building to monitor the heating system and determine the heating setback and whether the system is equipped with outdoor reset.



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Excellence

Source: Quadlogic Controls Corporation energy audit for Greater Allen Cathedral Senior Residence, 2015

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Photographs communicate efficiently and help make details accessible to non-technical decision makers.

Images of the customer's facility deliver a custom approach that helps to alleviate the negative "prescriptive" feel of the Tune-Up path that a number of participants have reported.

Photographs speed understanding of the project and what the measure will address, helping the non-technical decision maker in particular.

West End Place Condominium

emergency heat are run exclusively. This heating mode explains the significant peak that is seen in electricity usage in the winter months.

An alternative equipment type is the air source heat pump. At least one of the condo units had this type of equipment recently installed. Implementing this type of equipment is tricky given the limited access to outdoor space adjacent to each condo unit. This equipment should result in a lower peak in the winter months.

Individual condo units should be utilizing programmable thermostats for maximum energy savings. Upgrading to an Energy Star rated programmable thermostat is a low cost project with energy savings benefits.

Parking garage exhaust fans

Parking garage exhaust fans

The garage exhaust fans currently run 24/7. The function of these exhaust fans is to remove car fumes, etc from the space so that carbon monoxide levels are maintained at a safe level. It is recommended that a carbon monoxide sensor control be installed to operate the exhaust fans. ASHRAE HVAC Applications handbook states that control of fans by CO level can result in 30% energy savings as compared to continuously operated fans.



urrently run 24/7. The function of these exhaust fans is to remove car so that carbon monoxide levels are maintained at a safe level. It is n monoxide sensor control be installed to operate the exhaust fans. tions handbook states that control of fans by CO level can result in mpared to continuously operated fans.



In area lighting and controls revealed that upgrades to CFL's have ted. Further upgrades to the interior lighting systems should include and lobbys. The light levels during the day in these areas is sufficient al light sources. (measurements of 40 - 70 lux in hallways) Reduction the current fixtures and lamps will result in energy savings with these

Findings and Recommendations

FINDING 1

Participants dropped out of the Tune-Up path most often because their facility was not a good fit for retrocommissioning.

FINDING 2

Participants from all paths are concerned with issues of persistence, and have expressed interest in leavebehind materials and training to enhance persistence.

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Current practices should be leveraged to provide leave-behind checklists and references that will support participants' efforts to maintain persistence.

RECOMMENDATION 4

BOC and other training should be offered and/or re-offered at the end of the project to help facility staff understand implemented measures, how to use checklists and read the data, and how to return the optimized measures from temporary or seasonal changes, and provide EESP contact information as a resource.

RECOMMENDATION 5

The Executive Summary should feature accessible language, images and tables to effectively communicate to non-technical decision makers.

RECOMMENDATION 6

Financial metrics should be expanded to offer a business case for the project.

Thank you

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