

Connecticut Light & Power and the 2008 Retro Commissioning Program

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Synopsis

The Connecticut (CT) Retro Commissioning (RCx) program has been approved by the regulating authorities to move forward from a pilot to a program and be offered by the electric utility to its customers. What are the lessons learned from the evaluations conducted and what are the program modifications that stand out in the Connecticut RCx program from other RCx programs in the US? Currently, RCx projects in CT are seeing anywhere from 5% to 40% in electrical consumption savings.

About the Author

Employed by Northeast Utilities, Dave is assigned to the Stamford, Connecticut conservation and load management department in the office serving Fairfield County. An architectural engineer and Certified Energy Manager (CEM), Dave has more than 25 years of experience in construction, contract administration, maintenance and renovation of commercial, manufacturing and residential buildings. Dave has been instrumental in saving his employers, who include Almanden Vineyards, Signetics, Atari, and US Repeating Arms, as well as the numerous customers of Connecticut Light & Power, millions of dollars. Dave has provided over \$8 million of incentive to Connecticut Light & Power customer for electrical energy savings projects. Under his leadership as Senior Program Administrator, the RCx program has been added to the menu of conservation programs. The RCx program is approved by the Connecticut Legislator's Energy Conservation Management Board (ECMB) and the Department of Public Utility Control for the program year 2008.

Introduction

The Conservation and Load Management department (C&LM) at The Connecticut Light & Power Company (CL&P), a Northeast Utilities System company, has its roots going back to the oil embargo days in the late 1970's. This nationally recognized, award-winning operation has conducted energy-saving services for its ratepayers for more than 30 years. CL&P currently manages energy-efficiency programs in our service territory for the Connecticut Energy Efficiency Fund (CEEF). Our expertise in the creation and administration of these programs has contributed to their success and has resulted in lifetime savings of over 400 Megawatts in 2007 alone for CL&P's residents and businesses. CEEF programs are funded by a charge on customer electric bills.

With CEEF funding, CL&P has a variety of energy-efficiency programs for commercial and industrial customers. There are programs for new construction, retrofit projects, operations and maintenance, and load management. These programs use a strategy of cash incentives, rebates and technical assistance to enable businesses to employ energy-efficient equipment, technology and practices. In late 2004 CL&P expanded their existing Operations and Maintenance program (O&M) by launching a new pilot program named Retro Commissioning (RCx).

The Connecticut Retro Commissioning (RCx) program was developed with industry experts and community leaders from across the US. The RCx pilot program originally challenged five property owners to save energy by reviewing the operation of their buildings' energy management systems in great detail. The RCx program is seen as the "O" portion of the O&M program. In other words, the focus is placed on the entire operation of the building's energy system instead of the repair or replacement of component parts. This process requires more intensive engineering time, but it can provide more savings at a lower cost to the customer. The activity of RCx could be considered greener because it creates less waste as compared to new construction and retrofit programs.

The 2008 RCx program is designed to identify electric and non-electric energy savings opportunities through implementation of the Connecticut retro commissioning protocols. This program aims to make building owners and operators aware of operating inefficiencies in their facilities and systematically address these in order to generate energy savings. The program uses qualified building commissioning engineers (CxP) to conduct the process and provides significant financial incentives to assist with the cost of the process.

The Program objectives include:

- Continue to demonstrate the validity of retro commissioning as a viable energy-saving measure in the State of Connecticut.
- Continue to develop appropriate screening, survey, investigation, implementation, and measurement and verification (M&V) protocols to assure a high quality retro commissioning process for Connecticut buildings.

- Improve the ability of building operations staff to identify wasteful energy use of all types.
- Create an environment where savings in the participants' buildings persist over time.
- Ensure that quality control is a priority while moving throughout the retro-commissioning process.

Connecticut Retro-Commissioning Program Steps

Building Screening

When a site is recommended or a customer requests a building be entered in to the RCx program, a screening is conducted. This screening is a review of the building's condition, its energy management system's status, capabilities, and gauging the understanding of the facility's personnel in the RCx process. Specifically, the building must meet the following minimum criteria to be considered for the Connecticut RCx program.

1. The potential building shall be over 100,000 square feet or have a Building Management System (BMS) that controls an aggregate of 100,000 square feet or more on one meter.
2. The building must have a Direct Digital Control (DDC) system for most of the building with report trending capabilities and reasonable storage for trending data.
3. The facility's staff needs to be on-board and aware of the detail that the RCx program goes into.
4. The building must not have a large number of maintenance items requiring attention such as filter changes, coil cleaning, economizer linkage problems, leaking or bypassing valves, etc., that could interfere with the investigation and measure verification process.

The building screening requires the owner to fill out an information document that asks questions to help outline the program design and expected owner commitment. Included in this submission is a copy of a typical trending report. The proof of trending helps confirm the ability of the BMS DDC system. Also required is an ENERGY STAR[®] benchmark rating. This process requires the customer to find, handle and input information concerning their facility's energy usage. This step identifies the baseline for the customer with its peer buildings and hopes to put the customer on the track to an ENERGY STAR-registered building.

If the building is found to meet the above conditions and the information is submitted and approved, then the customer is asked to select from one of the six RCx Commissioning Providers (CxP) and a RCx survey agreement is signed between the electric utility company and the customer. The survey agreement outlines the RCx process from beginning to end.

Building Survey

Once a participant building is evaluated and approved for the program, an RCx survey determines the potential for cost-effective retro commissioning opportunities and the estimated cost of the investigation. The survey is conducted by a commissioning provider (CxP) and is expected to take two, two–person days, depending on the size and complexity of the facility.

The overall purpose of the building survey is to identify *indicators of opportunity* and potential for energy savings. If the survey finds adequate retro commissioning opportunities, the CxP incorporates the investigation scope of work and cost proposal into the survey report according to the RCx protocols. The survey report is then submitted to the utility company for review and approval.

Upon review and approval of the report, the CxP meets with the participant and utility company representative to discuss the survey and review the potential investigation opportunities. Upon agreement on the investigation scope of work and confirmation of the program funding of the scope, the owner proceeds by signing a three-party investigation agreement with the utility company for the RCx investigation assigning the CxP as the payee.

The investigation agreement requires the customer to commit to pay 50 percent of the investigation's cost if they do not achieve a paid incentive equal to or more than 50 percent of the cost of the investigation. This engages the owner to make sure they are capturing the most opportunity possible in order to limit their exposure to the investigation costs. If the customer meets the 50 percent rule, the paid portion of the cost will be returned and the customer forgoes any investigation payment risk. The CxP is paid directly by the utility when the implementation and verification report is approved. For municipal, State and Federal projects, the Participant is not required to commit to pay the 50 percent of the investigation costs.

Note: The introduction of the RCx Survey process instead of an RCx scoping study was made after the pilot evaluation in Connecticut. It was determined that most of the investigative work was being incorporated in the RCx scoping study, and that the scoping process as defined was delaying the move to investigation. As a result, an RCx survey is conducted with the primary purpose of obtaining a proposal and scope of work from a CxP for the investigation. More than one CxP could be asked by the customer to provide an RCx Survey. The RCx building screening was expanded to have additional information provided by the participant. This minor change in process has appeared to improve the process by saving project time and has moved the participant more quickly into investigation.

Retro Commissioning Investigation

A retro commissioning investigation process is undertaken if enough opportunities for building operations energy savings are identified by the retro commissioning survey report. During the investigation, the CxP analyzes these opportunities in more detail and often discovers additional opportunities. These opportunities are mostly operational energy-saving improvements. During a retro commissioning investigation, the CxP conducts a rigorous analysis of the building's

operations. Through observation, targeted functional testing, and trend data analysis, the CxP identifies deficiencies in the operation of the mechanical equipment sequence of operation, lighting controls, and related HVAC controls, and determines opportunities for corrective action including other operational and maintenance improvements that reduce energy consumption and demand.

In the Connecticut RCx program, capital improvements such as lighting upgrades and chiller replacements are not considered in the RCx investigation phase. These types of energy savings measure improvements are covered through other program incentives and designs. The RCx program has an individual measure cap of \$5,000.00 of capital equipment dollars. This measure cap will allow for small VFD's, high efficiency motor and other low cost capital items to be integrated into the measure design. In the majority of cases, the measures implemented are the addition of control points and software programming modifications.

The cost effectiveness of potential retro commissioning measures and the subsequent qualification of a full or partial incentive payment require a cost effectiveness qualification criteria procedure. This is conducted by the utility during the review of the implementation and verification report and determines the dollar incentive for the participant and the value to the ratepayer.

Included in the RCx implementation plan is a persistence strategy. This is required for each of the various RCx measures. A persistence strategy is a follow up on the measure by the owner at specific intervals and reviews the current operation of the implemented measure and compares it to the implemented design. If changes or modifications are found as deficiencies then the measure is brought back to its original conditions during this practice.

The CxP, along with the owner, will develop a scope of work (SOW) for each measure and provide an implementation plan. The scope of work is needed to determine hard costs for implementation and will help the owner work with outside contractors, guide in-house staff with implementation, and ensure measures are properly implemented. Estimated installation costs are required for each measure to complete this required task.

Once the investigation report is approved by the utility in concert with a QC engineering consultant, a letter of agreement (LOA) between the customer and the utility company is developed. This LOA will identify the measures that have been selected by the owner to be implemented in the facility, the estimated savings in kilowatt hours (kWh), kilowatts (kW), and the incentive in dollars to the customer. At no time is the customer required to install a measure, but if they do and it is verified to be operating as identified in the LOA, the incentive will be paid. Current program opportunities also allow for the provision of gas incentives for qualifying measures.

Retro Commissioning Implementation

The RCx program allows flexibility in how the owner wishes to implement the selected measures and use the incentive. The primary requirement is that the protocols are met and the measures are installed and verified, as outlined in the LOA. The owner has the option to utilize in-house staff, hire the CxP to implement or provide technical assistance, contract with outside subcontractors, or any combination of the above.

To keep the project on schedule, a project time line must be developed and maintained.

After the RCx measures have been installed and the O&M training has been completed, the O&M implementation manuals are presented to the utility for approval. This is the last step in the implementation stage. Once it has been approved, the incentive payment can be made for the measures implemented.

Typical RCx Measures

Some of the typical measures studied, investigated and deployed are as follows:

- Reset chiller discharge temperature
- Repair and upgrade demand base ventilation control
- Reset pump and fan speeds
- Improve free cooling shift over
- Add control scheme to electric unit heaters
- Air handling unit supply fan static pressure optimization
- Implement garage lighting scheme
- Broaden humidity set points in data centers
- Improve and validate demand base ventilation systems
- Confirm sequence of operations for EMS-controlled equipment
- Validate schedules and correct as required
- Coordination of lighting occupancy with HVAC
- Schedule coordination for cleaning crews
- Night light switching and verification

Commercial Retro Commissioning Process Evaluation

The retro commissioning program evaluation is planned to be conducted in the next few years, once additional projects have been completed. The following questions will be answered in the evaluation and we should be able to report on them at future conferences:

- What are the annualized energy and demand savings attributable to the program?
- How do actual savings compare to the projected engineering estimates found in the investigation report?
- Are the technology modifications operating as intended or not? If not, why?
- What is the appropriate baseline to use in calculating energy savings for each building participating in this program?

In addition, the on-site assessments for the impact evaluation would also support the process evaluation question of examining deferred opportunities. It will also be expected that information collected during the on-site visits will be used for the process evaluation as well.

Next steps

The program filing for the 2008 Retro Commissioning program was presented to the board for review and approval. It has been approved and funded for 2008. Currently, 20 projects are being administrated in the State of Connecticut by CL&P. Future opportunities for customers with energy management systems include:

- Colleges and universities
- Commercial office buildings
- State buildings
- Manufacturing operations
- Large municipalities

Conclusion

As we wait for the next evaluation to be conducted and the final third-party numbers to come in, we believe that the RCx program will be a valuable addition to the menu of programs available to CL&P's customers. The benefits of this type of program are enormous when you consider the overall effect that occurs in the participant's organization. The residual effect of the RCx project is the motivation it engenders in the business consumer to save additional energy in the non-retro commissioning projects identified during the process.