



## Reducing Energy Costs through Retro-commissioning

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Is your operations and maintenance budget tight? Are you constantly fielding comfort complaints and fighting maintenance fires? SEDAC recommends retro-commissioning to ensure that equipment and systems function as intended and operate at optimal efficiency. Retro-commissioning offers significant energy cost savings at a relatively low cost, increases building comfort, and can give you peace of mind, knowing that the building will require fewer stressful service calls.

### WHAT IS RETRO-COMMISSIONING?

The term “commissioning” comes from shipbuilding. Before a ship is commissioned or placed in active service, it must undergo a series of sea trials to identify any deficiencies. In building construction, commissioning is a quality-assurance process that ensures new buildings are designed, constructed, and programmed for optimal performance. Building systems (HVAC, mechanical, electrical) are tested to see whether they are performing according to their intended design.

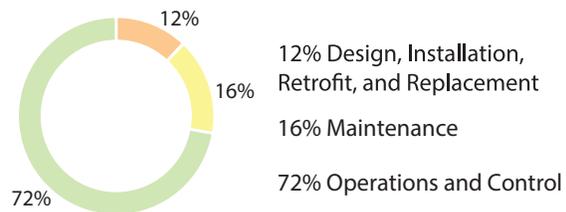
Retro-commissioning (RCx) applies this process to existing buildings that may or may not have ever been commissioned. It can also be used for buildings that have experienced major changes in occupancy or operation. Retro-commissioning can address problems that occurred during design or construction or that have developed over years of use. RCx helps buildings make the most of their energy systems by identifying what needs to be repaired, tuned, or better maintained to meet needs and reduce energy costs. Typically, RCx measures are fairly low cost with very quick payback because they are not capital-intensive projects.

### HOW IS RETRO-COMMISSIONING DIFFERENT FROM AN ENERGY AUDIT?

Energy audits typically address the whole building and may include capital-intensive, longer-life measures, such as replacing outdated lighting systems with newer lamps or upgrading a boiler to a more efficient model. Whereas nearly any facility could benefit from an energy audit,

retro-commissioning best serves buildings that may have issues that began during design and construction, or that have developed over years of use.

Compared to energy audits, retro-commissioning focuses more on operational and maintenance improvements, often requiring less capital investment to achieve significant savings. The graph below shows the kinds of measures that are most frequently implemented in retro-commissioning projects<sup>1</sup>.



### BENEFITS OF RETRO-COMMISSIONING

Researchers at Lawrence Berkeley National Laboratory (LBNL) concluded that retro-commissioning is one of the most cost-effective means of improving energy efficiency in buildings. Facilities that complete retro-commissioning increase their operational efficiency, significantly lowering energy bills. LBNL researcher Evan Mills found that buildings participating in retro-commissioning had an average energy savings of 16%, and projects took a mere 1.1 years to pay back, on average.<sup>2</sup>

SEDAC has also found retro-commissioning to be incredibly cost-effective. SEDAC has completed over 100 RCx projects, with a median identified savings of 16%, and an average 1 year simple payback.

Besides cost savings, retro-commissioning can improve air quality, increase occupant comfort, extend equipment life, decrease the amount of service calls needed, and help you comply with energy-efficiency standards. Retro-commissioning can give you peace of mind, knowing that your building is operating as it should.

## WHAT DOES RETRO-COMMISSIONING ENTAIL?

Retro-commissioning is a collaborative partnership between the building stakeholders and the retro-commissioning provider and team. A team of engineers and tradesmen assesses systems and maintenance programs and makes recommendations for how to update mechanical, electrical and control systems to maintain optimal efficiency. Facility managers actively participate by interfacing with the RCx team, providing plans and utility bills, arranging for contracted services, and tracking implementation expenses.

The RCx team first provides a detailed utility bill analysis and reviews construction and equipment documents. Then, working with the building staff, as well as the mechanical, electrical and controls contractors, the RCx team assesses the building systems and identifies measures to help restore the building to optimal performance.

The RCx team employs the building automation system (BAS), stand-alone data loggers, or hand held instruments to diagnose system malfunctions such as failed sensors, actuators and valves that are not functioning properly, and equipment in alarm states. Data trends are used to examine system operational behavior and verify that control strategies produce the desired outcome. The RCx team performs functional testing of select systems and identifies opportunities to improve control settings and schemes.

The RCx team may also identify failed equipment; equipment in need of cleaning, adjusting, or replacement; and suboptimal equipment run hours or settings. Sometimes the RCx team also finds errors in equipment identification and labeling or building design issues that make it challenging to maintain comfort within the space (such as outdated equipment zoning).

After the assessment, the RCx service provider will quantify the energy and cost impact of significant retro-commissioning measures and present them for your review, approval, and potential implementation. You decide what to implement and who will provide any repair and construction work. During implementation, your RCx service provider will be available for discussion. Once you have worked through the retro-commissioning cost-savings measures, the RCx service provider will verify that these measures have improved conditions by inspecting the site, analyzing trends, and reviewing BAS programming.

Your service provider will suggest methods for sustaining the operational gains through on-going maintenance procedures, energy tracking, and training of building operators and occupants.

<sup>1</sup>Building Efficiency Initiative, "Retro-Commissioning: Significant Savings at Minimal Cost." Figure Data Source: Mills, E., 2009. "Building Commissioning: A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions."

<sup>2</sup>Mills, E., 2009, "Building Commissioning: A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions." Report prepared for California Energy Commission Public Interest Energy Research (PIER).

## RCX PROGRAMS AND RESOURCES

Public Sector projects in Illinois may be eligible for SEDAC's Public Sector RCx program: <http://smartenergy.illinois.edu/retro-commissioning.html>

Private sector projects may be eligible for retro-commissioning programs through their utility providers. See, for instance:

ComEd Retro-commissioning  
<https://www.comed.com/WaysToSave/ForYourBusiness/Pages/RetroCommissioning.aspx>

Ameren ActOnEnergy  
<http://actonenergy.com/for-my-business/explore-incentives/retro-commissioning>

Energy Star's Building Upgrade Manual  
<https://www.energystar.gov/sites/default/files/buildings/tools/EPA BUM CH5 RetroComm.pdf>

Mills, E. 2009. "Building Commissioning: A Golden Opportunity for Reducing Energy Costs."  
<http://cx.lbl.gov/documents/2009-assessment/lbnl-cx-cost-benefit.pdf>

## SEDAC

The Smart Energy Design Assistance Center (SEDAC) assists buildings and communities in achieving energy efficiency and becoming more sustainable. SEDAC is an applied research program at the University of Illinois at Urbana-Champaign and a public-private partnership that operates in collaboration with the 360 Energy Group.

