Retro-commissioning in a Campus Energy Efficiency Program

By Christopher Powell

By now we have all heard of retro-commissioning (RCx), but how many of us employ this strategy as a regular practice for minimizing energy waste in our facilities? It's easy to say that we should do it, but how do you get started. Many questions come to light:

- What exactly is retro-commissioning?
- How much should it cost?
- What are your expectation for savings and other benefits from conducting RCx?
- How do I select appropriate buildings?
- What financial criteria will you employ to decide on which opportunities to implement?
- How do I find a qualified contractor and/or do we have internal staff whom could be trained? If so, where are training programs offered?
- What documents do I need? An RFP/scope for hiring consultants, an outline of the RCX process, building descriptions to deliverables such as weekly progress reports, and the final RCX report.
- What should be included in the final report?
- Does my local electric utility or other entity have electricity or natural gas energy conservation programs and is can they assist with funding or other resources to help start your RCx program.

I'll try to do my best to answer these questions.

Many if not most institutions have some level of energy conservation program today to help control energy usage. An RCx process can be a great addition, or can be the focal point of a program. It really depends on the condition of your building stock. How old are the systems? How much deferred maintenance exists? How well are buildings being maintained? Do you have existing buildings that have never been commissioned to restore them to optimal performance?

RCx is a systematic approach for conducting forensic evaluations of your buildings and its systems. This is accomplished through a documented and well-defined process that identifies low-cost operational and maintenance changes in existing buildings to bring your building back to original design standards at a minimum. It can also be expanded to include identifying technologies or practices to achieve better than design conditions. It should not be confused with new building commissioning services, which requires different processes and different expertise.

> IT'S ALSO IMPORTANT TO KNOW IF RENOVATIONS OR MODIFICATIONS ARE PLANNED AS THIS MAY LIMIT THE SCOPE OR DELAY THE TIMING OF AN RCX INVESTIGATION.

RCX COSTS AND SAVINGS ESTIMATES

Industry estimates[1] report costs ranging from $.13/sq. ft. to $.45 per sq. ft.. At Brown University we have completed RCx on 18 buildings encompassing approximately 2 million sq. ft. for an average cost of $.36 per sq. ft. However, our scope included identifying both RCx measures (<2 year payback) and capital intensive measures to enable us to go beyond design along with energy modeling. **When combining all measures, our average internal rate of return has averaged approximately 40 percent as compared to an 8.5 percent IRR threshold**.

Identifying appropriate buildings for RCx is not as simple as it sounds. You might think the oldest buildings would have the best opportunities, but this is not always the case. New buildings can have major savings opportunities even when new building commissioning has previously been performed. Typically, the best way to start the process is to calculate the energy density — or Energy Utilization Index (EUI) of your buildings in (BTU/Sq Ft). This can be compared to similar buildings in your area or on your campus or compared to national data via the EIA's Commercial Buildings Energy Consumption Survey (CBECS) *www.eia.gov/emeu/cbecs/contents.html*.

However, even this is not perfect as your building could have some additional loads from research, computing or just additional hours of operation or additional outdoor air requirements among other things. In the end some combination of these steps along with interviews of building mechanics or controls technicians and users can help narrow down the prospective buildings. It's also important to know if renovations or modifications are planned as this may limit the scope or delay the timing of an RCx investigation.

Finding a qualified consultant can also be a daunting task. Talking to other institutions or your local utility company and finidng out if they administer energy conservation programs is a great start. Additional resources can also be found through organizations such as the Building Commissioning Association *www.bcxa.org*. If you are having trouble finding a qualified consultant, you can also send your own internal HVAC and controls mechanics and engineers to training offered by many organizations.

As far as documents and tools, the best source is the Portland Energy Commission (PECI *www.peci.org/*). However, many of their tools have been expanded by PECI for other organizations, most notably the California Commissioning Collaborative (*www.cacx.org/resources/rcxtools/index.html*) or the New York State Energy Research and Development Authority (NYSERDA) *www.nyserda.org/programs/pdfs/retrocxhandbookfinal040704.pdf* among others. These have all the tools and sample reports you will need to create a robust RCX program that is a permanent part of your institution's energy savings and greenhouse gas reduction strategy.

IF YOU ARE HAVING TROUBLE FINDING A QUALIFIED CONSULTANT, YOU CAN ALSO SEND YOUR OWN INTERNAL HVAC AND CONTROLS MECHANICS AND ENGINEERS TO TRAINING OFFERED BY MANY ORGANIZATIONS.

Christopher Powell is the director of sustainable energy and environmental initiatives at Brown University in Providence RI. He may be contacted at *christopher_powell@brown.edu*. This is his first article for *Facilities Manager*.

REFERENCES

1. Mills, E, H. Friedman, T. Powell, N Bourassa, D. Claridge, T. Haasl, and M.A. Piette, "The Cost-Effectiveness of Commercial-Buildings Commissioning," Lawrence Berkeley National Laboratory.