Pacific Northwest
NATIONAL LABORATORY
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Retro-commissioning Sensor Suitcase

Challenge

Half of all commercial floor space in the U.S. consists of commercial buildings with floor areas less than 50,000 square feet. There are at least 4.6 million buildings in that size range, and they account for 44 percent of commercial building energy consumption—about 2.9 quads of site energy per year in 2003. None of these buildings have been retro-commissioned; hence most are not operating at their peak efficiencies.

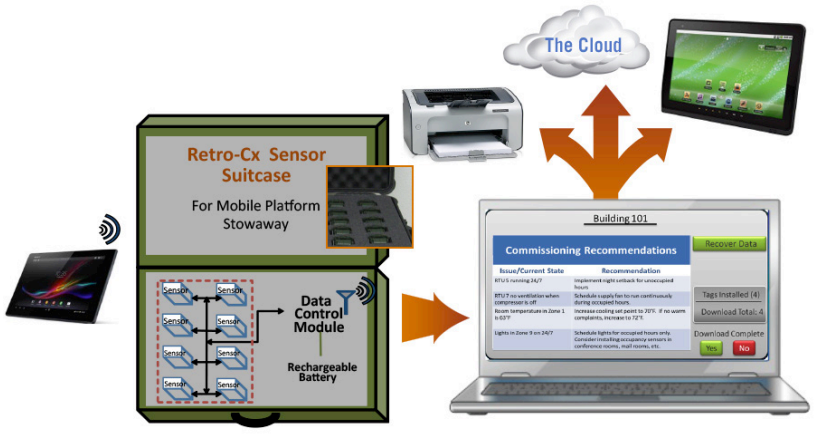
The total savings for retro-commissioning a commercial building averages about 15 percent. Commercial buildings with less than 50,000 square feet of floor area should achieve greater savings from retro-commissioning (RCx) because they are not operated and maintained as well as larger buildings, which have on-site operation and maintenance staff. Total annual savings potentials from retro-commissioning (RCx) of these smaller buildings are 435 trillion Btu of site energy worth about $7.5 billion based on 2003 consumption and prices.

The Retro-commissioning Sensor Suitcase

Pacific Northwest National Laboratory (PNNL) and Lawrence Berkeley National Laboratory (LBNL) have developed a retro-commissioning system that can help penetrate the retro-commissioning market for small buildings. The RCx sensor suitcase enables non-experts to automatically identify and make building-specific low- or no-cost improvements to decrease building operating costs and increase comfort and efficiency. Thus this tool offers a business opportunity to existing and new businesses. The RCx sensor suitcase targets small commercial buildings that lack integrated building automation systems, which are frequently used in larger buildings.

Here's how it works:

The service provider initiates the RCx process by using the sensor suitcase and its handheld tablet computer to guide installation of logging sensors at strategic building locations.



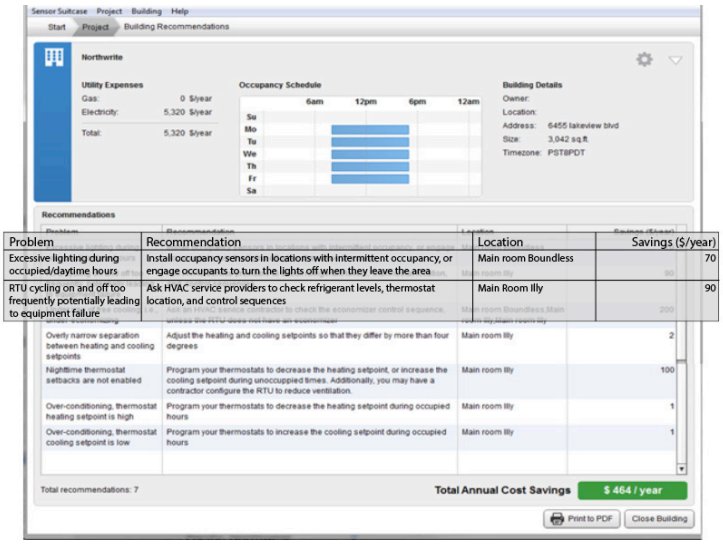
Retro-commissioning Sensor Suitcase System

As part of the process, the suitcase stores data on each sensor identifying the building in which it is installed, the type of measurement made by the sensor, and the sensor location (e.g., the room name or number). The tablet also provides easy-to-understand graphical instructions that guide the user in initiating configuration of each sensor and properly installing it. The sensors are left in place for 4 to 6 weeks and then retrieved, with each sensor returned to any slot in the suitcase. The data on the sensors are then transferred from the suitcase to a computer used for data storage and running the suitcase RCx analysis software; the software generates improvement recommendations. Finally, recommendations are implemented directly by the building owner or a service provider.

Analysis Software

Analytic software developed by LBNL processes data from the sensor suitcase to automatically develop building-specific recommendations for improving the operation of the building. Implementation of the recommendations decreases energy costs, improves the comfort of occupants, and extends the lives of building equipment. The software uses a graphical user

interface to simplify user interactions and clearly present the recommendations. For each recommendation, the software provides the annual energy cost savings, an explanation of the existing problem, and a description of the recommended action to alleviate the problem, improve operations, and reduce building operation costs.



Retro-commissioning recommendations from the sensor suitcase

Early Market Feedback

Initial feedback from a small group of potential users indicated a strong and positive interest in the sensor suitcase. Some of the key responses received during this initial inquiry included:

- The sensor suitcase's guided sensor configuration and installation could significantly reduce labor time and required expertise.
- The projected price point of $1,000-$1,500 seems reasonable.

Interested companies should contact:

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Sensor Suitcase Field Tests Show Promise

PNNL and LBNL researchers recently performed field tests on two small commercial buildings in Berkeley, California, and in the Portland, Oregon area. The suitcase system identified potential savings of up to 9 percent from simple measures such as using thermostat setback at night, eliminating short cycling of the rooftop units, using outdoor air economizing, and eliminating excessive daytime lighting use.

- The sensor suitcase helps penetrate a market that's in "dire need."
- The sensor suitcase complements existing products and services.
- Technology is "pretty versatile and could give you data where you wouldn't otherwise know what the actual operating conditions are."

Partnering Opportunity

The U.S. Department of Energy Building Technologies Office has funded PNNL, LBNL and Oak Ridge National Laboratory to work with industry partners to move the RCx Sensor Suitcase from a laboratory prototype to a commercially available product used to provide retro-commissioning services to the smaller commercial building market. We are seeking a vendor/manufacturing partner to participate in this project with the intent of ultimately offering a commercial product based on the RCx Sensor Suitcase concept. Among other activities, the project will join the vendor/manufacturer with early deployment partners who have expressed significant interest in using the Suitcase in offering RCx services to smaller commercial buildings. As part of this project, the national laboratories will support technical and market analyses, planning, technical assistance in understanding and using prototyped capabilities, product development assistance, and testing of product prototypes. Our goal is to move the RCx Sensor Suitcase concept to commercial availability by the end of 2017.

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U.S. DEPARTMENT OF ENERGY

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