Energy Innovators Initiative

Technical Fact Sheet

Recommissioning – The Optimization of a Building Systems' Operation

Background

Commercial and institutional buildings frequently undergo operational and occupancy changes. These changes, together with limited resources for preventive maintenance, challenge the ability of a building's heating, ventilating and air-conditioning (HVAC) equipment and other mechanical and electrical systems to perform at optimal levels.

Studies have demonstrated conclusively that these changes contribute to a decrease in a building's performance and can lead to indoor air quality problems and higher energy costs. These studies have also shown that, with minimal expense (no capital investment), it is possible to bring a building to its optimal operational level. This can result in improved indoor conditions and energy savings in the order of 5 to 15 percent with a payback period of less than two years.

Recommissioning Defined

Recommissioning is a holistic, systematic process applied to existing buildings to identify and implement operational and maintenance improvements, and to ensure continued performance over time. Also known as "retro-commissioning," it assures system functionality. Recommissioning optimizes how equipment and systems operate as well as how systems function together. Although recommissioning may include recommendations for capital improvements, its primary focus is on building operation. Recommissioning is not a substitute for major repair work; in fact, repairing major problems must be done prior to recommissioning.

Traditional energy audits focus on investigating *equipment replacement or retrofit opportunities,* while recommissioning explores opportunities for *low-cost operation and maintenance (O&M) improvements.*

The Recommissioning Process

The following flow chart and table demonstrate the various phases and activities of the recommissioning process. Although the flow chart shows the activities sequentially, they can be implemented concurrently or, depending on the project, completely eliminated.

Table 1 – The phases and activities of the recommissioning process

Planning Phase	• development of project plan (can be done in-house if staff and expertise are available)
Investigation Phase	• assessment of current building systems' operations and maintenance • identification of potential improvements • selection of most cost-effective improvements • implementation of simple, obvious and less expensive repairs and improvements
Implementation Phase	• completion of more complex improvements
Hand-off Phase	• integration of recommendations and modifications into a building's O&M and energy management plan • estimation of the return on recommissioning investment

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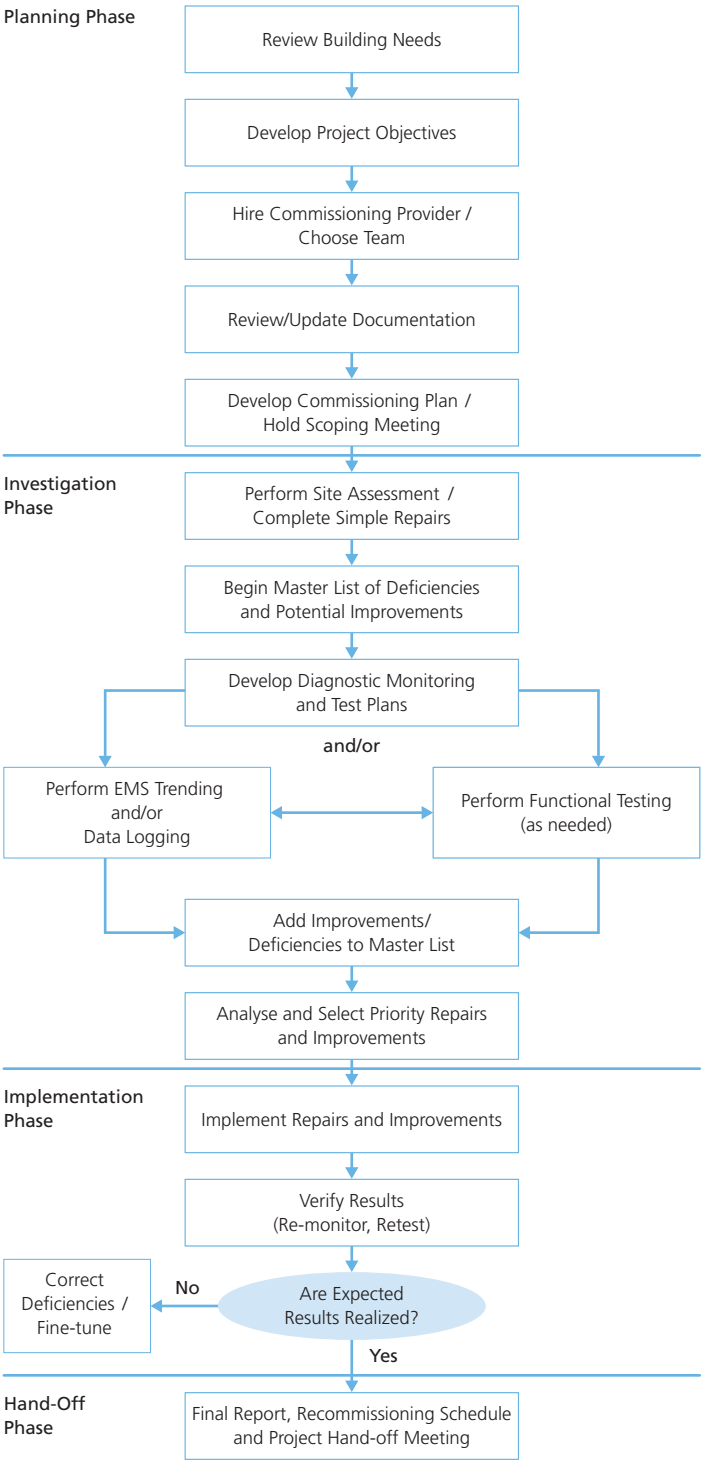
Figure 1 – The phases and activities of the recommissioning process[1]



Benefits of Recommissioning

Impact on Tenant Satisfaction

Improved building operation enhances air quality and thereby reduces occupant dissatisfaction. Although little research has been completed to document the link between comfort and productivity, it is a popular theory that comfortable employees will be more productive. Based on data from Statistics Canada, the office segment, including government services, generates more than 50 percent of Canada's gross domestic product (GDP). Financial, insurance and real estate segments account for more than 25 percent, while health care, education and retail services each contribute roughly 10 percent to total GDP. A recent study reported that higher levels of indoor air quality could lead to a 0.25 percent increase in productivity which, the study claims, represents approximately $90 per person.[2] Given that the commercial and institutional sectors employ almost 5 million people in Canada,[3] the value of increased productivity from higher levels of indoor air quality is estimated to be as much as $4.5 million.

Impact on Owners and Operators

A direct impact of recommissioning for building owners and operators is the reduction of energy and demand costs due to improved building operation. A 1996 U.S. study of the cost effectiveness of recommissioning 44 existing buildings revealed attractive paybacks, even when the estimates were based solely on energy cost savings. Recommissioning proved to have modest project costs of between $10,000 and $80,000, resulting in whole-building energy savings of between 5 and 15 percent.

[1] Modified from Haasl, T. and Sharp, T. 1999. *A practical guide for commissioning existing buildings*, Office of Building Technology, US Department of Energy.
[2] Turner, F. "IAQ and Energy." *ASHRAE Journal*, Vol. 40, No. 12, pp. 7.
[3] Trimmel, F., et al. 1998. *Foundation paper on the commercial/institutional sector in Canada*. Prepared for Buildings Table, National Climate Change Secretariat.

The study demonstrated that recommissioning costs vary according to the complexity of the systems, the number of pieces of equipment and the scope of the project, rather than by building type. Only 10 of the 44 buildings studied had recommissioning costs exceeding US$3.01/m^2. Of these, 9 had a simple payback period of two years or less. The buildings ranged from medical facilities and schools to office buildings. The largest of the buildings recommissioned was a medical institution occupying 82 452 m^2 at a cost of US$28,000 or US$0.33/m^2. The most expensive recommissioning project was a 57 900-m^2 office building worth US$80,000 or US$1.38/m^2 with a payback period of six months.

Case Study

A recent study carried out at the Centre d'hébergement et de soins de longue durée (CHSLD) Biermans-Triest in Montréal demonstrated the impact recommissioning can have on a building's operating costs.

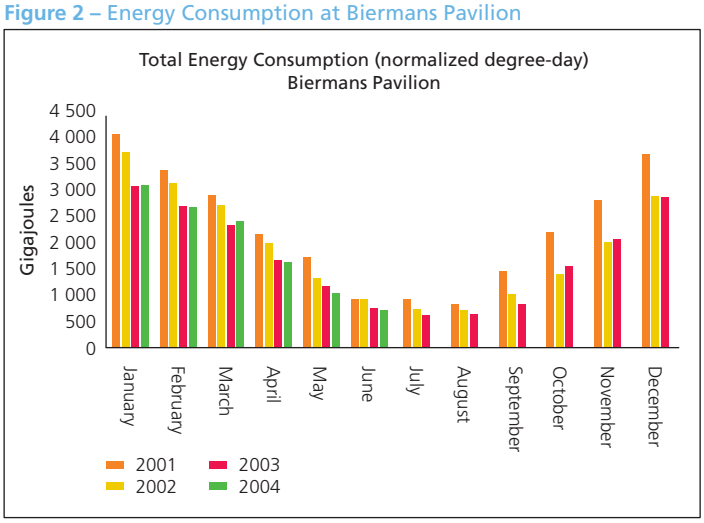
Providing care to 197 occupants, the Biermans Pavilion long-term care facility occupies three floors and covers 13 000 m^2. Thirty-eight percent of the building's surface area is allocated to rooms, 5.5 percent to office space and 9 percent to cooking and dining facilities, while the remaining areas are used for occupational therapy and physiotherapy, and mechanical and electrical services.

An assessment by a service provider prior to recommissioning indicated that the site was operated and maintained well, and that the building automation system was very thorough in its capabilities and was well utilized in general. The operations staff combined significant mechanical systems expertise with dedicated application of the control system and its capabilities.

The recommissioning study presented a series of recommendations that focused primarily on the ventilation system and other miscellaneous systems. An analysis of the HVAC system operation showed that the mixing air temperature was too low for the fresh air intake; consequently, the set point was adjusted accordingly. The study determined that the boilers were operated continuously to provide domestic hot water. It was recommended that a domestic hot water heater be installed, which allowed the operators to run the boilers only as outside temperatures descended.

Additional remote monitoring, combined with building-operator training, optimized the building systems, leading to an annual average reduction in energy consumption of 17 percent (Figure 2). This reduction netted the facility a savings in energy costs of $66,875 with a payback period of 0.41 years for an overall investment of $27,927.

Figure 2 – Energy Consumption at Biermans Pavilion



The EII and the Association des gestionnaires de parcs immobiliers en milieu institutionnel's (AGPI's) energy and environmental committees jointly produced this fact sheet.

The Energy Innovators Initiative, part of Natural Resources Canada's Office of Energy Efficiency, helps commercial businesses and public institutions improve energy efficiency and reduce greenhouse gas emissions that contribute to climate change.

For more information, contact
Energy Innovators Initiative, Office of Energy Efficiency, Natural Resources Canada, 615 Booth Street, 4th Floor, Ottawa ON K1A 0E9
Tel.: 1 877 360-5500 (toll-free) • **Fax:** (613) 947-4121 • **E-mail:** info.services@nrcan.gc.ca • **Web site:** oee.nrcan.gc.ca/eii
TTY: (613) 996-4397 (Teletype for the hearing-impaired)

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