Municipal Building Retrofits: The Business Case

What is a municipal building retrofit?

A building retrofit is an improvement to building infrastructure, and often to operating and management practices, that reduces utility (energy and water) and maintenance costs. A retrofit starts with a thorough audit to establish current costs and opportunities for savings. Improvements to infrastructure typically include mechanical, electrical and plumbing upgrades, as well as more precise control systems and conversion to renewable energy where appropriate. Staff training and new management and monitoring strategies ensure continued optimal operation and savings.

A building-wide or portfolio-wide assessment and coordinated renovations have already paid off for other Canadian municipalities, and they will pay off for you.

A Comprehensive Retrofit is Best

A comprehensive building retrofit has many advantages over implementing measures piecemeal. In a comprehensive retrofit, managers assess an entire building or portfolio of buildings and the whole range of efficiency opportunities. Measures that individually may pay for themselves over shorter or longer periods are combined into one package.

- As building engineers know, systems interact: changing one component always affects the others
- Combining short payback and long payback components creates a logical investment package that still meets established financial criteria
- Including longer payback measures in the retrofit increases your opportunity to renew the equipment that most needs to be replaced
- Working on a larger scale lowers purchasing costs and attracts more supplier competition
- Putting your project team to work on the whole building or portfolio of buildings will maximize the team's effectiveness and your investment in their skills.

FCM staff will walk you through every step of the comprehensive retrofit process, as well as put you in touch with peers and service providers in similar municipalities who have overcome the same challenges that you face.

The Case for Building Retrofits

Nationally, municipal operations consume about 60 million gigajoules of energy, at a cost of about $700 million per year. About 40 per cent is consumed in municipal buildings, at a cost of about $280 million per year. The energy required to power municipal building operations, given an average national fuel mix, emits approximately four million tonnes of carbon dioxide (CO2), the main greenhouse gas contributing to global warming and climate change. As a general rule, comprehensive building retrofits conservatively save 20 per cent of the utility costs of a facility or portfolio of facilities. Based on this, the following is considered achievable:

- Energy costs to municipal governments could be reduced, on a national basis, by about $56 million per year
- Given a simple project payback of five to seven years, a potential investment of $280 to $392 million dollars could be made in municipal building infrastructure
- Greenhouse gas emissions could be reduced by about 800 kilotonnes per year

In 1998, London, Ont., implemented a comprehensive retrofit program in municipally owned and operated buildings. The infrastructure investment was $3.7 million. An energy reduction of about seven megawatt-hours is expected to result in an annual utility cost savings of $478,000 per year. The project is expected to pay for itself in less than eight years. The reduction in energy use is also expected to reduce greenhouse gas emission by about six megatonnes per year. The project is expected to create 74 person years of employment for the London area.

Building retrofits get results

The benefits of a comprehensive building retrofit are many. FCM's MBRP program helps pinpoint where money can be saved now and for years to come, typically 20 to 25 per cent of annual building energy and water costs. You will not only justify, but pay for the investments you have been postponing. You will also create measurable results in cleaner air and water and a chance to show environmental leadership.

Stop losing money on utility bills and redeploy scarce tax dollars to improve assets. The "self-financing" nature of building retrofits allows asset renewal projects to move forward where the traditional capital approvals process may not.

Improve comfort, safety and productivity in your workplace and community spaces. The new technologies and improved operating practices generally create a better indoor environment for the occupants of the facility.

Reduce maintenance costs. New equipment can cost much less to operate than ageing systems. You also minimize your risk for costly emergency repairs.

Modernize buildings and bring operations in line with best practices. Managers have an opportunity to bring buildings and facilities up to code and retrain staff in best practices.

Upgrade staff credentials through training. Employees learn new energy-conscious techniques and master up-to-date systems.

Generate up to 20 local jobs for every $1 million invested. The Canadian government estimates that for every $50,000 invested in energy retrofits, one person year of employment is created. On a national scale, this represents an opportunity for between 5600 and 7840 person years of employment.

Show leadership and diligence in managing municipal assets. Retrofits demonstrate municipal government leadership in the community by addressing constituent demands for reduced energy use, reduced greenhouse gas emissions and environmental health and safety and responsible use of tax dollars.

Building Retrofits - What's Involved

In a comprehensive retrofit, managers assess an entire building or portfolio of buildings and the whole range of efficiency opportunities. Measures that individually may pay for themselves over shorter or longer periods are combined into one package. Building retrofit projects generally include some of the following elements:

Mechanical and plumbing systems are typically upgraded by:

- replacing inefficient boilers and cooling systems with high efficiency units
- replacing outdated cooling systems with higher efficiency ones
- installing variable speed motors and drives on pumps and fans that consume less energy than their constant speed counterparts
- converting air and water distribution systems to variable volume, which reduces energy consumption compared to a constant volume configuration
- installing renewable energy technologies such as solar pool heaters, or ground-source heat pumps or solar walls
- installing low-flow and flow-control devices to reduce the use of water
- expanding or installing modern digital control systems to more precisely control and monitor the operation of all systems, and to allow systems to be better scheduled

Electrical systems improvements can include:

- converting lighting systems to high-efficiency technology, like T8 lighting with reflectors or high intensity discharge lighting
- installing motion sensors to ensure equipment is only used when required
- installing digital lighting control systems
- converting electric heating to natural gas or solar power
- installing power factor correction capacitors to reduce utility charges

Retrofit projects may also include improvements to management and operations practices, such as:

- operating strategies and schedules to ensure equipment is only running when required, and that optimum settings are in place
- purchasing and maintenance practices to ensure high-efficiency equipment is used
- performance monitoring and reporting programs to ensure the project performs as expected
- Training staff in energy-conscious skills and techniques

What is the Process?

FCM's MBRP staff will walk you through every step, as well as put you in touch with peers and service providers in similar municipalities who have overcome the same challenges that you face.

Financing Building Retrofits

Building retrofit projects really do pay for themselves.

Your options include local borrowing or a range of internal financing mechanisms

- capital budget
- internal borrowing
- internal revolving funds
- energy performance contracting

FCM's Green Municipal Funds can support feasibility studies or implementation where there is a payback period of four to ten years or more.

The Green Municipal Enabling Fund can offer a grant towards half the cost of a feasibility study, which will establish your savings potential and targets.

The Green Municipal Investment Fund can provide loans or loan guarantees towards project implementation, if the project is sufficiently innovative and offers the prospect of substantial improvement over current performance.

Want to know more about the decision-making process that leads to a choice among financing options? ***See Case Studies:***

- Hamilton-Wentworth, Ont., chose internal financing
- Edmonton, Alta, developed an internal revolving fund
- Sudbury, Ont., choose capital funding
- Windsor and Toronto, Ont., relied on energy service companies

For information about help from the federal government, visit:
Commercial Buildings Incentive Program

Financing Building Retrofits : Capital Budgets

Sudbury, Ontario: Financing from the capital budget
When Sudbury conducted an energy audit of its facilities in 1995-1996, it identified a potential for $990,844 in annual savings, or a reduction of 28 per cent in the current annual energy bill of $3.4 million. The cost of the measures identified was estimated at $4.23 million, including project engineering and contingencies, with a simple aggregated payback of 4.27 years.

Analysis indicated that the identified measures could result in the reduction in carbon dioxide emissions of 24 per cent. Implementing the strategic energy plan was estimated to create 300 local jobs.

A financial model established the cash flow resulting from a full capital commitment to all the potential retrofit measures. The model also assessed various implementation

schedules with reduced capital commitments. The financial model showed that with an 18-month staged implementation schedule, the capital commitment to the project could be reduced by $500,000, compared to immediate full implementation. This was made possible by implementing short payback projects first and reinvesting the related savings in the projects with longer payback. A discount rate of 8 per cent was applied to determine net present value and benefit/cost ratio for investments. This is approximately equal to the region's cost of capital from external sources.

The region's finance department opted to fund retrofit activity from internal sources. Two internal funding scenarios were then further examined. These included:

1. Funding from current capital budget. Funding the retrofit measures entirely from the current capital budget would include a repayment scenario; all savings resulting from the measures could immediately reduce operating budget energy costs. The region could reinvest all savings that resulted from the measures in other regional initiatives.

2. Funding from a combination of current capital budget and reserves. In this scenario, it was assumed that the region was prepared to use approximately $1.2 million of its current capital budget towards the retrofit measures. In order to minimize interest costs for the retrofit program, it was assumed that the first $1.2 million would be made available at no interest. In addition, a draw of up to $3 million was assumed to be available from corporate reserves at an annual interest rate of 4 per cent. Interest was calculated monthly during the 24-month construction period, and annually thereafter. It was also assumed that all energy savings would be used to repay the reserves.

The region chose to finance the retrofit program from the capital budget.

In 1998, Sudbury Regional Council approved $4.23 million from internal funds for the implementation of the municipality's strategic energy plan.

The implementation schedule ultimately depended on the availability of project management, engineering and contractor skills over the course of the program. It was determined that phasing in the implementation would not have a strong impact on the long-term financial performance of the measures, since they have higher rates of return than the cost of borrowing for the program.

Financing Building Retrofits : Internal Borrowing

Characteristics of Internal Funds

Municipalities have a wide range of internal financing options. While criteria for undertaking energy retrofit projects using internal funds are not absolute, some common characteristics include:

- Strong internal support: With internal support and recognition for the work that needs to be done, it is much easier to secure commitment, resources and support for internally funded retrofit work.

- High return on investment: Municipal reserve funds are normally invested in safe government bonds that return low rates of interest. A well-quantified energy project usually provides a return greater than that earned by reserve funds.

- High ancillary benefits: If an efficiency project provides strong ancillary benefits to the community, such as local job creation and emission reductions, a stronger case can be made to use internal financing, especially if the project requires access to low cost internal financing.

Some advantages:

1. Better financing rates are often obtained through internal borrowing, compared to borrowing from outside the organization or having third parties borrow on behalf of the municipality (as energy services companies will do).

2. Internal funds can be made available at no interest as they involve fewer transaction costs.

3. Funds are usually available when needed.

4. All savings are returned to the municipality.

5. The municipal government can choose to do as much or as little external financing as required.

6. Riskier projects, or those that have lower rates of return, can still be funded from capital budgets.

Some disadvantages:

1. Using internal funds may delay or defer implementation of other projects.

2. Internal funds could be invested in financial vehicles that may provide a better rate of return.

3. Monitoring and verification of the savings and repayment schedule are needed.

4. There is a risk that borrowers could default on internal loans without recourse.

Financing Building Retrofits: Internal Revolving Funds

Revolving funds finance qualifying municipal projects on the condition that borrowed funds are repaid so that they are available for lending again. In theory, this revolving cycle of lending, repayment and lending continues until the fund is dissolved.

This is how a revolving fund works:

Inaugural funding: The money used to establish revolving funds can come from one or a combination of surplus funds: one-time budget allocations, yearly budget allocations, dedicated sales of assets, government grants or loans, industry and utility grants, loans, surcharges or payments.

Qualifying projects: Generally, a project must meet certain criteria before it qualifies for funding from the revolving fund. These criteria are usually defined in the fund mandate. In the case of revolving funds that are designed to finance energy retrofits, the criteria could relate to specific payback periods, targeted energy savings or specific emissions reductions. City departments or community groups could qualify. Some funds have provided forgivable loans or grants for efficiency upgrades or education campaigns.

Repayment options: To be a true revolving fund, money borrowed must be repaid so that it can be loaned again. In other words, the funds are continually "revolved." Traditionally, revolving funds required loans to be repaid at a rate of interest sufficient to maintain the value of the fund. Its repayment schedule is comparable to an energy service company's first-out contract, with scheduled repayments based similarly on energy savings from the project until all costs are recovered. The fund's repayment can vary: some funds require repayment of all energy savings, while others require repayment of only a portion of those savings. When only some of the savings are used for repayment, the remainder of the savings are either retained by the borrowing department's operating budget as a reward for undertaking the efficiency work, or they are directed to general revenues. When revolving funds capture the entire savings generated by the retrofit project, there are significant opportunities for growth. Other repayment options include fixed repayment with or without interest, and forgivable loans based on performance or other criteria.

Monitoring and verification: A revolving fund needs a monitoring and verification protocol to keep track of its money, progress of projects and repayment terms. Funds that require pre-established loan repayments need less monitoring because their repayments are not performance based. Funds that require repayment based on energy savings should have a well-defined monitoring and verification protocol to track energy savings and the amounts that must be repaid.

Energy Performance Contracting

For many Canadian municipal governments dealing with cutbacks in public sector funding, there is often little left for energy-efficiency programs such as building retrofits. And even if funds may be available, there is the question of expertise, expediency and measurable results. One way of implementing such programs is to contract an energy service company (ESCO) to carry out the retrofits and arrange the necessary financing.

Through an energy performance contract, an ESCO works with a municipal client to create the client's vision of a retrofit and renewal project, and then provides that project on a turnkey basis. The ESCO is willing to guarantee that, within a fixed time frame, the resultant savings will repay the funds spent on the work. This guarantee minimizes the municipality's financial risk. The federal government has implemented over $200 million of retrofit work with ESCOs using this approach to business.

It works like this:

- The ESCO will bring a lending institution into the discussions once the project's size and scope are approximated.
- The lender provides the funds to implement the work, and the municipality commits to paying the lender back.
- A repayment schedule is struck that mirrors the anticipated annual savings, the idea being that no new budget funds are needed from the municipality. The department(s) concerned simply continue to budget the same amount as before for utilities.
- The ESCO and the customer regularly review the actual savings against the repayment schedule. Any shortfall is made up by the ESCO to the municipality.
- Over the course of the contract, utility savings flow to the ESCO. By the end of the contract term, all savings revert to the municipality.

Most ESCOs provide a full range of energy-efficiency services, from energy audit to design, financing, construction, energy management and monitoring of savings. These companies operate on a design-build principle, that is the architects, engineers and contractors all work under a single contract and represent the same organization rather than working individually for the municipality or building owner. The owner buys the services in "bulk" on the understanding that the project will meet predetermined criteria and results. The owner's time is spent on planning, review and approval of the work, but not on detailed implementation or subcontractor management. This frees up municipal staff for other work assignments.

Besides advantageous financing options, the benefits of contracting an ESCO include technical expertise, project management experience and a speedy implementation of energy-efficient measures. Since ESCOs specialize in energy efficiency and are given a comprehensive mandate to deliver within a specific time frame, they generally complete retrofits more rapidly and effectively than conventional building contractors.

Recently, ESCOs have been expanding their range of services beyond building retrofits to include facility management, sometimes under private-public partnerships. Under such a partnership, an ESCO may design, build and operate a building for a municipality. The ESCO or another firm owns the building and leases it back to the municipality. The ESCO manages the property and guarantees operating costs over the life of the building. Some ESCOs are also applying their expertise in energy matters to become players in the utility industry, by buying and selling power, for example.

For more information about ESCO's, contact the Canadian Association of Energy Service Companies at (416) 969-9208 or visit their Web site at http://www.ardron.com/caesco

The Natural Resources Canada Web site at http://oee.nrcan.gc.ca/fbi/bidders.cfm provides a list of firms already qualified for the Federal Buildings Initiative (FBI).