

# towerwise

## retrofit case studies

### The Benefits of an Energy Retrofit

Many people ask the question: What are the best measures to use to reduce my costs? How can I be sure that the information I am getting is factual and is not just put forward by a company or service provider looking to sell a product? Isn't every building different?

The example below is from a large condominium building retrofit undertaken in Toronto. It illustrates the costs and payback of various measures and addresses issues such as escalating utility costs and the costs of waiting for price discounts / decreases. Following this example are other short case studies from a variety of different building types.

### What measures can be used and what can be accomplished?

This discussion is based on projections completed by the Energy Efficiency Office of the City of Toronto. In this case, the actual project results were equal to or better than projected. Although it was a larger project, the example below demonstrates a large number of different energy-use reducing measures that can be applied in many buildings.

Measure	Annual Savings \$	Capital Cost \$	Payback years	CO <sub>2</sub> Kg
HVAC	56,448	180,000	3.2	336,676
High Efficiency Heating Boiler	24,976	85,000	3.4	116,827
High Efficiency DHW (hot water) Boiler	11,609	61,000	5.3	54,302
Carbon Monoxide System	6,984	27,000	3.9	66,559
Booster Pumps VFD (variable frequency drive)	6,457	18,800	2.9	61,539
Cooling Tower Fan Motor VFD	1,922	26,000	13.5	18,319
Existing Chiller Motor VFD	7,600	85,000	11.2	72,428
Chilled Water Temp Reset	1,000	5,000	5.0	9,530
Building Automation System	5,923	70,000	11.8	44,869
Whirlpool and Pool Covers	771	3,500	4.5	3,605
Lighting Retrofit	13,068	42,096	3.2	124,534
Lighting Retrofit: Suites	8,488	6,000	0.7	80,894
Low Flow Showerheads	8,762	2,261	0.3	26,469
Pool Heating	8,122	31,000	3.8	99,202
Training and Education	6,613	5,000	0.8	44,869
<b>TOTAL</b>	<b>\$168,743</b>	<b>\$647,657</b>	<b>3.8</b>	<b>1,160,624</b>

In this case, **the total percentage of costs saved was 30%** and the retrofit was accomplished with very little disruption to the individual suites. Deeper savings might have happened with some additional work, such as installation of low-e windows, high-efficiency appliances, a geothermal heat-exchange system or a solar hot water system. Every building is different, and once a current energy usage baseline is established, modeling potential results is a key next step in completing an energy efficiency retrofit.

### What else can we see from this chart?

**First**, usually a combination or “bundle” of measures achieves deep results. And none of these measures is a “Star Trek” technology — they are all available off-the-shelf today.

**Second**, we can readily determine that the leading areas in terms of fast **payback** (how fast does my money come back through saving in terms of years. On TowerWise.ca see “Step 3: Moving Forward with a Retrofit” for a helpful discussion of payback measures) usually comes through the retrofit of heating systems and boilers.

**Third**, buildings need to be kept tuned and in fighting trim. Training of operators and commissioning are very important pieces of keeping the fighting edge. This means that those responsible for operating and managing the building’s energy costs need specific training.

**Fourth**, what is also very good news is that we also reduce environmentally harmful byproducts of energy use. In this case, over 1 million kg in greenhouse gases (CO<sub>2</sub>) will be eliminated each year. That creates a significant positive impact on the environment.

### What will it cost?

A better question is: **What is the cost if a retrofit is not done?** In the case above, the condo corporation invested **\$647,000**. The capital was back in place and in its control in less than four years. Beyond that point, the owners will continue to gain a further savings of **\$165,000** per annum (or a 30 % return on the initial investment) until the retrofitted items need to be replaced again. In the case of many of these measures, lifespans will stretch out for seven to ten years after payback, resulting in total net savings of well over **\$1,000,000**.

Therefore, a retrofit can **provide excellent protection against escalating utility and maintenance costs**. With utility costs accounting for up to 40 % of monthly condo fees, retrofits can actually reduce costs over time or level out or reduce the impact of rising utility bills. And the savings from the retrofits pay for the initial cost and then continue well past the payback period.

One of the challenges for many people is that as utility costs increase, the energy dollars that are saved from the retrofit don’t look as big as was initially thought. That is why it is important to focus on two issues:

1. That the cost of waiting to do the retrofit is higher than doing the retrofit: The cost of waiting two years to gain a 20 % decrease in initial costs means leaving more than \$300,000 in savings on the table.
2. Inflation and deflation of prices will have an impact, but while rising prices will generate a greater positive return for retrofit spending, falling prices will still result in an overall positive impact, albeit smaller.

You can get more help with planning a retrofit on the **TowerWise.ca** website, where, you’ll find spreadsheets for recording your baseline energy usage and for calculating the potential payback from a retrofit,(also see Step 3: Moving Forward with a Retrofit for a helpful discussion of payback measures), information on incentives and links to many resources.

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## Retrofit Snapshots

The following short case studies are based on projects supported by the City of Toronto's Better Buildings Partnership (BBP). For more on the BBP and its programs, visit [www.toronto.ca/bbp](http://www.toronto.ca/bbp).

### Celebrity Place

77 Maitland Place, Toronto

This condominium consists of two 19-storey reinforced concrete apartment towers connected by a 6 storey link. The towers have many recreational facilities for the residents to enjoy, such as an indoor pool, racquet and squash courts, and a state of the art fitness centre. Since its original construction in 1985, Celebrity Place has had no major additions or renovations.

To deal with the rising utility costs, Celebrity Place worked with an Energy Management Firm to implement energy retrofits. These included increased airflow for improved comfort, new light fixtures for improved light levels, new condensing (high efficiency) boilers, new chiller and corridor system upgrades. A new building automation system was also installed for improved building operation. The overall project reduced annual maintenance and allowed building staff to respond more pro-actively to maintenance issues.

#### Project savings

Annual Energy Savings: 3,267,557 ekWh

Project Cost: \$686,920

Annual Cost Savings: \$103,998

Payback Period: 6.6 years

Annual Carbon Dioxide (CO<sub>2</sub>) Reduction: 1,093 tonnes

### York Condominium Corporation (YCC) #380

301 Prudential Drive

YCC #380's 16-storey residential tower consists of 192 one, two and three bedroom suites. The total gross floor area of this condominium is over 367,000 ft<sup>2</sup>. Since its construction in 1976, this facility had undergone no major additions or renovations. The major building systems were largely original equipment. To improve occupant comfort, the facility implemented significant mechanical system upgrades and improvements. These included new condensing boilers for heating and domestic hot water. A new building automation system was also installed. All windows and doors were caulked and refurbished with new weather stripping and the corridor ventilation system was improved.

The savings from the energy-related retrofits were able to fund the improvements and ensure at least a neutral cash flow impact for the condominium. The retrofits also had a positive impact on YCC #380's current reserve fund study.

#### Project savings

Annual Energy Savings: 1.7 million ekWh

Project Cost: \$313,223

Annual Cost Savings: \$46,320

Payback Period: 6.7 years

Annual Carbon Dioxide (CO<sub>2</sub>) Reduction: 434 tonnes

**York Condominium Corporation (YCC) #386**

100 Prudential Drive

YCC #386's 16-storey residential tower consists of 192 one, two and three bedroom suites. The total gross floor area of this condominium is over 367,000 ft<sup>2</sup>. Since its construction in 1976, this facility had undergone no major additions or renovations. The major building systems were largely original equipment. To improve occupant comfort conditions, the facility implemented significant mechanical system upgrades and improvements. These included new condensing boilers for heating and domestic hot water. A new building automation system was also installed. To improve tenant comfort all windows and doors were caulked and refurbished with new weather stripping and the corridor ventilation system was improved.

The savings from the energy-related retrofits were able to fund the improvements and ensure at least a neutral cash flow impact for the condominium. The retrofits also had a positive impact on YCC #386's current reserve fund study.

**Project savings**

Annual Energy Savings: 1.9 million ekWh

Project Cost: \$337,112

Annual Cost Savings: \$50,384

Payback Period: 6.7 years

Annual Carbon Dioxide (CO<sub>2</sub>) Reduction: 474 tonnes

**Neill-Wycik Student Cooperative**

96 Gerrard Street East

Neill-Wycik Co-operative College is a 22-story residence for students attending Ryerson University and George Brown College in Toronto. Since 1967, Neill-Wycik has operated year round. During the summer months the facility is open as a summer hotel, offering affordable accommodation to travellers from around the world. The building houses 780 people, as well as providing office space, and offers its residents many services including laundry facilities, a cafeteria, a library, activity and games rooms, and a wood shop.

Since its construction no improvements had been made and boilers for heating and domestic hot water were failing at an alarming rate. Corridor lighting needed to be improved and all the washrooms needed to be completely refurbished with new tiles and fixtures. Windows were single glazing and so draughty that it presented serious comfort problems to the students.

To address these problems all boilers were replaced with new high efficiency models, ventilation systems were retrofit and made more energy-efficient, all windows were refurbished with caulking and weather stripping, lighting throughout the building was replaced with energy-efficient bulbs, and all bathrooms were completely renovated with new tiles and water efficient fixtures. Finally, a new central telephone system was installed to replace all individual phones, an upgrade financed by the savings from the energy retrofits.

**Project savings**

Annual Energy Savings: 2.3 million ekWh

Project Cost: \$1.65 million

Annual Cost Savings: \$113,000

Payback Period: 14.6 years

Annual Carbon Dioxide (CO<sub>2</sub>) Reduction: 572 tonnes

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## Supportive Housing Coalition (SHC) of Metropolitan Toronto

179 Broadview Avenue

SHC provides, promotes and supports accessible housing primarily for individuals suffering mental illness, as well as people with special needs. The challenges and financial constraints, mental illness and personal trauma experienced by people with special needs results in very few options for accessible, affordable and quality housing in our society SHC continues to work towards a tenant-focused management model with input from tenants that will address issues related to housing needs and helps to strengthen relations among all stakeholders.

The 48,335 square foot building was originally electrically heated. As the cost of electricity increased it became increasingly more expensive to heat the building. Using innovative technology a hydronic, gas-fired heating system was installed after the electric base board heaters were removed. A new boiler room was created in the basement and equipped with high-efficiency boilers. Energy-efficient lighting and water efficiency features such as ultra low flush toilets and low flow shower heads were also installed.

### Project savings

Annual Energy Savings: 99,600 ekWh

Project Cost: \$227,500

Annual Cost Savings: \$22,940

Payback Period: 9.9 years

Annual Carbon Dioxide (CO<sub>2</sub>) Reduction: 356 tonnes

For more information on the benefits of energy retrofits and helpful resources and advice, visit

**[www.TowerWise.ca](http://www.TowerWise.ca)**

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 **TORONTO** Atmospheric Fund

**[www.toronto.ca/taf](http://www.toronto.ca/taf)**