Framework to Achieve a 50% Energy Reduction in the Existing Multi-Unit Residential Condominium Sector:

People
Process
and
Products

Sharing what we know, providing the support and working together will achieve success!

Authored by Energy@Work

Abstract
Existing multi-unit residential buildings (MURBs) account for 18% of energy use in the residential sector. However, the energy performance in this sector is not improving despite technological developments and climate awareness. This paper summarizes a framework for condominiums to achieve a 50% energy reduction based on:
i) Commercial office experience that achieved a 50% reduction in electricity use,
   (verified by Toronto Hydro)
ii) A review of 182 condominium submissions into Ontario’s provincial database (O. Reg 506/18)
   (Energy, Water Reporting and Benchmarking (EWRB) plus building information)
iii) A peer review of the framework that offered challenges, opportunities and suggestions.

The framework is recommending a phased approach to achieve short, medium, and long-term objectives to secure stakeholder support. The framework was made possible by Sustainable Buildings Canada (SBC) and the contribution by Crossbridge Condominium Services. The essential elements of people, process and products are provided that can lead to the framework’s objective of a 50% reduction.
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Executive Summary

Canada’s multi-unit residential buildings (MURBs) account for 18% of the country’s residential energy consumption. The adoption of energy reduction measures has not kept pace with other sectors. For Canada to reach its Greenhouse Gas (GHG) reduction targets, it is essential that MURBs participate. This is particularly important in urban areas where growth is exponential.

The MURB sector is extremely diverse, consisting of different buildings, ownership types, and regulations. Although the focus of this framework is on how the existing condominium sector can reach a 50% energy reduction target, other sectors can adopt the principles to incorporate: *i) experience from commercial sector success, ii) data from 182 condominiums that were submitted into the provincial data base and iii) a distinguished peer review.*

**i) Energy@Work** achieved $1.7 Million in electricity savings between 2017-19 across 22 commercial offices and verified by Toronto Hydro. **ii) In 2019, energy and water data from 182 condominiums were submitted into the provincial database.** The data were analyzed to discover a lack of knowledge on energy efficiency, utility systems, and insufficient resources to address efficiency within the condominium sector. **iii) Together, these two initiatives were presented to the peer group, who challenged the feasibility of condominiums achieving a 50% reduction target, but also provided valuable insights into how it ‘might’ be accomplished.**

In response to the above, and based on more than 30 years of experience across multiple sectors, this framework suggests developing these 3 essential elements:

- **People:** The right information must be available at the right time to the right person.
- **Process:** A systematic and holistic approach is needed.
- **Products:** People make decisions; they need the products to support the process.

To reach a 50% a reduction target, the framework must be practical and obtain buy-in from the decision maker: the condominium board. Short, Medium, and Long-term energy efficiency measures (EEM) and strategies can build confidence in the process, people, and products which will lead to the deep retrofits that deliver the 50% reduction.

There are significant opportunities for energy and cost savings in the condominium sector and it will be essential to realize these savings to meet Canada’s Green House Gas (GHG) objectives. Utility costs are increasing, and condominium owners will want assurance that utility costs are managed and being reduced. However, to achieve the 50% reduction, greater transparency in performance and confidence that this will increase asset value will be required.

This framework offers a path forward, based on experience, an understanding of the sector and advice from industry experts. However, this is the start of a journey and not the destination.
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Forward

Each year Sustainable Buildings Canada (SBC) funds several research studies focusing on issues related to various aspects of high-performance buildings including water and energy efficiency, green energy, climate change, materials, and indoor environment. These “white papers” are posted on our website and represent an excellent technical resource for those interested in the latest developments in the high-performance buildings sectors.

The following paper provides a framework and background for examining improved energy performance in existing multi-residential buildings (MURBs). This sector is important not only due to its scale, but more importantly, it is where a significant percentage of our population calls home. The potential energy efficiency improvements and the various barriers to implementation must be considered as we contemplate how to both improve the stock and lower its energy use. As a founding member of the Toronto 2030 District, SBC supports the concept of deep energy retrofits as part of a strategy to dramatically lower the carbon footprint of buildings. SBC also recognizes that there will be occasions when building owners cannot or will not contemplate the decisions associated with this level of activity.

The authors of this study have more than 20 years’ experience delivering energy efficiency-based efforts and through that experience have developed a framework that will address both deep energy retrofits and more moderate energy efficiency investments. SBC fully understands the concept that: “if you only do the small things, you will never do the big things”

However, Energy@Work presents compelling evidence that a balanced approach can secure both deeper savings for some and moderate savings for many.
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Acknowledgements

Sustainable Buildings Canada

We appreciate the contribution, funding, and guidance from Sustainable Buildings Canada. Their assistance was instrumental in our understanding of the condominium sector and the development of this framework. Our goal is to support SBC and other groups, like Toronto 2030 District, in their GHG reduction goals by developing practical and economic solutions for the condo sector.

MISSION

“SBC is dedicated to its pivotal role as a market catalyst to advance the environmental and energy performance of the built environment. We strive to engage stakeholders in an inclusive and collaborative process to advance this agenda. This mission has two important elements. The first is to improve the energy performance of the building itself. The second expands beyond the building to the broader realm of the community and includes low impact development as well as community-based planning and energy systems.”

Crossbridge Condominium Services

In 2019, 182 condominiums managed by Crossbridge Condominium Services, entered utility data into the provincial Energy and Water Reporting and Benchmarking (EWRB) database as required by Ontario Regulation 506/18. This was the first time that utilities were required to provide aggregated data to a property at no cost. The result was the ability of condo boards to start tracking total annual electricity, natural gas and water use through a standard, publicly available and approved portal. Crossbridge was a major contributor to the EWRB process to ensure that it was fair and equitable. This paper would not have the foundation it has without the insights and leadership from Crossbridge.

MISSION

“We believe that our continued success is dependent on creating a true partnership with our Boards, residents, and building employees. This partnership is founded on the principles of mutual honesty and integrity and nurtured by the highest standards of performance and service. Everything we do is focused on making the lives of the residents who live in our buildings better.”

On behalf of the Energy@Work team:
We are very grateful to both organizations and the “People” that make all the difference!
Mike Singleton and Adam Jones from SBC. Murray Johnson, Rob Detta Colli and Peter Mahut from Crossbridge.
1.0 Introduction

1.1 Multi-Unit Residential Energy Consumption in Canada

Canada’s energy consumption is growing with a per capita energy consumption 5x higher than the world average. Canada is among the top energy consumers in the world. Since 1990, energy consumption has increased in all sectors, including the residential sector. In 2017, according to Natural Resources Canada National Energy Use Database, residential energy accounted for 17% of total Canadian consumption, second only to the industrial sector (40%). Multi-unit residential buildings accounted for 18% of the energy consumed in the residential sector, equal to 278.4 PJ (77,333,300,000 ekWh) in 2017. In the Greater Toronto Area, GHG emissions from MURB is 44% according to TAF 2018-Final.pdf.

MURB energy consumption continues to grow, and in 2017 consumed 3% of Canada’s energy, an amount nearly equal to the agricultural sector. However, actions to address MURB energy consumption have not kept pace. Research shows large variations in consumption between buildings, and there is no clear metric to evaluate MURB energy performance. For example, Natural Resources Canada’s Energy Star does not provide Energy Star Scores for MURBs, nor does it provide a mean EUI in the 2019 Energy Star Technical Reference. As a result, MURB owners and operators are left with little guidance on how their building is performing relative to others.

The Government of Canada set ambitious energy and GHG reduction targets, which we agree are needed. Organizations like the Toronto 2030 District are leading initiatives to help achieve these targets. Given its energy footprint, the MURBs sector must be involved. Like other sectors, they must have access to the people, process and products that are necessary to succeed.

1.2 Barriers and Challenges

The MURB sector has many of the classic energy efficiency barriers. For convenience, these are grouped to into the following 6 “A’s”:

- Attention: “No time or incentive to change”
- Affordability: “Don’t have money to change”
- Awareness: “Don’t know opportunities exist”
- Attitude: “Not part of my business!”
- Accountability: “Efficiency is not measured”
- Apathy: “Why should I care if no one else does?”

The MURBs sector is also very diverse, with different ownership structures, regulations, resources, and building types – rental vs. community housing vs. condominiums. Each will require its own specialized approach.
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Unlike other sectors, the ability to measure performance is particularly challenging. Ontario is unique in requiring properties over 50,000 sqft to report their energy and water use, but this was only introduced in 2018 and there has not been any published data. There is also no recognition on the value of living in an energy efficient or ‘green’ building.

1.3 Value of Green Buildings

To succeed, this framework must be attractive to condominium boards. The business case must appeal to the owner of the units and demonstrate that there is value to reduce energy use and become ‘green’. This has happened in the commercial sector with the introduction of BOMA BEST building certification, LEED, etc. The increased asset value is demonstrated in Appendix I.

Once energy performance data is published, understood, and effectively communicated, a similar evolution can occur in the multi-residential sector. But these are still very early days.

Condominiums can be the early adopters in this sector. There is growing evidence on the economic opportunities that reside within the sector and can be achieved by connecting people, process, and products through a strategy of short-term, medium-term, and long-term improvements.

1.4 Energy Water Reporting and Benchmarking (EWRB) and the Value of Benchmarking

“People Play Differently When There is a Score Board”

The first step in reducing energy consumption is knowing overall performance, which benchmarking achieves. Ontario Regulation 506/18 Energy, Water Reporting and Benchmarking (EWRB) has great potential to provide value because it is requiring buildings over 50,000 square feet (sq.ft.) to report energy and water annually. However, the Ministry has not released data as of July 2020.

**EWRB is particularly valuable to the condominium sector because it is the first time utilities in Ontario are required to provide aggregated data:** the total of individual suite consumption along with the common area use. In the past, the inability to obtain aggregated utility data prevented self benchmarking, so the removal of this barrier is a significant step forward.

EWRB will allow stakeholders to assess building’s energy performance to themselves and relative to others. Even more important, they will be able to compare annual use over time and referred to as “Self Benchmarking”. Appendix G: The Benefits of Benchmarking illustrates the value of benchmarking as well as a case study from the commercial sector.

Although the Ministry of Energy, Northern Development, and Mines (ENDM) has not published the first year of reported 2018 data, this will change. Once the public has reliable information to measure and compare energy consumption, the value of benchmarking will become obvious.

In 2019, Energy@Work reported over 200 buildings in the provincial energy and water database into EWRB. 182 were completed in partnership with Crossbridge Condominium Services. The insights gained from the EWRB submission process revealed the need for this framework and played a critical part in addressing the people, process, and products.
2.0 Insights from First Year Reporting into the EWRB

2.1 The Condominium Sector, their Utilities and EWRB

In the EWRB submission process, Energy@Work spoke with over 180 condominium property managers and learned some of the realities and challenges of the condominium sector:

1. Ontario’s utility industry, particularly electricity is complicated. Electricity, has had, and continues to undergo, unprecedented change since deregulation occurred in 2002. The sophistication and planning that is needed to understand and proactively respond is difficult to obtain within the condominium sector. The complex and layered decision-making structure makes it challenging for the expertise, that other sectors have access to, reach the appropriate decision makers.

2. Condominium ownership makeup is equally complex and diverse. The booming housing market has resulted in many condominiums being purchased as an investment. As a result, there is high turnover and units often become rental units. Other condominiums may have higher owner-occupied units which will have different priorities. The uniqueness of each property will require the framework to be flexible.

As an example, a property that has high owner turnover is unlikely to consider longer term energy efficiency measures (EEM). If a unit changes ownership every 5 years, an EEM over a 3-year payback will often be deferred.

3. Utility performance is generally not monitored by boards, property managers or owners. Service providers such as Heating, Ventilation and Air Conditioning (HVAC) vendors are not measured on Key performance indices (KPI) such as Energy or Water Use Intensity (EUI).

4. Utilities typically make it challenging and, in several cases, impossible to obtain aggregated electricity or even water data.

5. Condo managers often do not have access to the information needed to develop KPI, such as:
   * gross floor area, shared services, or other amenities,
   * bedroom configuration and appliances,
   * monthly head count or occupancy,
   These and other variables are needed to review and compare energy performance.

6. The decision-making process differs significantly from other sectors. Decision-makers for condominiums are the condominium boards. These people are volunteers and are required to take on a significant amount of responsibility without compensation or training. They must balance a wide range of duties while serving in this voluntary capacity. High turnover is typical.

7. The EWRB legislation was not well understood or presented in a way to show value to the condominium owners or boards. Although EWRB is a legal requirement, and, under Ontario’s Condominium Act, condominiums must obey the law, there is no non-compliance penalty. For these reasons, many condominiums failed to report or were unaware that there was a legal requirement to report.
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8. Most condominiums do not have an on-site, commercial-trained building operator as are available in the commercial sector, along with a technical manager. Condominium managers are typically reliant on 3rd party service agreements with contractors and sub-contractors to operate the building. The agreements rarely have an energy performance requirement that can be verified because of multiple barriers that include the absence of data.

9. Independent utility management assistance from the local distribution companies (LDCs) is difficult to obtain, particularly electricity. Natural Gas support from Enbridge is available through Demand Side Management (DSM) programs.

2.2 Analysis of Condominium Data Gathered for EWRB and MURB Energy Use

The data from over 180 condominiums gathered by Energy@Work, for the purpose of ensuring compliance under Ontario Regulation O. Reg 506/18, provided a unique opportunity to gain insight into MURB energy use. Analysis of the data reveals similar findings to other studies of GTA MURBs and indicates that MURBs present a set of challenges distinct from other sectors. A presentation that summarizes the analysis is available from Mr. Edward Newton Capstone project: Humber MURB EWRB

The data analytics resulting from EWRB compliance underscored the need for this framework and helped in its development. Listed below are three findings that are relevant to understanding the sector:

1. The typical Energy Use Intensity (EUI) that is commonly used in the commercial sector is not sufficient for universal comparison in the condominium sector. The EUI within the condominium sector varied from below 10 ekWh/SqFt/yr. to over 50 ekWh/SqFt/yr. The range could not be easily explained.

2. The number of suites in a building appeared to be a better predictor for energy comparison than building size.
   (Note: EWRB does not require the number of suites to be included with utility data, Energy@Work collected this and other information to better understand the sector.)

3. Building age does not impact the EUI.

4. There was minimal understanding, references, or support for the energy improvement.

Confidence in the value of EUI is much higher in the commercial sector, which is typically 20 to 35 ekWh/sq.ft. This confidence is based on decades of experience and energy management investment within the commercial sector, which has not taken place in the condominium sector.

These challenges would lead some people to think that the EWRB process is of little value to the condominium sector; however, this is not the case. EWRB emphasizes the challenges which can only be overcome with more information and a better understanding of the sector. This sector has not had the energy management attention that other sectors have had. For example, the analytics showed the
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Indifference of energy use intensity to age. Newer buildings have a higher Window to Wall Ratio (WWR) than older buildings but the EUI remains similar – why? Is this due to older equipment, different management or operational practices, or are there other factors? Clearly, EUI alone is not a reliable predictor of energy performance. More information and experience in understanding the data is needed.

The range of variables complicates benchmarking and can perhaps explain why EWRB’s 2018 data, purported to be publicly available in 2019, is still not available in 2020.

Nevertheless, self-benchmarking is still very valuable, providing there is a Product that can turn the data into useful knowledge within a Process, to allow action on which a Person can make the decision.

Following the EWRB submissions, Energy@Work visited individual condominiums to obtain a better and first hand understanding of the variables, challenges and potential opportunities:

i) People:
This includes the board members, the property manager, the superintendent and whether this is a live-in or live-out position, etc.

ii) Process:
The original developer and their process to develop the condominium, for example was to build and operate or to build and sell, were systems commissioned, etc. Are units sub-metered or are utilities included as a flat rate in the maintenance fee, etc.

iii) Products:
This include a host of items from the energy management tools that are available to the physical elements that are in place, such as type of meter, equipment, control, etc.
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2.2.1 Variation in Energy Consumption

*Figure 1. Energy Use per Square Foot and per Suite* shows the variation in consumption within the building sample. Consumption is shown according to the metrics of energy use per square foot and per suite. The differences in energy consumption is due to several factors that includes performance and a large variety in suite size and amenities. Suite sizes ranged from approximately 500 sq. Ft. to over 4,000 sq. Ft. Heating and cooling systems also have an impact on overall energy consumption. The results show that comprehensive approaches are needed to achieve a reduction target and must factor in different building characteristics.

![Energy Use per Square Foot and per Suite](image)

<table>
<thead>
<tr>
<th></th>
<th>Min.</th>
<th>Mean</th>
<th>Median</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EUI (ekWh/sq.ft.yr)</strong></td>
<td>7</td>
<td>18.5</td>
<td>17</td>
<td>52</td>
</tr>
<tr>
<td><strong>ENERGY USE INTENSITY (ekWh/sq.ft.yr)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min.</td>
<td>Mean</td>
<td>Median</td>
<td>Max.</td>
<td></td>
</tr>
<tr>
<td>8,479</td>
<td>26,408</td>
<td>28,096</td>
<td>67,758</td>
<td></td>
</tr>
<tr>
<td><strong>ENERGY USE/SUITE (ekWh)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.2.2 Energy Consumption
Using Multiple Metrics: Energy Use Intensity and Energy Use/Suite

Using the data of 182 condominiums, regression analyses ($R^2$) were used to determine the correlation between the size of the building or the number of suites and the total building’s energy consumption. The $R^2$ of 0.7 for the number of suites in a building was a better predictor of total energy consumption than the $R^2$ of 0.5 using the square footage of the building.

Figure 2. Regression Analysis of Energy Consumption by Building Size and Number of Suites

- **TOTAL BUILDING AREA CONSUMPTION AND SQUARE FOOTAGE**

  - Equation: $y = 10.4x + 3E+06$
  - $R^2 = 0.4965$

- **ENERGY USE WITH NUMBER OF SUITES**

  - Equation: $y = 21437x + 1E+06$
  - $R^2 = 0.6946$
2.2.3 Building Age Did Not Impact Consumption

The age of a building did not appear to have an impact on overall energy consumption. The regression analyses using age as a predictor of EUI or Energy Use/per Suite showed no correlation to energy use, Figure 3. Regression Analysis of Building Age and Energy Consumption. This indicates that new buildings are not more efficient than old ones and there is room for improvement in both newer and older buildings.

Figure 3. Regression Analysis of Building Age and Energy Consumption

2.3 Energy End Uses

Energy end use analysis shows that space heating consumes the largest portion of energy in MURBS (38%). This presents the most significant opportunity for energy reduction. Domestic Hot Water and suite plug loads comprise the other top end uses, Figure 4. Toronto MURB Energy End-Use Breakdown.

For a summary of how a building can achieve 50% reductions by focusing on heating load reductions, see Appendix E: Sustainable Buildings Canada Savings by Design Case Study.

Figure 4. Toronto MURB Energy End-Use Breakdown

Source ASHRAE Level II Audit of a Toronto MURB conducted by Energy@Work
3.0 People, Process and Products

This framework, which targets a 50% energy reduction in the condominium sector, began with a reflection on the critical elements of a successful frameworks used within the industrial and commercial sectors. This included experience from multiple audits, project successes and failures, etc. The conclusion was that for a framework to be successful, it must integrate people, process, and products, in that order.

3.1 People

The first and essential element to succeed is people.

People bring about change and must be engaged to achieve results. They are responsible for making every decision within a project, communicating these decisions, and moving the project to the next step.

Appendix C: Condominium Stakeholders:

Roles/Responsibilities and Key Motivators suggests a matrix of the defining features of different stakeholders in the MURB sector. For this framework to be successful, it is essential to understand the stakeholders and their priorities and to address the following questions: What role and responsibility does each stakeholder play? Who has the authority to approve a project? Are their motivations based on financial targets, or are they focused on environmental impacts or tenant comfort concerns? What are potential challenges or barriers that could arise in the decision-making process? How to make the business succeed and demonstrate value?

Addressing these issues will help to ensure the right process is in place and that products are delivering the right people the right information at the right time.

If the people are informed and engaged, they will be prepared ahead of a major decision, which has major implications for a project’s success and cost. As shown below in Figure 5. Cost-Influence Diagram

the opportunity to influence a decision diminishes dramatically over time or expense. This is the reason
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to have a process in place early to influence the solution that offers the best overall value.

Figure 5. Cost-Influence Diagram

3.2 Process

The condominium sector is complex. Achieving objectives with the many stakeholders and moving parts requires that a process be in place. There are multitude processes that can support a successful energy management plan. References are provided in Appendix D: Sample Products and Process. Energy@Work successfully developed and implemented our own process called the Energy Management Action Plan or E-MAP, the emphasis is on Action. People need to see results to participate.

E-MAP is built on seven pillars that have 3 parts each and is described in Appendix B: Energy@Work’s Energy Management Action Plan

The E-MAP creates a partnership between stakeholders to help achieve objectives through regular meetings, results-tracking, and project implementation. An example building is also provided in R 7.7

Prepare a short 90 second professional video to gauge interest and comments
Framework to Achieve a 50% Energy Reduction in the Existing Multi-Unit Residential Condominium Sector

Appendix A: Case Study of Berkeley Castle. This heritage building located in downtown Toronto reduced its EUI from 26.97 ekWh/sqft to below 19.57 ekWh/sqft and became an Energy Star Certified building in 2019.

There was a committed effort to improve that included the monthly utility review, identifying energy efficiency measures (EEM) and implement change that started with short term EEM, graduating to mid term and long term improvements. Change continues and E-MAP has become a process Vs a project.

The E-MAP has been adopted by over 60 commercial offices and multiple property management companies. The average energy use intensity is 23 equivalent kilowatt hours per square foot (ekWh/sqft) compared to BOMA Canada’s average of 27 ekWh/sqft. Several are approaching a 50% energy reduction from BOMA’s average and contemplating Net Zero. A 2017-19 review of the E-MAP electricity savings, which have been verified by Toronto Hydro, totalled more than $1,700,000. The savings were achieved through short term, medium term and long-term measures that included capital, operational techniques, technologies, and behavioural energy efficiency measures. The E-MAP cost was less than a $500,000 because the Toronto Hydro OPSaver covered the first-year cost of preparing the E-MAP, Measurement and Verification (M&V) plan as well as monthly meetings. The monthly participation is unique to Energy@Work’s approach. We believe that people must relate to the right products for the process to succeed.

Results, shown in Table 1, illustrate that for every $1 spent, there was a $10 return. The following are the electricity savings from 8 property management companies for 22 properties that implemented the E-MAP between 2017 and 2019. Toronto Hydro verified the electricity savings through an approved Measurement and Verification plan that met Option C, IPMVP.
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Table 1. Energy Management Action Plan Results in the Commercial Sector

<table>
<thead>
<tr>
<th>Property Management Company #</th>
<th>Original kWh Baseline</th>
<th>2019 % Savings</th>
<th>2017-19 kWh Savings</th>
<th>Cumulative Electricity Savings 2017-19 (Incentive+ Avoided Cost)</th>
<th>Cumulative Electricity Savings 2017 to April 2020 (Incentive+ Avoided Cost)</th>
<th>Estimated E-MAP Cost</th>
<th>For each $1 E-MAP Investment; the return was:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8,465,980</td>
<td>3%</td>
<td>370,837</td>
<td>$60,853</td>
<td>$60,853</td>
<td>$4,895</td>
<td>$12.43</td>
</tr>
<tr>
<td>2</td>
<td>4,416,279</td>
<td>0%</td>
<td>0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>3</td>
<td>2,690,264</td>
<td>12%</td>
<td>320,897</td>
<td>$39,064</td>
<td>$48,883</td>
<td>$41,741</td>
<td>First Year</td>
</tr>
<tr>
<td>4</td>
<td>5,696,638</td>
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Notes:
1. First Year cost for Energy Management and Action Plan <E-MAP> is covered by Toronto Hydro OPSaver
2. Measurement and Verification (M&V) Plan is also covered by Toronto Hydro OPSaver and compliant with IPMVP

While the commercial and condominium sectors differ in key areas, the same fundamental process built on the 7 pillars can be applied. Identifying and organizing the right people to participate in the process may be a major challenge within the condominium sector.
3.3 Products

Products include the ‘energy management tools’ that help achieve and, more importantly, sustain results. They include a host of items from benchmarking, energy management guidelines, analytics with monitoring and verification techniques, to name just a few.

Products, by themselves, achieve nothing. However, products supplied to the right people and at the right time within a process achieves amazing results.

A great product example is a Measurement and Verification (M&V) Plan. Energy efficiency (EE) cannot be measured. EE must be calculated because something that is not being used cannot be measured. Therefore, the Efficiency Valuation Organization (EVO) developed the International Performance Measurement and Verification Protocol (IPMVP), which provides a standard methodology for quantifying energy savings by comparing a baseline period with a reporting period, including adjustments.

A M&V Plan is particularly important to establish ahead of a 3rd party energy service contract or ESCO. Obtaining agreement on an approved energy baseline ahead of the contract eliminates conflicts and ensures the reported savings are real and more importantly, identify the actions that were taken.

Other product examples include:

1. **Benchmarking:** Typically, the first step in creating the overall awareness on a building performance.

2. **Sub-metering:** Condominiums have an exemption under the Ontario Energy Board regulation that is referred to as ‘Exempt Distributor’ which would allow sub-metering for energy management purposes.

3. **Utility Data:** For the first time, condominiums can obtain aggregated data for their condominium.

   Ontario now has the advantage of the EWRB legislation that requires, FOR THE FIRST TIME, utilities to provide aggregated data. Once this data is publicly reported, this will lead to greater awareness of energy performance as well as the ability for condominiums to self benchmark over multiple years.

   As demonstrated, there are challenges in comparing condominium’s energy and water use
Framework to Achieve a 50% Energy Reduction in the Existing Multi-Unit Residential Condominium Sector

directly, however, self-benchmarking is practical to obtain year over year comparison.

4. **Real Time Monitoring:** Seeing energy use in real time can help spot anomalies, alert operations of changes and reflect on past consumption.

5. **Energy Audit:**
   Often the second step in understanding a building is to obtain a description of building systems, utility use and potential Energy Efficiency Measures (EEM).

6. **Existing Building Commissioning (EBCx):** A detailed and structured review of a building’s systems to ensure systems are functioning as required. Natural Resources Canada has an excellent [Existing Building Commissioning (EBCx)](https://www.energy-efficiency.com/ebcx) guide. This and other products are available online from NRCan web site.

   Note:
   Climate Wise provided a presentation on the distinction between an Audit and an EBCx.

7. **Cumulative Sum (CuSum):** A CuSum is an analytical tool that helps identify changes in consumption and total savings.

   Every building should have its own CuSum for on-going performance reviews.

   *Appendix D: Sample Products and Process provides a list of other products and their source.*
4.0 Proposed Framework for the Condominium Sector

The condominium sector’s potential to achieve a 50% energy reduction will be a significant challenge.

The barriers and opportunities were clearly described through a detailed peer review of the early results. The feedback from condominium experts and energy management specialist was greatly appreciated and summarized in section 5.0 Results From Peer Review of Framework.

The peer review suggested that consideration be given to:

4.1 Finding the “Perfect Storm”
There may be opportunities for specific condominiums to take on an aggressive target to achieve multiple and long term objectives with a sweeping vision.

4.2 Developing a Phased Approach
A phased approach can consider the practical, financial, and technical realities of the condominium sector with an appropriate response to each concern. The 50% energy reduction target be positioned through short, medium, and long-term strategies rather than a ‘big, hairy, audacious goal’. Proposing a 50% reduction target could alienate the very decision-makers that are needed obtain the buy-in required to succeed.

4.1 The Perfect Storm

A property may be at an age or condition where it is pre-disposed to a major upgrade. This ‘sweet spot’ is building specific. It would require deep energy retrofit that includes the more expensive measures such as envelope improvements. Several factors would have to align for deep energy retrofits to take place because these retrofits require significant investments that go beyond energy efficiency. These include aging building components, discomfort issues, exceptionally high utility costs, structural issues, etc. In addition, an engaged and motivated board is needed to obtain the information required to make the decisions that can capture the holistic results through envelope upgrades combined with more cost-effective energy efficiency measures such as building commissioning.
4.2 Phased Approach: Short, Medium and Long Term

Most buildings will not have the perfect storm that allows or requires the capital-intensive projects. It is better to take advantage of short-term measures to "prime the pump" and show the opportunities that exist with the saving potential to encourage larger and deeper investments.

The disadvantage to a phased approach is the natural tendency to do the small stuff and never get to do the big stuff, hence the term in the energy management business known as "cherry picking".

There is also the failing to consider the true value of an energy efficient project and ‘skimming the cream off the top’. A great example is ‘saving money’ by not putting in motion sensors when a major lighting retrofit is underway. This is discussed in Appendix F: The True Cost of an Energy Efficiency Investment.

Despite these risks, the experience within the commercial sector supports a phased approach.

Phased Approach through On-going: Utility monitoring, resident engagement, target-setting, etc.

- Short-Term
  - Operational changes
  - Lighting upgrades
  - Occupancy sensors
  - Behavioural engagement

- Medium-Term
  - Central plant recommissioning
  - High-efficiency appliances
  - Individual suite metering
  - Behavioural engagement

- Long-Term
  - Envelope and window upgrades
  - Heat recovery systems
  - Behavioural engagement

Year: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15+
4.2.1 Short Term (1-3 years): 15-20% Savings from the Energy Baseline

## Short-Term: Keys to Success

1. Selecting projects with under three year payback
2. Low and no-cost measures
3. Establishing owner and resident support

1. The Short-Term focus is on projects with a 3-year or less payback. The objective is to produce immediate savings and can demonstrate the value of the framework.

2. A monthly utility management budget can assist in capturing savings. This financial strategy will help review utility costs as well as ensure funding is available for larger measures.

3. Short-term measures can be operational, technical, or behavioural. These include reviewing maintenance practices, replacing fluorescent lamps with LEDs, and adjusting schedules or setpoints. The ‘low and no’ cost savings provide the support to look deeper and develop the business case for medium- and long-term savings.

4. The support of the condominium owners and residents is crucial. The key to this is communicating how these impact energy consumptions. The communication with condominium residents should focus on how the successful implementation will control costs and over time increase asset value.

### Energy Efficiency Measures: Short-Term

**Operational**

- Operations changes:
  - Optimizing Zone Control temperature in corridors during heating months or reviewing lighting schedules and ensuring lighting is off when not required
  - Identifying redundant or malfunctioning equipment or components
  - Encouraging the replacement of appliances with Energy Star Appliances
    - NRCan: Energy Star Appliances
  - Awareness: Regular, logical and sincere awareness on energy management.

Seeing the Opportunities:

**Reducing waste:** Up to 20% of water consumption in residential buildings is due to toilet leaks.
Framework to Achieve a 50% Energy Reduction in the Existing Multi-Unit Residential Condominium Sector

**Technological**
- Installing VFDs on booster pumps
- LEDs in common and outdoor areas + LED Exit Signs
- Occupancy sensors in gym and laundry areas
- Garage fan controls (CO/NOx sensors)
- Low-Flow shower and tap fixtures and aerators

**Behavioural**
- $$ to Sense Training: IESO is funding training to support operations staff and management in understanding Utility use. Training is needed in multiple levels: superintendent, management, etc.
- Educational and behavioural campaigns: Using power bars for in-suite appliances or showing impact of energy savings measures to residents.
- Monitoring utility consumption: Typically, 3-8% savings will occur according to the office of energy efficiency.

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**Tools for Savings: Short-Term EEM**

Enbridge and the saveONenergy incentive programs can help by identifying opportunities and offsetting the upfront cost. There are several incentive types applicable.

**Operational assessments:** These find low and no cost opportunities often with less than a year payback.

**Equipment upgrade incentives:** Equipment upgrades or replacements, like Variable Frequency Drives (VFD) or LED lights will offset the initial project cost.
4.2.2 Medium Term (3-10 years): 25-35% Savings from Baseline

Medium-Term: Keys to Success

1. Increased investment and resource planning
2. Incorporating energy efficiency consideration in the reserve fund study
3. On-going engagement and education

1. Individual suite meters will achieve savings because: “people manage what they measure.”

2. Reserve fund studies are conducted every three years and examine the components of the building and the estimated cost of replacement. Having an energy expert make recommendations based on the study can ensure that improving energy performance is part of the building maintenance and renewal.

3. The framework success often depends on a ‘champion’. Typically an individual board member or group of individuals who actively supports energy reduction targets to move progress forward.

4. Educating building residents and establishing a Green Team can help achieve the objectives by changing behaviour and attitudes of the residents towards energy reduction targets.

Figure 7. Medium-Term Energy Reduction Measures

Seeing the Opportunities:

Suites that are individually metered use 12% less electricity than bulk-metered suites!

Source: CMHC

Careful analysis of the sub-metering contract is essential so that the costs do not outweigh the energy savings.

Energy Reduction Measures: Medium Term

Operational

- Regular review of operations to find opportunities for improvement

- On-going operational training
  Note:
  In the condominiums visited, there was support from the operators / superintendents and the property managers for training in order to better understand the system, servicing requirements and overall system reviews.

- Operational manual and operation log.
  There were very few examples of operation manuals being available or updated. Operational logs can help identify recurring problems.
Framework to Achieve a 50% Energy Reduction in the Existing Multi-Unit Residential Condominium Sector

**Technological**
- Individual suite metering
- Real-Time Monitoring
- Central plant, MAU, BAS and other building recommissioning
- ECMs for fan-coils
- Upgrading equipment replacement (PTAC) and/or Fan-coil unit upgrades
- Drain-water heat recovery
- Air leakage assessment and sealing
- In-suite thermostat upgrades
- High-efficiency appliances in suites

**Behavioural**
- Education and Training Workshops and special events such as:
  * Earth Week
  * Earth Hour
  * Waste reduction
- Establishing and maintaining a Green Team

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**Tools for Savings: Medium-Term EEM**

1. Incentives from Enbridge and the IESO provide funding to help improve the economics of an EEM.

2. Larger projects should use a higher energy cost for the business case and factor in the total cost of a product, not just the purchase price. See Appendix F: Evaluating the True Cost of Energy Efficiency Investments for more details.

3. Natural Resources Canada and other organizations provide tools for energy management and energy audits. See Appendix D: Sample Products and Process
4.2.3 Long-Term (8+ years): 30-50% Savings from Baseline

Long-term measures are typically 8+ years or more. These target the deeper energy efficiency opportunities that have the long-term payback and to meet other requirements such as comfort, equipment reliability, etc.

On-going utility management and review of operations is still essential in this phase. However larger capital investments will be required to meet the 50% reduction target. These include building envelope improvements, e.g., exterior walls, window replacement, roof upgrades, etc. Equipment upgrades is also an ideal opportunity. Surprisingly, condominiums that were under 5 years old, were still installing atmospheric boilers and missing the opportunities for condensing boilers.

Long-Term Keys to Success

1. Vision for the future and include increasing: Asset Value!
2. Clear and consistent communication between board, owners, and service personnel
3. Incorporate energy efficiency into major building upgrades and repairs

1. A vision to increase the asset value will help an organization maintain and sustain the momentum needed to achieve the 50% energy reduction target. Personnel will change and consistently happens within condominium boards. However, if the Process includes a vision that has been supported and proven successful, the annual effort will continue, and responsibilities will be transferred to maintain momentum and engagement.

2. The Energy Management Action Plan, <E-MAP> or the equivalent process that is in place, should include a consistent communication plan with building residents: Owners and Renters. This will help maintain awareness, buy-in and engagement. Very different strategies are required for owners Vs renters.

3. Envelope and central heating and cooling system upgrades are necessary to reach a 50% energy reduction. When a building component needs to be replaced, the most energy-efficient option should be evaluated based on total value and not payback.

Seeing the Opportunities:

Windows account for 31% of building energy loss and play a significant role in occupant comfort.

Source: CMHC
Energy Reduction Measures: Long-Term

Operational
- On-going Operational Training and Integrate decision making into the reserve fund decisions

Technological
- Equipment Replacement
  - Heat pumps
  - High-efficiency condensing boilers
- Building envelope retrofits:
  - High-performance windows and glazing
  - Roof replacements
  - Exterior cladding
- Heat recovery ventilation (HRV) system
- Thermal break for balconies

Behavioural
- Clear communication with residents and owners for on-going engagement

Tools for Savings: Long-Term

1. Low interest loans are available from some municipalities, such as the City of Toronto, for energy efficiency upgrades. See Appendix H. MURB Resources for a complete list.

2. Enbridge’s Savings by Design offers incentives for large construction projects and includes a full-day workshop with industry experts to identify energy savings opportunities.

4. Major equipment retrofits are eligible for incentives and should be applied to early in the process to avoid disappointments.
5.0 Results from Peer Review of Framework

Early in the development of the framework, a peer review was held with industry experts and the following presentation was provided:

2020-07-08 SBC PEER REVIEW Framework (Energy@Work) ppt RB
This can be found at: Peer Review Proposed Framework

The purpose of the peer review was to discuss the initial iteration of the framework and obtain advice on the assumptions as well as suggestions on the appropriate direction to move forward based on sector experience.

Background was provided from:

i) the 180 condominium submissions that were made into the provincial EWRB database and follow up analytics and subsequent research.

ii) Energy@Work’s results from implementing the Energy Management Action Plan (E-MAP) across 30 plus commercial office and other sectors.

The feedback from the review are grouped according to the 3 essential components of:
People, Process, and Products.

5.1 Peer Perspective on “People”

• A 50% energy reduction will require active owner/tenant participation to succeed.

• Attempts in the past to adopt energy and water saving technologies typically failed.

As an example, an initiative to distribute aerators for bathroom faucets had less uptake than expected, even though the measures presented no costs. There are several reasons for the lack of participation but the most obvious was not being able to see the impact from the water savings.

• There are two very different residents within a condominium. There is the owner that lives in the building and the owner that is holding the unit for investment and is renting out the unit. The latter is difficult to reach by conventional communication channels and is typically transient as units turn over. to see the immediate results of their actions; being aware of this will help motivate energy and water conservation efforts.

• Site personnel are typically not required to optimize energy performance and often have to rely on third party contractors to maintain equipment.
Framework to Achieve a 50% Energy Reduction in the Existing Multi-Unit Residential Condominium Sector

5.2 Peer Perspective on “Process”

- Condominium boards typically look for projects with a payback of 3 years or less. The first energy efficiency projects should provide savings within that timeframe to build confidence in the process.

- Energy investments can be approached from the perspective of reviewing and preparing the reserve fund study. The study can incorporate energy efficiency by considering building maintenance savings, long-term asset preservation and the ability to increase asset value.

- Most condominium will not be able to reach a 50% reduction target.

There might be the few that have the necessary elements: high energy costs, resident discomfort issues, aging equipment, and dedicated board members. These would have to be sought out.

- Recognizing the accomplishments and successes of team members and stakeholders is essential for on-going support. However, communication is typically a challenge at all levels. Although there are several Products available to help, such developing an energy baseline, a process is not in place to use them. Refer to Appendix D: Sample Products and Process.

- Every process should start with a Measurement and Verification Plan (M&V) but who will pay for a utility management process?

A M&V plan ensure that savings can be determined and separated from the changes within the building. There are 3rd party companies that offer an energy saving process that will ‘pay for itself’ based on guarantee utility savings. However, without M&V these savings cannot be verified.

**A recent experience illustrated the reluctance for proactive utility management investments.**

A rate analysis determined that a change in their utility rate plan would save over $549,000 annually. The recommendation was made, accepted, and resulted in savings of $585,649

A subsequent recommendation to re-invest less than 0.02% to be better prepared, have a monthly utility review and have obtain energy management expertise was rejected.
5.3 Peer Perspective on “Products”

- The challenge with products is three-fold:
  i) who will pay for them?
  ii) who knows how to use them?
  iii) which products are required for the needs of the property?

- A suggested approach is to make the first product a utility ‘management’ budget - a budget to manage utilities instead of simply paying the bill.

- Target the base building first with low and no-cost measures (average of 10-15% savings). From these ‘published’ success, more investment can be supported for capital.
6.0 Conclusions

6.1 People Conclusions

• The biggest challenge and opportunity are the People connections.

• There are multiple levels that will need to be addressed systematically and consistently to achieve a 50% energy reduction target.

• A review of experience from the commercial sector can help obtain buy-in along with case studies from early adopters.

• Obtaining and celebrating the teams that succeed or at least make an effort will help the market transform.

• From the Energy@Work's experience, once buy-in is obtained, people will drive change.

6.2 Process Conclusions

• Each building has their own potential saving and achievement will depend on many factors. A ‘one size fit all solution’ is not practical or feasible. Each building has its own requirements.

• Energy@Work's process is our Energy Management Action Plan (E-MAP).

E-MAP has been successfully transferred across sectors. Originating in the utility sector (Ontario Hydro where there were no electricity bills), E-MAP transferred into the industrial as well as institutional and commercial sector. E-MAP can be customized within the condominium sector. There are other process such as Energy Star as well.

• New buildings do not perform better than older buildings. Poor energy performance is not simply a matter of components failing at the end of their useful life. There are opportunities for all building types to reduce energy consumption ranging from operational, technical, and behavioural measures.

• Other sectors have demonstrating the energy saving potential and from the review of the results in the condominium sector, the same is expected.

There was no discovery of a process that could be easily adopted. To be successful will require a customized approach.
6.3 Products Conclusions

- The first step in initiating widespread change in the condominium sector was thought to be benchmarking. EWRB will be of tremendous value once it can show condominium stakeholders how their building’s energy consumption compares to others.

- Ontario requirement for utilities to provide aggregated data for the first time in history is a significant step forward but poorly understood or appreciated.

- Sub-metered was shown to reduce the electricity use of the whole building and not just the electricity used in the suites that were sub-meters. It is believed that knowing the suite use was sub-metered influenced total behaviour which included the thermostat in the suite which controlled central systems.

- The report “Benchmarking and Reporting for Multi-Unit Residential Buildings in Toronto: An Investigation of Opportunities, Limitations, and Metric” supports this study’s results that condominium energy consumption varies widely between buildings and that there are significant opportunities to reach 50% energy reductions.

People, process, and products must be integrated into the framework. One without the other two will fail.

The products and process are established and proven, but it is people aspects that the framework will need to address to be successful.
7.0 Recommendations

7.1 Self benchmarking is now possible for the FIRST TIME!
Utilities are required to provide the data and the Ontario Condo Act requires that the EWRB is used. Self benchmarking can become a very cost-effective opportunity to track annual performance.

R 7.1: “Boards should take advantage of this cost-effective opportunity”

7.2 Continue to support the EWRB process to encourage the data to be made public
O. Reg. 506/18 requires public disclosure but has not happened. Over 30+ years of energy management support has focused on the commercial sector and the value of performance comparison. In the condominium and multi-residential sector, there has not been the same effort. The diversity of the market, the lack of big players and not as many people focusing on energy efficiency continues to be the challenge.

R 7.2: Support the ministry and continue to lobby for public disclosure of the data.

7.3 Pilot a Savings By Design project:
Appendix E: Sustainable Buildings Canada Savings by Design Case Study shows the results for a project completed in Ottawa that achieved the 50% target! Many older buildings may need envelope repairs and probably building upgrades. They might consider a deep energy retrofit that includes building envelope improvements if they were aware of the program and potential benefits.

R 7.3 Identify and target a building that might be that ‘perfect storm’

7.4 Support the development of pilots and share the success with others.
As an example, use a utility ‘management’ budget with a Measurement and Verification Plan that tracks results using a CuSum. These products help to ensure the tools are in place to evaluate progress, EEM and proposals that are presented to the board as utility saving opportunities. At the end of the day, savings must show on the bill or be challenged.

R 7.4 Continue to encourage the use and develop of these tools to raise awareness

7.5 Condominium management companies have an opportunity to distinguish themselves
An investment in a full time Energy Manager to champion and support property managers and differentiate themselves from other management companies. Crossbridge provides a great example.

R 7.5 Continue to encourage the use and develop of these tools to raise awareness
### Framework to Achieve a 50% Energy Reduction in the Existing Multi-Unit Residential Condominium Sector

#### 7.6 Develop a “pull” strategy:
Build a compelling business case with a supporting presentation to the condominium board. This must be clear, transparent, and concise. Even then, not every board will be interested. It is better to invest the time and effort with those boards that are interested. The alternative is for EWRB process to illustrate the range in performance and might become a motivator.

**R 7.6** Continue to encourage the use and develop of these tools to raise awareness

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<tr>
<td></td>
<td>This information and supporting presentation can be used to obtain feedback, suggestions and potential interest on either:</td>
</tr>
<tr>
<td></td>
<td>i) The perfect storm</td>
</tr>
<tr>
<td></td>
<td>or</td>
</tr>
<tr>
<td></td>
<td>ii) The Phase Approach,</td>
</tr>
<tr>
<td></td>
<td>However, obtaining feedback from the tenants and owners is challenging and typical responses focus on immediate challenges, such as parking, pets and most recently access to amenities.</td>
</tr>
<tr>
<td></td>
<td>Property manager’s assessment on their opinion or the reception that they would expect to receive from their respective condominium board might be more practical.</td>
</tr>
<tr>
<td></td>
<td>But in our experience, property managers are again too busy to read this document. We therefore suggest a short professionally prepared video that captures the 50% potential as well as the proposed framework.</td>
</tr>
<tr>
<td></td>
<td><strong>R 7.7</strong> Prepare a short 90 second professional video to gauge interest and comments</td>
</tr>
</tbody>
</table>

Filename: 2020-07-09 SBC Framework Report(Energy@Work) word R18 ©
Location: Z:\EnergyShare Reorganization\1.0 E@W Clients\SBC\Multi-Res Framework\Framework Deliverables and Supporting Documents
Tel: 416.642.0571  |  E: Requests@Energy-Efficiency.com  |  WEB: www.energy-efficiency.com
Framework to Achieve a 50% Energy Reduction in the Existing Multi-Unit Residential Condominium Sector

Appendix A: Case Study of Berkeley Castle

Berkeley Castle (Historic Building in downtown Toronto with commercial offices and cafes)

Pre 2016: Strategy: monitor utility costs, implement lighting projects, but no E-MAP:


Energy Management Action Plan, (E-MAP)

<table>
<thead>
<tr>
<th>Year</th>
<th>Avoided Cost</th>
<th>Investment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017:</td>
<td>$33,698</td>
<td>$9,864</td>
<td>For each $1 there was a $3 pay back</td>
</tr>
<tr>
<td>2018:</td>
<td>$60,178</td>
<td>$14,910</td>
<td>For each $1 there was a $4 pay back</td>
</tr>
<tr>
<td>2019:</td>
<td>$54,629</td>
<td>$16,252</td>
<td>Saving supported a capital project, new BAS less than a year payback, inc. incentives Enbridge and THES Energy Star Score &gt;75 and 2019 Energy Star Certified Building Won BOMA Toronto CREST Award for Energy Management</td>
</tr>
</tbody>
</table>

^ Electricity savings are verified by Toronto Hydro.
Energy@Work developed this E-MAP by modifying the framework that was developed for Ontario Hydro for the private sector. The framework won both NRCan and EPA awards for achieving energy efficiency results that were independently verified by Ernst and Young.

**E-MAP has the following 7 pillars:**

<table>
<thead>
<tr>
<th>1. Top Level Commitment:</th>
<th>Ensuring there is support from the pinnacle of the organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Clearly Defined Goals:</td>
<td>Setting specific Key Performance Indices (KPI) for each objective</td>
</tr>
<tr>
<td>3. Assignment of Responsibility</td>
<td>Defining who is expected to do what and when</td>
</tr>
<tr>
<td>4. Utility Tracking System</td>
<td>Ensuring utility and impacts to utility use are recorded and understood</td>
</tr>
<tr>
<td>5. Project Approval</td>
<td>Defining the process required to obtain project approval</td>
</tr>
</tbody>
</table>
## Appendix C: Condominium Stakeholders: Roles/Responsibilities and Key Motivators

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Roles/Responsibilities</th>
<th>Key Motivators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condo owners:</td>
<td>• Pay for the operation of the building and utility costs through their condo fees</td>
<td>• Comfort</td>
</tr>
<tr>
<td></td>
<td>• Responsible for consuming 60% of building’s energy use in most cases</td>
<td>• Saving money</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Keeping condo fees stable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reducing stress</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Maintaining or increasing asset value</td>
</tr>
<tr>
<td>Condo boards:</td>
<td>• Represent the condo owners’ interests</td>
<td>• Controlling costs</td>
</tr>
<tr>
<td></td>
<td>• Allocate budget and determine condominium fees</td>
<td>• Maintaining Asset Value</td>
</tr>
<tr>
<td></td>
<td>• Adhering to Condominium Act</td>
<td>• Following best practices that clearly demonstrate value</td>
</tr>
<tr>
<td>Property Managers:</td>
<td>• Responsible for carrying out the condo board’s directives.</td>
<td>• Safety</td>
</tr>
<tr>
<td></td>
<td>• Ensuring smooth operation of the building</td>
<td>• Regulations</td>
</tr>
<tr>
<td></td>
<td>• Keeping tenants safe and happy</td>
<td>• Tenant comfort. Resolving issues, proactively, to avoid complaints</td>
</tr>
<tr>
<td></td>
<td>• He would seek best practice to help the board and advise the board</td>
<td>• Re: Utilities:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Ensure bill is paid on time to avoid late payment costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Controlling costs</td>
</tr>
<tr>
<td>Superintendent:</td>
<td>• Reports to property manager</td>
<td>• Maintenance</td>
</tr>
<tr>
<td></td>
<td>• Responds to operational concerns</td>
<td>• Response to operational issues</td>
</tr>
<tr>
<td></td>
<td>• Familiar with the building’s systems and maintenance requirements</td>
<td></td>
</tr>
<tr>
<td>Service personnel:</td>
<td>• Responsible for regular inspection and continued operation of equipment</td>
<td>• Maintaining existing contracts</td>
</tr>
<tr>
<td>Renters:</td>
<td>• Pay rent to condo owners and may pay for utility costs but this will vary considerably and will need to individually be assessed</td>
<td>• Keeping rents stable</td>
</tr>
<tr>
<td></td>
<td>• Consume building energy</td>
<td>• Comfort</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ease</td>
</tr>
</tbody>
</table>
Appendix D: Sample Products and Process

D.1 Products

Provides guidance on the provincial requirement for Energy and Water Reporting and Benchmarking.

https://evo-world.org/en/
Measurement and Verification using IPMVP

ENERGY STAR Portfolio Manager
This is the tool to monitor, rate and optimize your building’s energy use.

Natural Resources Canada and US EPA Energy Star: Guidelines for Energy Management
Provides a strategy for creating an energy management plan.

Provides an instructive handbook for implementing an Energy Management Information System (EMIS), including tools to support an EMIS audit, planning and implementation.

Energy Management Best Practices
These are non-technical techniques or methodologies that revolve around the “softer” issues, such as behavioural change arising from increased awareness, training, accountability and information systems that result in energy savings.

NRCan Energy and GHG Management E-Learning
These are modules to help to better understand and manage energy and greenhouse gas emissions of your buildings.

NRCan’s Energy Retrofit Guidelines
This will help identify building opportunities guidance on how to carry out an energy retrofit project.

Energy Savings Toolbox: An Energy Audit Manual and Tool
This will help to assess and lower organization’s use of energy, including forms, checklists and templates that will help you collect and analyze your organization’s energy information.

This document provides an in-depth discussion of the three topics: preventive operation and maintenance, tracking, and scheduling.
Framework to Achieve a 50% Energy Reduction in the Existing Multi-Unit Residential Condominium Sector

https://sbcana.org/white-papers/
A number of documents are available that demonstrate the opportunities available within the multi-residential sector.

https://taf.ca/programs/
These programs offer insights into the multi-residential sector along with case study examples.

August 2010
This guide highlights O&M programs targeting energy and water efficiency that are estimated to save 5% to 20% on energy bills without a significant capital investment

NRCan Building Recommissioning Guide shows how building owners can control energy consumption and costs through the recommissioning process

D.2 Process

Unlocking the Energy Efficiency Retrofit Opportunity
United Nations Environment Programme Finance Initiative’s Commercial Real Estate has outlined a process for increasing the value of real estate through energy efficiency retrofits.

Energy Star Guidelines for Energy Management
This outlines 7 Steps for Improving Energy Performance

Recommissioning (RCx) Pre-Screening Tool
This RCx pre-screening tool has been developed to help select the best building candidate(s) for recommissioning. Prioritizing a portfolio of buildings and selecting those with the greatest likelihood for success can assist with long-term planning and enable to capitalize on short term paybacks. This pre-screening tool is designed to be used at the planning phase of the standardised RCx process.

Note: Energy@Work was engaged to update the screening tool and it will soon be released in 2020
SBC 2020 Integrated Design Process, as part of the Enbridge Savings by Design workshop investigated an Ottawa condominium in Ottawa. The objective was to reduce its energy consumption by 50%. The study included an hourly energy model to quantify the savings of the proposed measures.

The principle findings included:

1. A 50% energy reduction is possible.
2. Approximately 75% of the savings are in the reduction of the heating load.
3. Mechanical as well as envelope upgrades are needed to reach a 50% reduction target.

The measures used in the model to achieve the 50% reduction included:

Note: The condominium had already implemented other low and no cost measures, such as LED lighting upgrades but was still able to reach a 50% reduction.

Reference file: Knollwood Design Workshop Final Report
Appendix F: Evaluating the True Cost of Energy Efficiency Investments

Most energy efficiency measure (EEM) investments resemble an iceberg: 90% of the TRUE “Value” lie hidden below the surface since these can defer the long term expenses: energy use, maintenance, etc. However, the top 10% represents the initial cost and typically used to develop the business case. This ignores the full value of the EEM.

For example: A lighting retrofit
Lighting is typically evaluated on the initial cost of the fixture, lamp, and installation. This is about 8% of the lifetime cost. The ‘true’ cost includes electricity use, maintenance, and lamp replacements. ‘Value added’ evaluations often ignore the 92% and focus on 8%. This results in selecting the cheapest first cost option but paying more in the long-term due to component inefficiency and unreliability.

Figure 1. Integrated Design Process (IDP)

Similar to the influence and expenditure diagram, the IDP will consider initially expenditures with other options before too much time or money has been invested. This highlights the need for time to make smart investment decisions.

Recommended Approach
Energy@Work’s approach is and always been on value and includes these steps:
1. Establish a policy that prevents ‘like for like’ replacement and requires specific requirements to be defined ahead of time while there is time to influence the decision.
2. Specify the project intent, required outcomes and how these will be evaluated.
3. Document evaluation c/w reference checks so the best measure is selected.

Select solution based on best overall ‘Value’:
Consider operating, maintenance & disposal Vs first cost, often referred to as life cycle costing.
Appendix G: The Benefits of Benchmarking

“People Play Differently When There is a Score Board”

In our experience, with over 50 Energy Management Action Plans, there is typically a reduction after the first 3-6 months once utility use is tracked and examined. Benchmarking is the starting point.

### THE BENEFITS OF BENCHMARKING

**WHAT IS BENCHMARKING?**

Benchmarking is the review and comparison of a building’s energy and water performance to itself or relative to other buildings.

**WHY BOTHER BENCHMARKING?**

1. Benchmarking reveals if your building is spending more than others on energy and water costs.
2. Establishes a baseline to measure improvements.
3. Leads to savings and helps manage utility costs.

### Opportunities in the Commercial Sector:

In 2017, Energy@Work implemented an Energy Management Action Plan (E-MAP) targeting a mid-tier commercial office. Its focus: improve tenant comfort while reducing energy use.

**Step 1: Benchmarking.** An energy baseline was established after examining the utility use and a Measurement and Verification (M&V) Plan consistent with IPMVP requirements was prepared.

**Step 2: Finding opportunities.** Energy@Work worked in collaboration with the operations team to find opportunities to reduce energy use.

**Step 3: Calculating savings.** The following are the first-year results of the property: 10.4% savings with no capital, as shown below:

Following this success, the same property management company implemented E-MAPs in 2 more buildings in 2018, with similar results!
Appendix H. MURB Resources

http://bomacanada.ca/bomabest/resourcesupdates/buildingdefinitions/
BOMA Canada’s definition of a Multi-unit Residential Building (MURB)

Energy and Retrofit Loans
The City offers financing for up to 100% of project costs, at a rate equal to the City’s cost of borrowing, with repayment terms up to 20 years.

Green Will Initiative – April 2020, program design still underway
The Green Will Initiative is a voluntary program targeting building portfolios initially, that will support building owners/operators in moving their buildings through six key stages towards achieving net-zero emissions

Better Buildings Navigation and Support Services
Better Buildings Navigation & Support Services provides building owners, operators, and property managers support navigating the process of improving the energy efficiency of their buildings and reducing greenhouse gas emissions.

Apartment High-Rise Retrofit Improvement Support Program (Hi-RIS)
The High-Rise Retrofit Improvement Support Program (Hi-RIS) program makes low-cost financing available to undertake a variety of building improvements.

https://taf.ca/programs/towerwise/
TowerWise
This program is a collaboration between TAF and building owners and operators to carry out deep energy retrofits. It has been implemented in townhomes, and low and high-rise MURBS, including low income and social housing.
Appendix I: Value in Creating a “Green” Building

20 years ago, it was difficult for commercial offices to see the value of investing in building to become “Green”, beyond the traditional view of reducing utility costs. However, this has changed with the introduction of BOMA BEST Certification, LEED and environmental reporting such as https://gresb.com/

Evidence continues to grow that demonstrate the higher asset value of a green building. As an example, a study published in the Journal of Portfolio Management entitled “Green Certification and Building Performance: Implications for Tangibles” conducted by Dr Kok and Dr Devine explores the correlation of improved property performance and green building certification. The research analyzes 10 years of financial performance data across 58 million square feet of US and Canadian office space. https://jpm.pm-research.com/content/41/6/151.abstract

As stated in the study:

“The benefits uncovered through this analysis carry significant income and value implications, which are relevant for the appraisal/valuation community. Although it can be difficult to measure the financial impact of improved tenant satisfaction, what can be measured are the financial impacts of the added building stability through a more satisfied tenant base”.

According to the study, buildings which are LEED and/or BOMA BEST certified:

- Have higher net effective rates (3.7% higher if LEED certified in the US).
- Lower rent concessions (4% lower in Canada if LEED and BOMA BEST certified).
- Higher occupancy rates (18.7% higher in Canada if LEED and BOMA BEST certified).
- Higher tenant renewal rates (5.6% higher in Canada if buildings were certified by BOMA at level 3 compared to non-certified buildings).
- Higher tenant satisfaction scores (7% higher in Canada if buildings were certified by BOMA at level 3 or 4, compared to non-certified buildings).
- Lower energy consumption.
Framework to Achieve a 50% Energy Reduction in the Existing Multi-Unit Residential Condominium Sector

There may be similar path forward for the Condominium sector as supported in this article: The United Nations Environment Programme Finance Initiative (UNEP FI).

This was highlighted as “the most downloaded paper on commercial real estate” and still available: http://www.unepfi.org/fileadmin/documents/Commercial_Real_Estate.pdf

The following provides a summary, relevant to what we have been discussing in this framework and explores the following:

- Challenges of implementing an effective energy efficiency retrofit strategy.
- Encouragement to property investors to focus on the benefits energy efficiency retrofits.
- Keys to unlocking the energy efficiency retrofit potential.
- Discussion on the significant investment opportunity in energy efficiency building retrofits and cost effectiveness.
- Tips to develop a practical framework on how to address challenges.
- The steps owners and managers can take now to set themselves up for success.

Their framework consists of 7 steps and like the E-MAP:

1. **Ensure executive awareness of the business case.** This will lead to an investment in consultants or of internal staff time to carry out the next step.

2. **Measure and benchmark building energy performance.** This requires competent staff or trusted consultants to manage a portfolio-level program and an allocation of funds to carry out the audits and put in place energy benchmarking software.

3. **Set portfolio energy efficiency targets.** Whether or not they are publicly disclosed, executives and key decision makers need to know what they are aiming for.

4. **Link asset manager compensation to energy performance.** Like any major corporate initiative, the surest path to progress is to pay people based on performance, in this case on energy performance and some qualitative targets such as certification.

5. **Align lease clauses to enable retrofits (green leases).** Systematically introducing these clauses at lease creation and renewal enables energy efficiency retrofit projects to become viable. The last two steps will increase an investment manager’s chances of getting energy efficiency retrofits approved and financed.

6. **Include impact on asset value in investment analysis.** Enlarge the business case beyond the energy efficiency project assessment level by accounting for impact on the financial performance of the investment.
Framework to Achieve a 50% Energy Reduction in the Existing Multi-Unit Residential Condominium Sector

7. **Take a portfolio approach to determine next steps.** Map out your buildings according to four key variables (type of lease, lease duration, availability of capital and relationship to property [owner, manager or tenant]) and determine next steps for either a retrofit or creating the lease and financing conditions to enable one.

The study found that:

- a) Energy efficiency retrofits have attractive returns on investment, even for short-term investors.
- b) Despite evidence of the cost-effectiveness and robustness of the business case for such investments, most profitable retrofit opportunities remain untapped.
- c) The market perceives a high risk to investing in energy efficiency retrofit projects.
- d) By following the seven-step process, real estate owners and investors can tap into significant sources of wealth creation within their portfolios.
- e) If owners have enough funds themselves, they can capture the financial benefit themselves. If they do not have the funds, they will be able to bring well-constructed business cases for energy efficiency retrofits to the financial markets where demand for such projects is growing.

These opportunities exist for the Condominium sector to achieve the same awareness as benchmarking matures, information is provided and a greater awareness increase.

---

**But where to begin?**

Perhaps it is a review of the monthly maintenance fee which is typically a combination of:

Reserve Fund Contribution: 60%

Utility cost and operation cost 40% with the utilities equally to 50%.

Therefore, a vision to make a condominium ‘Green’ by reducing utility costs and other measures may become the first step.
Appendix J. Example of Energy Efficiency Measures

The following are example EEM that were observed during a 3 hour walk through of a 6-year-old Condominium during the COVID period. The EEM are not comprehensive and intended to show the potential that exists.

**Short Term Energy Efficiency Measures**

**S-1 Training:**
Building systems, documentation, and control strategies. Most of the property managers and superintendents were open to training.

**S-2 Check Filter Replacement:**
Filters were reported to have been changed last week but did not appeared clean.

**S-3 Turn off Fitness equipment when not in use:**
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S-4 Turn off heating in the fitness centre when not in use

Supply was @ 59 Degree C and Return @ 42

[Images of temperature readings]
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S-5 Fitness Centre Diffuser Temp at 43 Degree C compared to ambient and 38

S-6 Turn off pool water pumps when pool was not in use

S-7 Prepare a CuSum and M&V model for electricity use since the suites are sub-metered, the base building consumption can be tracked and EEM, such as the booster pumps, recorded.
Mid Term Energy Efficiency Measures

MT-1 Upgrade Controls

MT-2 Check if two pool pumps are required
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MT-3 Complete functional tests to optimize pump & check potential pump throttling
(Functional test will be required to confirm)

MT-4 Existing Building Commissioning
Use NRCan pre-screening tool to assess potential
Long Term Energy Efficiency Measures

L-1 Possible Heat Recovery

L-2 Boiler Upgrade from Atmospheric at time of replacement (15 years)