Future-proofing our buildings through energy efficiency retrofits

Report to Guelph City Council January 2020

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Executive Summary

The world is facing a climate crisis. Emissions of greenhouse gases (GHGs) must be reduced dramatically to avoid a global catastrophe.

Canada's emissions per person are 4th in the world[1]. It is the solemn responsibility of each community to curb their own contribution to the problem, as City Council acknowledged in May 2018 by endorsing the goal of making Guelph a Net Zero Carbon community by 2050[2].

Residential and commercial buildings contribute nearly half of our emissions by burning natural gas for space heating and domestic hot water supply. These emissions can be curtailed through energy efficiency retrofit projects, which reduce energy consumption through energy efficiency, and switch to non-emitting fuels.

The biggest barrier to energy efficiency retrofit projects is financing. The most promising solution of the seven that were reviewed is Property-Assessed Clean Energy (PACE), which attaches financing to the property, rather than the property owner, through the tax roll. The program was previously introduced to Council as the Guelph Energy Efficiency Retrofit Strategy (GEERS).

This report builds on prior work, but proposes to minimize municipality's role to the bare minimum necessary. The bulk of the program will be performed by a 3rd party delivery agent. Other parties will play key roles, including investors, contractors, utilities, and property owners, with each party deriving specific benefits from their involvement. The program poses risks specific to each participant, but various measures are proposed to mitigate these risks.

By moving ahead with GEERS, our community will make our building stock more energy efficient, more valuable, more comfortable, and more resilient. We will also significantly reduce our contribution to the global climate change crisis.

[1] https://www.ucsusa.org/resources/each-countrys-share-co2-emissions. Data from 2016.
[2] https://guelph.ca/2018/05/council-unanimously-accepts-energy-guelphs-community-energy-recommendations/

Introduction

Climate change is rapidly becoming the central issue of our time. The Intergovernmental Panel on Climate Change published a special report in October 2018 laying out in stark detail the implications of global warming of 1.5 °C above pre-industrial levels[3]. Climate emergencies have been declared by countries like Canada, Portugal, Ireland and France, and in individual cities such as Paris, New York, Toronto and Vancouver. On May 28, 2019, Guelph City Council has passed a motion acknowledging the climate crisis[4]. On November 5, 2019, more than 11,000 scientists signed a declaration of a climate emergency in the journal *Bioscience*[5].

The update to Guelph's Community Energy Initiative, presented to Council in May 2018, showed that the municipality does not have the luxury of leaving the climate challenge to other orders of government and to the marketplace. If it were to choose to do so, greenhouse gas (GHG) emissions in 2050 would be essentially the same as they are today; while broad advances in energy efficiency are anticipated, population growth would almost completely eclipse them[6]. Against this backdrop, Guelph City Council endorsed the target of making Guelph a Net Zero Carbon community by 2050.

By taking this important step, Council acknowledged that our community-wide GHG emissions are contributing to the global climate crisis. Council further acknowledged that our community must act. If we rely on the marketplace and other orders of government to deliver climate solutions, our community-wide emissions will remain static - any improvements in efficiency will be eclipsed by growing population. Finally, Council acknowledged the clearly- expressed desire of our community for Guelph to continue its leadership role on climate action, by taking aggressive steps to drive GHG emissions down.

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[3] https://www.ipcc.ch/sr15/
[4] https://guelph.ca/wp-content/uploads/council_minutes_052719.pdf#page=15
[5] https://www.cbc.ca/news/technology/scientists-declare-climate-emergency-1.5347486
[6] https://www.ourenergyguelph.ca/downloads/baseline-and-business-as-usual-report.pdf#page=5

One year later, Our Energy Guelph (OEG) presented Council with a roadmap to achieve that target: The Pathway to Net Zero Carbon[7]. This Pathway contained two surprises, both in contrast to public discourse which assumes massive taxpayer-funded expenses will be required to address climate change. First, eliminating Guelph's GHG emissions will result in a substantial net economic benefit of $1.7B (in present dollar terms) and the addition of 1,300 jobs. Second, the Pathway offers an Internal Rate of Return (IRR) of nearly 9%[8], making it an attractive investment opportunity for private sources of financing, and rendering public sector capital contributions unnecessary.

Of the 25 actions in the Pathway, three involve retrofitting existing buildings to improve energy efficiency (EE). A further five actions can be enabled using the same basic approach. Together, these eight actions account for 61.5% of the annual greenhouse gas emissions (GHG) reductions required to meet the target[9]. This document proposes a program to deliver these eight actions.

The CEI update of May 2018 also reported on progress toward two key goals from the original Community Energy Initiative, namely to reduce GHG emissions by 60% and energy consumption by 50%[10]. The community was on track to achieve the former target, but due to actions taken provincially rather than locally (i.e. the elimination of coal-fired generation from the provincial electricity supply). The city was far from achieving the latter target (2% compared to the 20% reduction that would have been expected by 2016 assuming linear progress)[11]. Achieving the new Net Zero Carbon goal will require significant reductions in energy consumption, and these can only be

[7] https://www.ourenergyguelph.ca/pathway-to-net-zero-carbon

[8] https://www.ourenergyguelph.ca/downloads/ssg-phase-2-report-the-pathway-to-net-zero-carbon.pdf#page=8

[9] https://www.ourenergyguelph.ca/downloads/ssg-phase-2-report-the-pathway-to-net-zero-carbon.pdf#page=35 Actions 3, 4, 5, 7, 8, 9, 12, and 21 account for 578 out of 940 kT CO_2e.

[10] Both targets with respect to 2006 levels, to be achieved on a per-capita basis by 2031.

[11] https://www.ourenergyguelph.ca/community-energy-initiative-cei-update-2018/research-and-response/baseline-and-business-as-usual-report

achieved through deep energy efficiency retrofits across all of the city's building stock.

How do buildings use energy?

Energy allows buildings to be comfortable, safe, and useful. Heating (including hot water), cooling, humidity control, and ventilation make buildings comfortable and avoid risks to human health. Lighting makes it possible to see what you're doing, whether that's moving around or performing tasks. Electrical outlets supply power to devices that make life easier, including refrigerators, dishwashers, clothes washers and dryers, televisions, computers, and smartphones.

Natural gas is used for space and water heating, and in some cases cooking food and drying clothes. Electricity can provide these services, as well as everything else mentioned above. Diesel fuel is used for backup generators, although natural gas is another option.

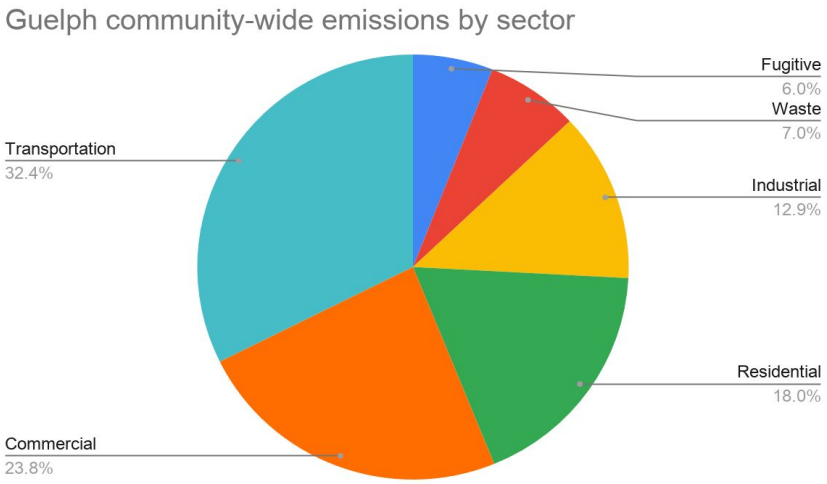
Why does building energy efficiency matter?

If a building is not efficient, it is wasteful. Wasted energy results in unnecessary GHG emissions and exposure to fluctuating energy costs. Inefficient buildings are also less comfortable, noisier, and can have bad health effects for occupants. They are more dependent on externally-supplied energy, making them less resilient.

Buildings emit GHGs

When buildings use energy, that energy can produce GHG emissions. These emissions could be onsite, such as the carbon dioxide that is given off when natural gas is burned in a residential water heater. They could also be "upstream", meaning emissions that are produced in the process of generating energy and transporting or transmitting it to the building. An example of this is when natural gas is burned in so-called "peaker plants" (like the one on the north side of Highway 401 in Milton). Emissions can also be "embodied", meaning that they happened during the original manufacture and shipping of the materials that make up the building as it was being constructed.

Together, residential and commercial buildings are responsible for nearly half (41.8%) of our community-wide GHG emissions[12]. The chart on the right shows how each sector contributes to our emissions.



An inefficient building emits more GHGs than an efficient one. By making our buildings more efficient, we can reduce their contribution to GHG emissions and hence to global climate change.

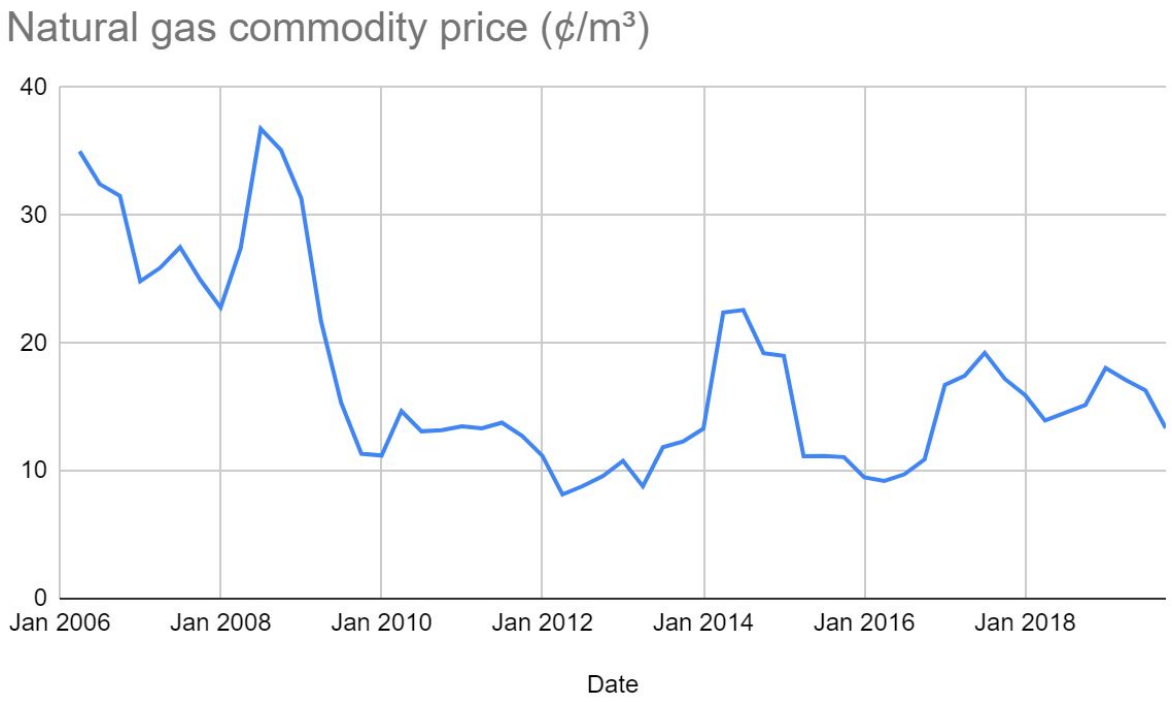
Energy costs can fluctuate wildly

Prudent homeowners live within their means, and use a budget to keep finances on track. The same goes for business owners. When a particular budget item is subject to large and unpredictable price movements, it wreaks havoc. The more exposed a home or business is to price swings, the more necessary it is to have a financial cushion - a reserve, or a line of credit - to deal with unexpected cost increases.

Ontario energy prices are regulated, so they don't tend to change much from month to month, especially for homes and small businesses. Larger businesses, such as medium to heavy industry, pay market rates that can vary dramatically over time (especially considering the impact of the so-called Global Adjustment). The chart below illustrates how much natural gas prices have fluctuated since 2006. For example, from July 2008 to October 2009 a recession combined with a dramatic increase in production caused the price to drop nearly 70%; by contrast, from April

12 https://www.ourenergyguelph.ca/downloads/baseline-and-business-as-usual-report.pdf#page=14

2013 to July 2014, the Polar Vortex extreme cold event caused the price to increase 70%. Price swings like these can wreak havoc on personal and business finances.



Energy-efficient buildings are less exposed to fluctuating energy prices. This makes it easier to budget for energy costs, and makes it less important to keep a “rainy day fund” to deal with the unexpected.

Leaky buildings are uncomfortable, unhealthy, and noisy

Inefficient buildings usually have a leaky outside shell, referred to as the “building envelope”. Cracks around windows and doors, as well as baseboards and electrical outlets on outside walls, provide pathways for air to move in and out of the building. That makes it harder to keep the inside at a comfortable temperature, so the furnace or air conditioner needs to consume more energy to offset the air that leaks out. It also means that some parts of the buildings are drafty. Sitting by the window of a century home may offer a nice view, but it probably also means a chilly draft in wintertime. In a well-insulated home, you can be as comfortable in a chair by the window as in bed under a quilt.

Cold spots on outside walls can cause worse problems than discomfort. They can get chilly enough to reach the dew point, and moisture can start to build up. That moisture can lead to problems like mold and mildew, which in turn can cause health issues like respiratory illnesses.

Finally, thin and poorly-insulated walls aren't very soundproof. If you live in a noisy neighbourhood, and your house doesn't have good insulation, you'll hear all kinds of things that you wouldn't hear in an efficient, well-insulated house. This can be more than irritating - it can interfere with sleep, which can lead to all manner of health problems.

By contrast, well-insulated, efficient homes offer comfort, health, and quiet.

Inefficient buildings are less resilient

Extreme weather events like flooding, high winds, ice storms, and heat waves are becoming more frequent. These events can cause power outages that disable heating and cooling equipment. A building can only remain livable for a certain period of time when this happens. This period of time depends on how energy efficient the building is - specifically, how well the building envelope keeps heat out during summer and warmth in during winter.

A less efficient building with a leaky envelope will rapidly become unlivable when its energy supply is interrupted. Hence, occupants of less efficient buildings are more likely to be forced to vacate their building and seek shelter elsewhere - likely in a municipal warming or cooling centre, such as a recreation centre. This increases the burden on municipal resources during an emergency and makes it less likely that the community can weather the storm without calling on outside help.

Conversely, a more efficient building with a better envelope will remain livable for a longer period of time.

What's included in an EE project?

EE retrofit projects typically include improvement or replacement of the following measures in their scope:

- Attic, wall, and basement insulation
- Weather stripping
- Windows (ideally triple glazed)
- Furnace
- Air conditioner
- Water heater
- Smart thermostat
- Drain water heat recovery

While not strictly speaking considered EE measures, the following may also be included:

- Water efficiency systems, such as grey water recovery or rainwater harvesting
- Rooftop solar systems (photovoltaic electricity generation, or solar hot water)
- Electric Vehicle Supply Equipment (i.e. electric car charger)
- Re-roofing (raised seam steel roofing, steel architectural tile, or ceramic tile)

History

The idea of renovating a building to make it more energy efficient is not new, but it received a big push from the two energy crises of the 1970s. These events, and the resulting sharp increases in energy prices, prompted property owners and builders to reduce their dependence on imported heating oil by making their buildings more efficient. Lower energy prices in the 1980s led to reduced interest. More recently, concerns about climate change have revived the EE market. An example is the EcoEnergy for Homes program of 2007-2012, which stimulated adoption of EE retrofits in Canada.

PACE in the US

One of the most significant transformations to the EE retrofit industry has resulted from the Property Assessed Clean Energy (PACE) program in the United States. 20 states have implemented PACE programs, allowing property owners to make EE investments in their buildings and repay the capital cost on their property tax bill over an extended period of time. Since the inception of the program over ten years ago, US$5.6 billion has been invested in residential properties and US$1.1 billion in the industrial, commercial, and institutional (ICI) sector according to the advocacy group PACENation[13].

PACE loans have two significant benefits that distinguish them from other options:

1. **Lower default rate.** Properties with PACE loans have a lower property tax default rate than properties without them[14].
2. **Resale premium.** Properties with PACE loans command a premium on resale of the property that is over and above the value of the loan. In other words, the PACE project increases the value of the property by an amount higher than the cost of the project. This is in contrast to other renovation options, which see property value increases lower than the cost of the project[15].

Solar City in Halifax

Launched in 2013, the Solar City program[16] has had considerable success with promoting the installation of rooftop solar energy systems, including both solar hot water and solar electric (photovoltaic) technologies. Solar City uses a similar financing approach to PACE.

Other municipalities in Nova Scotia, including Bridgewater and Digby, are at various stages of implementing PACE programs.

[13] https://pacenation.org/pace-market-data/
[14] https://www.pacenation.org/wp-content/uploads/2018/04/DBRS-Residential-PACE-Delinquency-Trends.pdf
[15] https://www.paceab.ca/resources/05._PACE_Impact_on_Home_Real_Estate_Value.pdf
[16] http://poweredbycommunities.ca/index.php/2019/10/21/property-assessed-clean-energy/

Local Improvement Charges in Ontario

An amendment to provincial legislation passed in 2012 allows a municipal finance tool called Local Improvement Charges (LICs) to be used on a voluntary basis for energy and water efficiency retrofit projects on private property. This amendment was inspired by the success of the US PACE program. The City of Guelph participated in the advocacy efforts that led to this amendment, through a collaboration led by the Clean Air Partnership called CHEERIO (Collaboration on Home Energy Efficiency Retrofits In Ontario)[17].

HELP in Toronto

The Home Energy Loan Program (HELP)[18], initiated in January 2014, uses PACE-type financing based on the LIC mechanism to enable EE retrofits. The program offers loans of up to $75,000 and financing terms of up to 20 years. Capital is supplied from a City of Toronto reserve fund. A companion program, High-rise Retrofit Improvement Support (HI-RIS), targets multi-unit residential buildings. As of May 2019, the two programs had mobilized a total of $14.9 million to deliver 202 retrofit projects. The average HELP loan amount is $22,000, while the average HI-RIS loan is $735,000[19].

GEERS

The City of Guelph has been exploring ways to encourage EE retrofits for more than ten years:

Date	Event
2007	Guelph adopts the Community Energy Plan, which identifies EE retrofits as a tool to reduce community-wide energy consumption.

[17] https://www.cleanairpartnership.org/projects/cheerio/

[18] https://www.toronto.ca/services-payments/water-environment/environmental-grants-incentives/home-energy-loan-program-help/

[19] https://www.toronto.ca/legdocs/mmis/2019/ie/bgrd/backgroundfile-134697.pdf#page=7

September 2015	Guelph Energy Efficiency Retrofit Strategy (GEERS) first presented to Council.
May 2016	GEERS presented to Council again, incorporating the changes that were requested in 2015.
2016-2018	GEERS is put on hold while the Community Energy Initiative (CEI) is updated.
May 2018	CEI Update is presented to Council, recommending GEERS or a similar program to reduce energy consumption of buildings.
May 2019	Pathway to Net Zero Carbon is presented to Council. EE retrofits comprise three of the 25 technical actions in the Pathway.

In response to the recommendations of the May 2018 CEI Update, a project was initiated in February 2018 to revise the GEERS proposal.

Engagement approach

The GEERS project employed an engagement approach consisting of two elements. The first was to convene a team of local stakeholders, while the second was to participate in a joint project with other municipalities (see CASC, below).

Stakeholder team

The stakeholder team included the following individuals:

Name	Organization	Constituency
Patrick Andres	City of Guelph	Building inspections
Gavin Baxter	SHED Design	Renovation contractors
Alex Chapman[20]	Our Energy Guelph	Guelph community
Ian Dunbar	Enbridge Gas	Natural gas utility
Don Eaton	Elora Environment Centre	Energy auditors
Evan Ferrari	eMerge Guelph Sustainability	Environmental NGOs

[20] Alex Chapman transitioned from the role of Manager, Climate Change Office with the City of Guelph to ED of Our Energy Guelph during the course of the mandate of the GEERS Advisory Group but served as chair throughout.

Andy Goyda	Owens Corning	Materials suppliers
James Krauter	City of Guelph	Finance
Mark Poste	County of Wellington	Social housing
Irene Szabo	Sutton Group	Realtors
Erik Veneman	Alectra Utilities	Electricity utility
Heather Yates	City of Guelph	Water utility

This advisory group met seven times over the course of the year, examining different aspects of the program and refining the recommended approach described in this document.

CASC

With funding support from the Federation of Canadian Municipalities Transition 2050 program, in 2019 the Clean Air Partnership launched the Climate Action Support Centre (CASC). This entity is supporting three work streams, one of which is assisting communities interested in implementing an EE retrofit program. Guelph provided a letter of support for the preparation of the initial application. CASC has delivered a series of webinars on this topic as part of this program.[21]

The financing barrier and how to overcome it

EE retrofit projects result in reduced consumption of electricity, natural gas, and possibly water. This leads to utility bill savings which serve to pay back the initial investment, but they don't do so very quickly. The typical residential EE project has a simple payback period of eight years[22].

Coincidentally, the typical Canadian will stay in their home for eight years[23]. Hence, the average homeowner would have to retrofit their home immediately after

[21] https://www.cleanairpartnership.org/projects/casc/
[22] http://guelph.ca/wp-content/uploads/IDE_agenda_090815.pdf#page=37
[23] https://mortgageproscan.ca/docs/default-source/default-document-library/a-profile-of-home-buying-in-canada.pdf?sfvrsn=e54ef47e_0

purchase to have a reasonable chance of repaying their initial investment before the house is sold again. This is likely to discourage many prospective customers.

If a property owner goes ahead with an EE project anyway, they have a number of possible ways to pay for it, including:

- Savings
- Home equity loan or line of credit
- Unsecured line of credit
- On-bill financing
- Utility incentives

These are discussed in more detail below.

Savings

EE retrofits compare rather well with other investment alternatives. They provide savings on after-tax income, whereas the interest earned on investments (e.g. a savings account, mutual funds, stocks, bonds, or Guaranteed Investment Certificates) is taxable in the investors hands. The eight-year simple payback period for the bundle of EE measures envisioned for a typical residential project (see *What's included in an EE project?* above) translates into an after-tax rate of return of 12.5%; such a rate of return is difficult to match on the stock market, let alone lower-risk investment options.

The problem is that most Canadians are heavily indebted. Few have savings available to invest in an EE project. Even if a property owner has capital to spare, EE projects are a highly illiquid investment; you can't cash out on demand as you can with, say, a high-interest savings account.

Home equity loan or line of credit

Canadians typically use this instrument to finance renovations like granite countertops, adding or improving a bathroom, or replacing flooring. (It can also be used for unrelated purposes like debt consolidation or post-secondary education

tuition.) Because the debt is secured by the property, the lender has the right to seize the property and sell it to recover their money if the borrower goes into default. Hence it is a comparatively low risk for the lender and they can offer an attractive interest rate.

Loans have strict terms for repayment, while lines of credit are more flexible. Flexibility can be both good and bad; it can lead to a lack of fiscal discipline, which results in a much longer time to pay off the debt than in the case of fixed payments. In both cases, means testing is used to determine if the borrower is an acceptable risk, and not all will pass that test; those that do will face limits on future borrowing as the debt is attached to the individual rather than the property. When the property is sold, the debt must be paid off.

Unsecured loan or line of credit

This option is similar in most respects to the previous item, except that the lender does not have the last-resort option of seizing an asset if the borrower defaults on their debt. As a result, the interest rate is considerably higher to compensate for the higher risk to the lender.

On-bill financing

Some utilities provide financing to help their customers to purchase energy-saving devices (e.g. replacing an old furnace with a new, high-efficiency one). The customer incurs little or no up-front cost, and they pay off the principal on their utility bill. Utilities have a comparatively low cost of capital and can therefore offer an attractive interest rate. However, they do not have the ability to seize the property or the asset, so the rate is typically higher than that available with a Home Equity Line of Credit. It is also difficult for the utility to force the new owner to assume the liability if the property changes hands.

Neither Alectra Utilities or Enbridge Gas currently offer any programs of this type.

Utility incentives

Electricity, natural gas, and (some) water utilities offer incentives for implementing measures that reduce consumption. These incentives are usually in the form of a rebate that is paid out after the measure is completed, thereby reducing the capital cost that must be repaid through the bill savings arising from reduced consumption. The programs may be “prescriptive”, meaning that a given measure is automatically eligible for a specific rebate (e.g. at the time of writing, Union Gas offers a $40 rebate for every window that is replaced with an ENERGY STAR® Zone 2 or 3 qualified model). They may also be “engineered” or “custom”, which requires the proponent to provide detailed calculations demonstrating the savings that the measure will produce.

Rebates reduce the initial cost of an EE project, but don’t solve the problem of financing the remainder. Rebates can be “stacked” (i.e. combined) with other options. Currently the Independent Electricity System Operator (IESO) is responsible for all incentive programming related to electricity efficiency.

The Government of Canada offered rebates for EE retrofits through its EcoEnergy for Homes program, but this was discontinued in 2012.

LIC/PACE loan

This option is open to municipalities that pass an enabling bylaw. Essentially, the property owner borrows the money for an EE project from (or through) the municipality. The debt is then attached not to the owner, but rather to the property itself, via the tax roll. The owner then makes debt repayments along with their property tax payments.

If the property is sold, the buyer can require that the seller repay the PACE loan as a condition of sale. (This occurs in about 50% of cases in the US PACE program.) If they choose not to, they automatically assume the liability when they take ownership of the property.

This option is very low risk as the municipality holds a more senior debt obligation on the property to that of mortgage lenders. If the property goes into default, and all

efforts to extract payment are unsuccessful, the municipality has the legal right to subject the property to a tax sale. The municipality then recovers its unpaid taxes from the proceeds, before any mortgage lenders are allowed to recover their investment. This low risk can translate into very attractive interest rates.

In some PACE programs, the capital for the loans is supplied from the municipality's reserve funds. In others, private capital is obtained from investors such as pension funds or insurance company asset managers.

Ontario LIC legislation allows the term of the loan to match the usable life of the asset. This could be as long as 25 years.

The municipality is the only entity that can perform certain administrative tasks related to the PACE loan, including:

- Adding the loan to the property at the outset
- Processing payments
- Transferring to another owner on sale
- Liquidating the loan when the term is concluded
- Liquidating the loan when a buyer requires it to be paid in full as a condition of sale

Other tasks related to PACE programming, including specifying contractor qualifications, marketing the program to customers, raising capital, and paying investors, may be performed by a third party (typically called a "delivery agent").

Ontario's LIC legislation allows for the municipality and the delivery agent to recover administrative costs through these methods:

- Interest rate rider on financing terms
- Administration charge added to initial financing capital
- Grant or other discretionary funding sources

Green mortgage

Energy efficient properties offer two key benefits. First, they have higher intrinsic value than less-efficient properties; research conducted into PACE properties in the US showed that they commanded a premium higher than the value of the PACE loan. This means that the PACE project added value over and above its cost. By comparison, other renovation projects almost always destroy value; the increase in sale price of the property is less than what the renovation cost.

Second, an energy-efficient property offers its owner protection against unexpected jumps in energy costs. In extreme cases, an increase in electricity or natural gas prices could drive a property owner into default; this outcome is less likely if the property consumes less energy and therefore has lower bills.

In recognition of these two benefits, so-called "green mortgages" offer a lower interest rate to energy-efficient properties. The Energy Efficiency Mortgage Action Plan is exploring this idea in the European Union and several banks have piloted green mortgage products. Here in Canada, the Canadian Mortgage and Housing Corporation Green Home program offers a 25% reduction in mortgage loan insurance to property owners that build, buy, or renovate for energy efficiency. In 2011 the Bank of Montreal launched a reduced rate product called the Eco Smart Mortgage but has since abandoned it. It does not appear that any major Canadian bank offers a green mortgage product.

Recommended approach

The only option listed above that has the potential to drive significant adoption of EE retrofits in the near term is PACE financing. It is therefore recommended that Guelph adopt a PACE program as soon as practical. The program should be targeted to achieve the following objectives:

- Address energy poverty by targeting low-income or affordable housing
- Focus on very large projects to reduce the share of PACE administration costs as a percentage of overall project cost
- Reduce sales cycles by focusing on commercially-owned rather than owner-occupied properties

The type of property that fulfills each of these criteria is multi-unit residential buildings (MURBs). They often house tenants in the lower income category. They are typically larger buildings, requiring larger investment to drive significant energy efficiency improvement. They are also commercially owned, which means that investment decisions are driven by economics and a sound business case.

Based on prior direction from Council, the role of the municipality should be kept to the bare minimum. It is therefore recommended to employ a delivery agent to perform all tasks other than those that only the municipality can perform.

The Delivery Agent

This entity (and any subsidiary entities it engages on a subcontract basis) will be the cornerstone of the program. It will perform the following tasks:

1. In consultation with OEG, develop strategies for engagement with all relevant stakeholders/partners, including:
    a. Investors
    b. eMerge Guelph Sustainability and other local organizations
    c. Property management corporations
    d. Realtors and mortgage brokers
    e. Mortgage lenders
    f. Property insurers
    g. Contractors
    h. Energy auditors
    i. Suppliers
    j. Utilities
    k. Architects/design consultants
    l. Building science consultants
    m. Local municipality
    n. Peer municipalities
    o. Property owners
2. Manage relations with investors, including:
    a. Identifying potential investors

b. Pitching the program
c. Obtaining investor agreement to provide funds
d. Execute all necessary legal documents
e. Receiving funds from investors
f. Manage all “parked” funds until such a time as they may be remitted to each property owner
g. Manage repayment of funds to investors, including agreed interest

3. Manage relations with eMerge Guelph Sustainability and other local organizations with goals that are aligned with those of the program, including:
    a. Providing collateral material to assist with promoting the program
    b. Specifying what data must be collected when referring a prospective customer
    c. Establishing an appropriate fee to be paid out in consideration of the referral value
4. Manage relations with property management corporations, including:
    a. Pitching the value of energy efficiency retrofits to
        i. Increase the asset value of the building
        ii. Increase the attractiveness of the property to prospective tenants
        iii. Reduce the risk of tenant default on rent payments
        iv. Reduce risks to the integrity of the building, such as cold spots leading to condensation and mold/mildew
    b. Facilitate discussions with the actual property owner with the goal of signing them up as a program participant
5. Manage relations with realtors and mortgage brokers, including encouraging realtors to present a PACE project to:
    a. Increase the value of the property in advance of a sale
    b. Increase the value, comfort, quiet, and cost-effectiveness of a property following sale
6. Manage relations with mortgage lenders, including presenting PACE projects as a tool to:

    a. Increase the asset value of the property by an amount greater than the PACE loan value
    b. Decrease the risk of default on mortgage payments
    c. Future-proof the property against future fluctuations in energy prices
    d. Enhance the resilience of the property to extreme weather events, including resulting interruptions in energy supply
7. Manage relations with property insurers, including item 6(d) above and its potential to reduce overall insurer risk, offer discounted premiums, and communicating these facts to policyholders to encourage program uptake
8. Manage relations with contractors, including:
    a. Developing contractor eligibility criteria, likely including a 3rd party qualification program
    b. Developing and implementing a program to help property owners to select a contractor
    c. Developing and implementing a program for property owners to evaluate contractor performance
    d. Working with local stakeholders including post-secondary institutions, the Ontario College of Trades, to develop and grow a workforce with the necessary skills to support the program
9. Manage relations with energy auditors, including:
    a. Identifying an energy audit framework that is suitable to the PACE program, consisting of:
        i. Auditor qualifications
        ii. Audit methodology
        iii. Audit standards
        iv. Auditing tools
        v. Audit deliverable templates and samples
    b. Determining whether a pre and post audit will be a mandatory element of the program or a value-added option offered at an additional charge
    c. Determining how to integrate audit execution in the context of the PACE program with audit-related offerings from utilities (see below)

    d. Aggregating audit results in a database with other salient project attributes to provide a resource to guide program continuous improvement
10. Manage relations with suppliers, including:
    a. Developing product eligibility criteria, likely including a 3rd party evaluation program (e.g. ENERGY STAR®)
    b. Integrating the PACE program delivery process with product customer evaluation/review processes and tools
    c. Arranging bulk discounts
11. Manage relations with utilities (or entities responsible for delivery of EE incentive programs, such as the IESO), including:
    a. Promoting the program through bill inserts or other means, especially after the property changes hands (as this is when owners are most likely to engage in a retrofit project)
    b. Identifying EE measures that are eligible for both the PACE program and utility incentives/rebates
    c. Harmonizing the application processes for the PACE program and incentive programs to allow both to be completed in a single step
    d. Harmonizing energy audit processes and rebates
    e. Integrating rebate payment process
12. Manage relations with architects/design consultants, including:
    a. Demonstrating the benefits of adding a PACE EE project to the scope of an existing renovation project
    b. Providing tools to facilitate integrating EE measures into a renovation design, including modelling of the benefits
13. Manage relations with a building science consultancy, including:
    a. Identifying or creating a standard that contractors must meet to be eligible to participate in the program
    b. Collaborating with other entities to develop the standard, including:
        i. Peer municipalities
        ii. Provincial ministries such as the Ministry of Environment, Conservation, and Parks; the Ministry of Natural Resources and

Forestry: and the Ministry of Energy, Northern Development, and Mines

iii. Federal ministries such as Natural Resources Canada and Environment and Climate Change Canada

iv. Canadian Green Building Council

14. Manage relations with the local municipality, including:
    a. Assisting with continuous improvement of LIC administration process
    b. Confirming LIC receipts that the municipality retains to defray the costs of LIC administration
    c. Working with the municipality to monitor program key metrics, such as:
        i. New PACE loans executed
        ii. Total PACE repayment receipts
        iii. Property sales involving PACE loans
        iv. PACE loans that are paid out, either as a precondition of property sale or otherwise under the direction of the property owner
        v. PACE loans in default (as a percentage of the overall default rate)
        vi. Tax sales executed on PACE properties
    d. Program qualitative reporting in the context of overall OEG progress reporting
15. Manage relations with peer municipalities, including:
    a. Identifying and collaborating with municipalities that are in the process of developing and deploying PACE programs
    b. Reporting on PACE program progress
    c. Developing options for extending the program to other municipalities, such as:
        i. A playbook resource
        ii. Hands-on assistance with setting up new local entities modeled on OEG and the Delivery Agent
        iii. Expanding the service territory of OEG and/or the Delivery Agent
16. Manage relations with property owners, including:
    a. Sales and marketing
    b. Qualifying applicants (see details below)

c. Instructing successful applicants on their role in the process
d. Advancing funds to pay the contractor deposit, if applicable
e. Directing them to resources to assist with:
    i. Contractor selection
    ii. Reviewing and executing the contract
    iii. Applying for and receiving utility and/or government incentives/rebates
    iv. Paying a deposit
    v. Overseeing the project
    vi. Reviewing completed work, including making and closing out a deficiency list
    vii. Evaluating and reporting on contractor performance
    viii. Issuing final payment to the contractor
    ix. Understanding the warranty and addressing any issues that arise during the warranty period
f. Issuing final payment
g. Following up on any issues/questions regarding the PACE loan and repayment process
h. Providing guidance regarding subsequent property sale, including:
    i. Paying out the PACE loan if the buyer requires it
    ii. Providing a PACE primer to the buyer if they choose not to pay out the loan
i. Advising the property owner when the PACE loan has been fully paid

17. Manage program sales and marketing, including development of the following sales channels:
    a. Contractors presenting a PACE project as a potential change order on a renovation project at some stage of completion
    b. The eMerge Home Tune-Up
    c. Various programs that OEG supports, such as My World, My Choice
    d. Real estate stakeholders, including realtors, mortgage brokers, mortgage lenders, and utilities

18. Qualify program applicants and either accept or reject them according to specified criteria, including:
    a. The applicant must be able to demonstrate that all persons/entities on the title for the property (as determined by a title search) agree to have the PACE loan attached to the property
    b. The property owner must be up to date on their property tax payments
    c. The loan value may not be higher than a specified percentage of property value
19. Communicate the outcome of the eligibility screening to the property owner
20. Issue the request to the City to add the LIC to the property
21. Release funds to the property owner (including any advance/deposit that the contractor requires, and the balance due upon project completion)
22. Receive aggregated PACE repayment instalments from the City (net of the agreed fee for recovery of costs for LIC administration)
23. Retain the portion of the administrative fee associated with its own operations
24. Forward net, aggregated PACE repayment instalments to investors
25. Report on progress to all stakeholders
26. Work with OEG to promote/advocate for a mandatory requirement that all property renovation projects include measures to bring the entire building up to the EE requirements of the current Ontario Building Code

To establish the delivery agent relationship, OEG will likely start by issuing a Request for Proposals from organizations wishing to partner with OEG in the role of Delivery Agent. If no suitable organization is identified, OEG will build the Delivery Agent organization from the ground up.

Partners

It is recommended that the parties listed in item 1 of the previous section be engaged as additional partners in the program.

The role of each party is elaborated below.

Investors

- Supply capital for PACE projects, and receive a return on their investment. Potential investors include insurers (especially property insurers), pension funds, and even individual investors making deposits through a cooperative or other aggregating entity.

eMerge Guelph Sustainability and other local organizations

- Market the PACE program to participants in programs such as the eMerge Home Tune-Up program, positioning PACE as a next logical step.
- Pass referrals to the Delivery Agent for follow up.
- Receive a referral fee as a reward.

Property management corporations

- Market the PACE program to property owners as a means to reduce property management risks such as damage from moisture and tenant default on rent payments.
- Pass referrals to the Delivery Agent for follow up.

Realtors and mortgage brokers

- Market the PACE program to sellers as a means to enhance the value and salability of properties before they are listed, and to buyers as a means to enhance the value, comfort, and operating cost profile of properties after purchase.
- Pass referrals to the Delivery Agent for follow up.

Mortgage lenders

- Encourage borrowers to adopt the PACE program as a means to enhance the asset value of the property and reduce the likelihood of default on mortgage payments.
- Pass referrals to the Delivery Agent for follow up.

Property insurers

- Encourage policyholders to adopt the PACE program as a means to decrease property susceptibility to extreme weather risks, whether these may be direct (e.g. water damage due to flooding) or indirect (e.g. pipes freezing and bursting when heating plant stops working during a power failure), and thereby offer savings on premiums.
- Pass referrals to the Delivery Agent for follow up.
- Participate in the PACE program in the role of investor, to align financial assets with business objectives.

Contractors

- Encourage renovation clients to adopt the PACE program as a no-money-down increase to the project scope that will enhance the building's cost-effectiveness, comfort, quiet, and health and the opportunity to attain all this while the usability of the property is already disrupted by the initial renovation.
- Pass referrals to the Delivery Agent for follow up. Alternatively, use a direct sign-up process to qualify applicants on the spot (as some US PACE providers offer).

Energy auditors

- Conduct pre and post retrofit energy audits to demonstrate the effectiveness of the project.
- Provide program participants with an audit report including audit approach, findings, and recommendations.

Suppliers

- Supply products aligned with PACE program objectives (see *What's included in an EE project*, above).

- Provide bulk discounts to reflect the large purchase volumes that result from the success of the program.

Utilities

- Integrate incentive program application processes with the PACE program application process.
- Promote the program to customers through bill inserts and dedicated mail-outs when the property changes hands.

Architects/design consultants

- Promote adoption of the PACE program to renovation clients as a no-upfront-cost method to enhance the building's cost-effectiveness, comfort, quiet, and health.
- Pass referrals to the Delivery Agent for follow up.

Building science consultant

- Develop a certification/qualification program for contractors to demonstrate that they have the required skills, experience, and ability to deliver successful EE retrofit projects.

Local municipality

- Establish and manage PACE administrative processes
- Pass the LIC bylaw
- Add the LIC to the tax roll for each PACE property
- Issue property tax bills*
- Collect property tax remittances, including PACE repayment revenues*
- In the event that the property owner defaults on payments, execute established procedures (ultimately concluding with a tax sale if all other measures to obtain payment are unsuccessful)*

- Remit the aggregate LIC receipts to the Delivery Agent, net of the agreed amount for recovery of LIC administration costs
- Retire the LIC if it is paid out upon the request of the property owner, as a condition of sale, or on completion of the payment schedule
- On sale of the property, transfer the LIC to the new property owner they have not requested that it be liquidated as a condition of sale

* These items are not significantly different from current practice in the absence of the LIC/PACE program.

The role of each of the parties in the business process is depicted in *Appendix: GEERS Business Process*.

Benefits

The table below lists the benefits to each of the program stakeholders.

Stakeholder	Benefits
1. Investor	● A low-risk investment with an attractive return
2. eMerge Guelph Sustainability and other local organizations	● Ability to offer a more complete and comprehensive service to clients ● Referral fee revenues
3. Property management corporation	● Reduced risk of tenant default on rent payments ● Reduced risk of building damage due to moisture and mold/mildew
4. Realtor, mortgage broker	● Enhanced service to clients ● Competitive differentiator
5. Mortgage lender	● Enhanced value of the asset ● Reduced risk of borrower default on mortgage payments
6. Property insurer	● Enhanced resilience of the insured property; reduced risk of insured loss due to extreme weather ● Opportunity to offer a premium discount as a reward to the policyholder

	• Competitive differentiator
7. Contractor	• Increased project scope and revenues
8. Energy auditor	• Additional projects and service revenues
9. Supplier	• Additional sales and resulting revenues
10. Utilities	• Increased uptake of incentive/rebate programs • Ability to accommodate growth without adding to the asset base
11. Architect/design consultant	• Enhanced professional image
12. Building science consultant	• Service revenues • Enhanced professional eminence due to role in developing a widely-accepted standard
13. Local municipality	• Contribution to the goals of the Pathway to Net Zero Carbon • Increased assessment values • Enhanced ability to accommodate growth, by freeing up utility capacity (water, wastewater, electricity, and natural gas) • Full recovery of costs incurred
14. Peer municipality	• An established, successful PACE program to use as a model for their own program
15. Property owner	• Reduced property operating costs • Increased quiet • Greater comfort • Reduced risk to health • Enhanced resilience to energy supply disruption • Obtaining all of the above with no out-of-pocket costs or investment

Risks and mitigation

The PACE program poses risks to some stakeholders. These risks, and the means to mitigate them, are detailed below.

Risk: The property owner defaults on payment.

Description: The property owner is unable to make one or more property tax payments, including the Local Improvement Charge component.

Affected stakeholders: Delivery agent, investors, mortgage lender, local municipality, property owner

Mitigation: Property tax collections are the primary revenue source for municipalities. Default rates are extremely low given that the municipality has the power in extreme cases to subject the property to a tax sale. Property owners usually resolve the problem and clear the arrears before the municipality is compelled to exercise this option. This factor contributes to why interest rates on municipal bonds are also quite low and they are considered among the lowest risk financial instruments available.

Guelph has among the lowest default rates in the province. In the US, properties with PACE loans have been shown to have a lower default rate than those without. The combination of these three factors makes this risk exceedingly low.

In the US, mortgage insurance providers Fannie Mae and Freddie Mac have declined to cover properties with PACE loans. In Toronto, some mortgage lenders have declined to give their consent for borrowers to participate in HELP. To mitigate concerns of mortgage lenders and insurers, the State of California implemented a loan loss reserve; it has never been used. It is therefore recommended not to implement such a mitigation measure, unless it is implemented on a provincial scale as was recommended by the former Environmental Commissioner of Ontario[24].

This risk is best mitigated by highlighting the fact that the PACE project enhances the property value and is associated with a lower rather than a higher default rate. In other words, a PACE property is a better mortgage risk than a non-PACE one.

Risk: Project energy savings fail to meet expectations.

[24] https://docs.assets.eco.on.ca/reports/energy/2019/why-energy-conservation.pdf#page118

Description: An energy audit will typically include an estimate of the savings that can be expected after the recommended EE measures are implemented, and hence the business case for the project. There are three main reasons why the project may fail to meet expectations:

- The auditor overestimated the benefit of the proposed EE measures.
- The contractor made errors in the installation which prevented the included measures from performing as expected.
- The occupants exhibited wasteful behaviours that offset the expected energy savings.

No matter the reason, the result is that the savings - which were intended to pay back the initial investment - failed to materialize. This can have a negative impact on the property owner, as well as all players with a visible connection to the project. In an extreme case, a badly executed project can actually cause damage to the building.

Affected stakeholders: Property owner, delivery agent, contractor, municipality

Mitigation: This risk can be mitigated by requiring that the contractor obtain a specified qualification/certification before they are eligible to deliver a PACE-financed project. Parties involved in project financing (principally the delivery agent, but also the municipality) should avoid any direct link to the contractor, by avoiding explicit contractor endorsement (e.g. through an approved contractor list). In addition, the delivery agent can mitigate this risk for future projects by mandating all participating property owners to provide a review and rating of their contractor on a public forum, to provide transparency and accountability. The contractor can mitigate their risk by obtaining warranty insurance, as well as by training the occupants and/or the property manager how to obtain optimum performance from the retrofit and tuning any newly-installed equipment to manufacturers specifications after the project is complete. (This is referred to as commissioning.)

Risk: A project has excessive delays.

Description: Poor project planning, including resource mismanagement, can draw out project duration by weeks or even months. This can lead to occupant discontent and in extreme cases legal action.

Affected stakeholders: Property owner, occupants, contractor

Mitigation: This risk is mitigated by requiring contractors to meet the qualification/certification, and by providing transparency on contractor performance through a public customer review and rating platform.

Risk: A supplier product causes project failure.

Description: If a product such as a high-efficiency water tank fails to perform as intended, it can cause the project to fail to meet EE expectations and may even damage the building.

Affected stakeholders: Suppliers, contractor

Mitigation: This risk can be mitigated via the product warranty, and by requiring contractors to be trained how to install the product properly and in accordance with the supplier's specifications.

Risk: Outstanding PACE loans negatively impact municipal finances.

Description: Where a municipality directly borrows the funds for a PACE program, there is a risk that excessive borrowing could affect the City's credit rating and/or encroach on debt limits imposed by local policy or provincial regulation.

Affected stakeholders: Municipality

Mitigation: This risk only exists if the liability is on the municipal ledger. It is mitigated by taking the debt off the municipal books completely, and having it reside exclusively with the Delivery Agent.

Risk: Disruption to building inspection cost recovery.

Description: Building inspection fees for larger properties are used to cross-subsidize those for smaller properties. If there is a significant increase in the number of inspections for smaller properties, it could drive Building Services into a budget deficit.

Affected stakeholders: Municipality

Mitigation: Begin the program with a focus on large-value properties. As the program is made available for smaller properties, monitor the balance of inspection costs and make adjustments as required.

Program economic analysis and business case

The economic benefits of the proposed program vary from stakeholder to stakeholder. A business case for a sample multi-unit residential building is provided below.

Property type	Multi-Unit Residential Building
Number of units	100
Floor area per unit (m^2)	90
Total floor area (m^2)	9,000
Retrofit cost per m^2 (per 2015 GEERS report, adjusted for inflation)	$75.50
Total retrofit cost	$679,000
Cost per MWh, natural gas	$23.40
Cost per MWh, electricity	$146.96
Operating energy savings, natural gas	35%
Operating energy savings, electricity	35%
Total operating cost savings	$63,436.76
LIC interest rate	6%
LIC repayment term	20 years

GEERS annual repayment	$59,198.31
Net annual savings to owner, Year 1	$4,238.44
Co-benefits	• Increased occupant comfort by eliminating drafts • Reduced noise transmission from outside • Reduced risk of occupant health impacts • Reduced exposure to energy price fluctuations

The Delivery Agent program financials are estimated to be as follows:

Total investment in first year of operation	$25,000,000
Total number of buildings per example	37
Annual revenue	$2,190,000
Investor repayment (principal + interest at 4%)	$1,840,000
LIC administration fee to City	$50,000
Net revenue	$300,000

Targets, measurement, and reporting

The retrofit program has the following principal targets, taken from the *Pathway to net zero carbon* report presented to Council in 2018:

- Retrofit 98% of pre-1980 dwellings by 2050, with retrofits achieving thermal and electrical savings of 50%.
- Retrofit 98% of dwellings built between 1980-2017 by 2050, with retrofits achieving average thermal and electrical savings of 50%.
- Retrofit 98% of pre-2017 ICI buildings by 2050, with retrofits achieving average thermal and electrical savings of 50%.

Further, PACE financing could be used to achieve the following targets associated with HVAC equipment:

- Air source heat pumps are added to 50% of residential buildings and 30% of commercial buildings by 2050

- Ground source heat pumps are added to 20% of residential and 40% of commercial buildings by 2050
- Solar PV- net metering Solar PV systems are installed on 80% of all buildings by 2050. These PV systems provide on average 30% of consumption for building electrical load for less than 5 storeys and 10% for multi-unit buildings greater than 5 storeys and commercial buildings.
- Hot water heat pump installations are scaled up to 80% of residential buildings by 2050, and 50% of commercial buildings by 2050.

Finally, PACE financing could be used to finance the purchase of electric vehicle chargers in support of the following targets:

- 100% of new passenger vehicles are electric by 2030.
- 95% of new commercial vehicles are electric by 2030.

To aid in tracking progress toward these goals, the following metrics will be used:

1. Number of units retrofitted
2. Aggregate floor area retrofitted
3. Aggregate electricity savings arising from retrofits (kilowatt-hours)
4. Aggregate natural gas savings arising from retrofits (cubic metres)
5. Aggregate dollar savings, broken out by energy type
6. Aggregate carbon emissions reductions

Each of these metrics will be broken out by building category (i.e. single detached, double detached, row housing, apartments, industrial, commercial, and institutional). We will endeavour to track all retrofit projects, not just those done through the GEERS program.

The retrofit business volume will not be constant, as the renovation sector will take time to build up capacity to match demand. Initially, volume will double every five years, meaning a compound annual growth rate of 15%. After ten years, growth will level off. This is illustrated in the following two tables (excerpted from the *Pathway to net zero carbon*), the first showing the aggregate number of residential units retrofitted as of the end of each five-year period:

Year	Single detached	Double detached	Rows	Apartments
2026	10,856	1,287	4,076	3,696
2031	21,711	2,574	8,152	7,392
2036	22,154	2,627	8,318	7,543
2041	23,098	2,739	8,436	7,673
2046	23,394	2,774	8,309	7,596
2051	23,369	2,772	8,071	7,450

The next table shows the aggregate floor area (in square metres) of retrofit activity in the ICI sector in five year increments:

Year	Commercial	Retail	Warehouse	Education	Institution
2021	96,400	248,033	126,867	268,268	193,007
2026	193,897	488,984	256,718	547,689	387,745
2031	244,765	611,124	325,779	701,108	491,080
2036	270,899	677,481	364,401	785,343	545,336
2041	283,759	712,700	385,190	831,593	574,513
2046	289,632	729,794	396,117	856,987	589,325
2051	291,931	736,692	401,658	870,930	596,239

The Delivery Agent will provide detailed quantitative reporting on progress of the above metrics on an annual basis, along with quarterly qualitative progress reports.

Next steps

The first order of business is to get the Delivery Agent in place and ready to begin work. This is expected to take 4-6 months, and will include the following tasks:

- Analyse business process in detail to identify all requirements
- Develop and issue RFP

- Revise RFP in response to proponent feedback
- Select successful proponent

A parallel work stream will mobilize investment capital, so that it is ready to be invested when the Delivery Agent is open for business.

As described above in the section entitled *Recommended approach*, the first target market for the Delivery Agent will be MURBs. It is proposed to focus solely on this market segment in the first year of operations. This will maximize the amount of capital mobilized and the amount of floor area retrofitted, compared to the number of transactions. This will give the City of Guelph Finance Department time to drive down the organizational costs associated with LIC administration, and will allow these costs to be spread over a much larger per-transaction capital base.

In the second year of operations, it is proposed to continue having sales and marketing efforts focus on MURBs. Other building types will be welcome to participate in the program, but will not be specifically targeted.

By Year 3, sales and marketing efforts will be expanded to include all building types and sectors.

This sales and marketing approach is summarized below:

Year	Single detached Double detached Townhomes	MURBS	Industrial Commercial Institutional
1	No	Yes	No
2	Reactive	Yes	Reactive
3	Yes	Yes	Yes

By Year 3, the program will be well on its way to driving down energy consumption and carbon emissions in Guelph's building sector. The success of this effort will play a crucial role in achieving the goal of making Guelph a Net Zero Carbon community by 2050.

Appendix: GEERS Business Process

Refer to diagram at this link.