



# BETTER HOMES BURLINGTON

## Recommendations Report for City of Burlington Home Retrofit Program

January 2022

*Prepared by the Centre for Climate Change Management*



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### The City of Burlington's Climate Action Plan Community Stakeholders Committee

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- Finance
- Legal

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## II. EXECUTIVE SUMMARY

In **April 2019 the City of Burlington declared a climate emergency**, signalling the priority to deepen the City's commitment to mitigating and adapting to climate change, which resulted in the development of a Climate Action Plan (CAP). The CAP, approved in April 2020, outlined seven programs to support the transition to become a net zero carbon community by 2050. A key program within the CAP includes the creation of a deep energy retrofit program (also called a home energy retrofit, or HERO program), as **residential buildings make up 26% of Burlington's greenhouse gas (GHG) emissions**. Home upgrade programs present significant opportunities to reduce GHGs, support climate adaptation while contributing to local employment, education and training opportunities, which result in and more sustainable and innovative cities.

To ensure substantial program uptake and reduction in residential GHGs it is essential that **homeowners and contractors see value in the program**. All aspects of this work are designed around how to best reduce homeowner and contractor barriers to increase program participation. Key components of the following report include:

- **Background research and data** relating to key home characteristics, home energy use, utility and carbon costs, and GHG emissions
- **Program design** including program sequence and eligible home upgrades
- **Program delivery** recommendations to support homeowners and contractors as they move through the program
- **Goals and metrics** to measure quantitative impact towards long-term goals
- **Monitoring and evaluation** recommendations for impactful and efficient reporting and strategy development
- **Financing** options to ensure long-term program funding
- **Implementation** timelines for program planning and launch
- **Burlington homeowner survey** results relating to home upgrades, values, and climate action
- **Education and outreach** campaign summary identifying completed efforts to support program stakeholder education

**Table II.1:** Summary of key recommended home upgrade elements.

Participant Eligibility	Details
<b>Home Eligibility</b>	Burlington residential homes (detached, semi-detached, and townhomes)
<b>Financing Incentive</b>	Local improvement charge (LIC) loan
<b>Eligible Measures</b>	Air sealing and heat pumps
<b>Program Delivery</b>	Local not-for-profit
<b>Additional Services</b>	<ul style="list-style-type: none"> <li>• Identify financing options and complementary programs</li> <li>• Help homeowners move through program</li> <li>• Climate adaptation/resilience programming information and referrals</li> <li>• Potential for EV infrastructure for home information</li> <li>• Options for non-GHG related home upgrades</li> </ul>
<b>Environmental Impacts</b>	Approximately 3 tCO <sub>2</sub> e reduced per home per year
<b>Program value</b>	<ul style="list-style-type: none"> <li>• Education regarding financing and home upgrade options</li> <li>• Understanding of home upgrade impacts and reducing GHG emissions</li> <li>• Logistics support for homeowners and contractors that participate in the program</li> <li>• Potential for local economic growth</li> </ul>

## Recommendation Summary

### *Baseline Data*

- **Postal code, energy poverty, and Lightspark data** should be used to inform marketing and targeted demographics and/or neighbourhoods.
- An **initial emphasis on rural areas** that have a higher proportion of **heating oil, propane, or electric radiant heating** should be targeted due to **high GHG reductions and increased financial return on investment**.
- **Financial return on investment** calculations for home upgrades should **include carbon tax savings**.

### *Program Design*

#### **Baseline Creation**

- **Baselining** should be **completed quickly** with as **minimal information and time required from homeowner as possible**.
- It is recommended to use **RETScreen Clean Energy Management Software** as the **primary analysis tool for energy, emissions, and (if feasible) utility cost baselining**.
- **Inform participating homeowners of projected impacts to utility bills** to avoid any surprises and ensure informed consent.

- **Baseline results should be discussed in real-time** with the homeowner.

### **Identify Upgrades and Financial Incentive Options**

- **Homeowners do not have to complete both heat pump installation and air sealing**, but at a minimum the former must be completed.
- **Heat pump offering should be flexible** and include both ducted and ductless types, air source and ground source, as well as hybrid and full heat pump installation.

### **Work Completed by Qualified Contractor**

- An online **qualified contractor list is created and accessible through the program's website**. Information to display in the list includes business name, location, link to website, phone number etc.
- Mandatory information program staff should verify and require to be on the list includes:
  - **Registered (HST #)** to improve business legitimacy and reduce underground options.
  - Proof of a **313A or 313D** license.
  - Purchased **liability insurance** that covers all employees.
- Qualified contractor's should be **located in Burlington**. If low contractor uptake is seen expansion to other neighbouring municipalities may be useful.

### **Post-Upgrade Monitoring**

- **1-3 months post-upgrade installation a satisfaction survey** should be completed through either email or phone. The survey is recommended to be short and quick to complete, and focus on overall experience and areas for improvement, knowledge gained during the process, and home comfort improvements. This may also be an opportunity to gather any other metric data.

### *Program Financing*

- Utilize the **local improvement charge (LIC) model** as a financial incentive.
- Offer up to **\$10,000** to cover air sealing services, the **purchase and installation of heat pumps and any electrical service upgrades required** to install the technology.
- Make the **incentive available to those wishing to leverage more than one upgrade incentive program**.
- A **loan loss reserve** with coverage of minimum 5% of total loan base is recommended.

### *Financial Incentives*

- The City should **apply for the Federation of Canadian Municipalities Capital Program (grant plus credit enhancement)** to fund 80% of the programs cost over the first four years.

- **Funding to run the program should come from diverse sources to reduce long-term risk.**
- The overall percentage the municipality is responsible for funding should be reduced over time.
- Identifying how other municipalities may want to work together to reduce retrofit delivery centre (RDC) costs should be a proactive priority.
- **Options for third party funding should be considered** to increase program uptake over the medium and long-term.

### *Program Delivery*

- Municipalities should opt for a **non-profit organization to act as the program delivery agent.**
- The non-profit can be newly created or existing, so long as they can meet the criteria listed herein. To ensure accountability, transparency, and a comprehensive evaluation the delivery agent should be chosen through an RFP process, and consider the following criteria:
- **Qualifications and Experience**
  - **Delivery agent**
    - Considered credible and trustworthy by citizens.
    - Ideally an already established NFP or social enterprise.
    - Not be subject to a real or perceived conflict of interest.
    - Prohibited from benefiting from commissions or kick-backs from vendors or contractors.
    - **Local to the Bay area.**
    - Have demonstrated or values program flexibility, adaptiveness to market needs, barrier reduction, and collaboration.
    - Ideally, **have participated in similar programs**, whether municipal program delivery or home-energy related programs etc.
  - **Staff**
    - Staffed with **individuals well versed in various local program offerings** and processes.
    - Staffed with individuals who have “on the ground” expertise in the mechanics of the retrofits being offered by the agent.
    - Staffed with those who understand the local context.
- Focus on **education and coordination** as key support services, primarily communicating to homeowners their options for upgrades and associated GHG and utility impacts, timelines and inputs, financing options, and other complementary programs available to them.
- The **value of the program is identified as being homeowner support through the upgrade process**, not solely the financing options.
- To reduce program start-up costs **housing the RDC in a virtual environment is recommended.**
- **The RDC should have the knowledge on available climate resilience programs.**
- Future Burlington resilience programs may be offered through the RDC to streamline offerings and a one-stop-shop for citizens.

## Monitoring and Evaluation

- Use **total and intensity metrics** where applicable.
- **Data gathering should be built in to program steps** to reduce staff collection time requirements and organization.
- The RDC should be required to present the above stated results annually to relevant municipal councils and answer questions.

## *Marketing and Communications*

- **Initial heavy focus on marketing and communications** should be considered for educational and participation uptake.
- **Marketing should be tailored to both homeowners and contractors**, with relevant value for each group established.

## *Governance and Implementation*

### Governance

- The RDC should be required to form a volunteer advisory group that supports program rollout and administration. This group should be made up of a diverse group of local individuals with varying skills and expertise.
- The advisory group should not have the power to implement decisions related to staffing etc., that should lie with the City.

### Implementation Plan

- A **high priority on funding and partnership strategy creation and implementation** should be applied to help sustainably finance the program. It is recommended to do this through working alongside local businesses and other groups with similar interests i.e. GHG mitigation, home upgrades etc.
- **Program scaling decisions** should be **based on feedback from homeowners and contractors/suppliers** as well as changes to other complementary programs to ensure all home upgrade gaps are identified.
- A **phased approach to program delivery** that eventually transitions some or all of the RDC from a public-sector led to another model will support program scaling.
- **Provide 3-6 months' notice of program details** to suppliers, contractors, wholesalers, realtors, HVAC associations and the like prior to the launch of a program.

## Abbreviations

- ASHP: Air Source Heat Pump
- BACCC: Bay Area Climate Change Council
- BACCIT: Bay Area Climate Change Implementation Team
- BHB: Better Homes Burlington
- CAP: Climate Action Plan
- CCCM: Center for Climate Change Management at Mohawk College
- CUSP: Canadian Urban Sustainability Practitioners
- FCM: Federation of Canadian Municipalities
- FSA: Forward Sortation Area
- GHG: Greenhouse Gas
- HERO: Home Energy Retrofit
- LIC: Local Improvement Charge
- LLR: Loan Loss Reserve
- ME: Monitoring and Evaluation
- NRCan: Natural Resources Canada
- PACE: Property Assessed Clean Energy
- PDA: Program Delivery Agent
- QC: Qualified Contractor
- RDC: Retrofit Delivery Centre
- TAF: The Atmospheric Fund
- tCO<sub>2e</sub>: Tonnes of Carbon Dioxide Equivalent

## III. CONSIDERATIONS AND NEXT STEPS

Based on the following report, City of Burlington should consider:

1. Drafting and passing a LIC bylaw after legal and financial reviews are complete.
2. Hiring one staff member to continue with program development next steps to ease into program preparation prior to implementation.
3. Launching the program's website.
4. Submitting a Federation of Canadian Municipality application under the Capital Program funding stream to help cover program costs for the first 4 years of the program.
5. Creating an expression of interest for a program delivery agent to administer the program.
6. Initially offering the program in a virtual environment.

## IV. INTRODUCTION

### Purpose of Work

The purpose of this work was to **develop the key components for a home energy retrofit program within the City of Burlington with the primary goal of reducing greenhouse gas (GHG) emissions.**

This background work is meant to provide high-level planning, rationale, and recommendations to guide the design and implementation of a successful program.

### *A Note on Terminology*

When discussing home-related programs certain terminology is used that may require clarification or updating, as it may be confusing or unfamiliar.

The term **Home Energy Retrofit (HERO)** refers to a program that focuses on improving energy efficiency of a home and/or reducing GHG emissions. The term “retrofit” has different meanings or may be unknown to many. Within this report the term “**home upgrade**” or “**home upgrade program**” will be used.

The term “**Program Delivery Agent**” (**PDA**) refers to the organization responsible for implementing the program through the retrofit delivery centre.

### Alignment with City Strategy

The creation of a home-upgrade program is **one of seven programs outlined in Burlington’s 2020 Climate Action Plan (CAP)**, which **provides a pathway to becoming a net-zero carbon community**. A home upgrade program **aligns with the City’s Vision 2040** where people, nature, and businesses thrive, which is achieved through:

- **A City that Grows** through increasing local economic opportunities catalyzed by environmental and health improvements.
- **A City that Moves** where a variety of convenient, affordable and green forms of transportation are available.
- **A Healthy and Greener City** that is achieved through stewardship of the natural environment.
- **An Engaging City** where the community is engaged and empowered to take climate action with the support of easy to access information and educational support.

The program demonstrates the City’s values, reaffirming that Burlington:

1. Is a caring, friendly, and inclusive community,
2. Values innovation and trusted partnerships,
3. Demonstrates respect by being fair and ethical.

Finally, this report **builds on and supports the 2014 Community Energy Plan** by focusing on ways that energy efficiency, conservation, and energy sources can be incorporated into housing. The program supports energy education through community engagement, increased use of lower-GHG energy sources, and collaboration to streamline and expand impacts.

## Home Upgrade Program Background

Programs supporting home energy efficiency improvements and/or GHG reductions have been available for decades, primarily in the US. **Recent interest in Canada stems from the significant contribution homes have to municipal emissions.** Within Canada, implementation of programs specifically aimed at reducing GHGs from homes is very recent, with the first Ontario example being Toronto's Home Energy Loan Program (HELP) in 2014. Since then, approximately **12 Ontario municipalities have either completed a feasibility study, program design work, or launched a home upgrade program.**

Home upgrade programs are typically comprised of the following steps:

1. **Generate a baseline** usually through an energy audit to understand a home's starting point regarding energy use and GHG emissions.
2. **Identify the types of home upgrades** required to meet program and homeowner goals.
3. **Complete home upgrades.**
4. Complete a **post-upgrade audit and/or ongoing monitoring** to quantify GHG and energy impacts.

The following items are key considerations that contribute to increased program uptake and therefore GHG reductions. Considerations were informed by lessons learned from other programs, Burlington stakeholder and homeowners, and best practices based on the research completed in the May 2021 *Findings Report* ([Appendix A](#)).

- The primary value of programs is three-fold:
    - Helping homeowners **understand home upgrade options** that help to meet program targets and their own home-related goals.
    - Helping homeowners **move through the program.**
    - Providing appropriate **financial incentives** to increase participation.
  - **Minimize the required program steps** and involvement of homeowners and contractors. The fewer steps, quicker turnaround, and less work homeowners have to complete offers significant program value.
  - These programs, and particularly the RDC, offer **substantial opportunities for collaboration** to help homeowners take advantage of multiple programs.
  - It's important to consider how various sources of funding over time can contribute to scaling programs, such as bonds, third-party funding, as well as collaboration with other municipalities.
  - Programs offer **opportunities to incorporate climate adaptation/resilience** programs.
  - There will always be early adopters driven by environmental interests; additional program value for those not driven by environmental interests needs to be communicated effectively to improve participation.
-

## Methodology

To develop comprehensive program recommendations that considers all program areas as well as opportunities and risk, this work was built on four main areas:

1. **Stakeholder Outreach** to gather feedback from key stakeholders about how to develop programs, program feedback, and lessons learned. Significant stakeholder outreach was completed first to inform the remaining areas and gain a sense of the current local home upgrade market and program success.
2. **Homeowner Feedback** to identify homeowner motivators, barriers, and knowledge regarding home upgrades and climate change.
3. **Housing Data** to understand the City’s “hotspots” regarding utility use, utility pricing, emissions, energy poverty etc.
4. **Policy Analyses**

The following table summarizes work completed to arrive at the final recommendations within this report.

Work Completed	Description	Purpose
<b>STAKEHOLDER OUTREACH</b>		
Literature Review	<ul style="list-style-type: none"> <li>• Reviewed of Canadian and local Ontario programs.</li> <li>• Reviewed recommendations and feedback from established North American programs, policy groups, environmental non-profits etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Provided base knowledge to guide and inform stakeholder outreach groups and discussions.</li> </ul>
Stakeholder Outreach	<ul style="list-style-type: none"> <li>• Gathered feedback from local experts regarding program design and implementation.</li> <li>• Completed discussions with technical experts regarding home upgrade options and homeowner interests.</li> </ul>	<ul style="list-style-type: none"> <li>• Provided guidance and feedback on all aspects of the program.</li> </ul>
Municipal Discussions	<ul style="list-style-type: none"> <li>• Gathered recommendations from Canadian municipalities with available programs.</li> <li>• Discussed potential options for aggregating programs in the future for a regional approach to home upgrade programs.</li> </ul>	<ul style="list-style-type: none"> <li>• Lessons learned from municipalities regarding timelines, expectations, staffing etc. used to develop recommendations and planning.</li> </ul>
<b>HOMEOWNER FEEDBACK</b>		
Homeowner Survey	<ul style="list-style-type: none"> <li>• Gather quantitative, local data from homeowners about heating systems, anticipated upgrades, financing,</li> </ul>	<ul style="list-style-type: none"> <li>• Allowed program design to be steered in a direction that aligns with homeowner interests.</li> </ul>

	energy audit knowledge, and climate change.	
Market Education and Outreach	<ul style="list-style-type: none"> <li>• Social media campaign created to educate the public on home upgrade programs and the connection to climate action.</li> </ul>	<ul style="list-style-type: none"> <li>• Increased interactions with key stakeholders who would support the program (realtors etc.).</li> <li>• Increased public knowledge of programming.</li> </ul>
<b>HOUSING DATA</b>		
Utility Analysis	<ul style="list-style-type: none"> <li>• Analysed Burlington’s housing utility data to identify areas of high utility use.</li> </ul>	<ul style="list-style-type: none"> <li>• Provided added detail on key locations to focus program marketing as well as emissions associated with housing within Burlington.</li> </ul>
Housing and Energy Mapping	<ul style="list-style-type: none"> <li>• Analysed Burlington’s energy audit data to identify different home categories within the City as well as key information to inform the program, such as recommended home upgrades, fuel type, insulation levels etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Informed home upgrade recommendations, built on utility pricing and emissions estimates, mapped energy poverty.</li> </ul>
<b>POLICY ANALYSES</b>		
Landscape Analysis	<ul style="list-style-type: none"> <li>• Identified advantages and disadvantages of global home upgrade programs.</li> </ul>	<ul style="list-style-type: none"> <li>• Provided base knowledge for program design.</li> </ul>
Cost Benefit Analysis	<ul style="list-style-type: none"> <li>• Assessed popular upgrade options on the basis of cost and greenhouse gas impact.</li> </ul>	<ul style="list-style-type: none"> <li>• Quantified emission savings and utility pricing changes of common upgrades to justify recommendations.</li> </ul>
Local Context Analysis	<ul style="list-style-type: none"> <li>• Identified if the local market would make such a program feasible.</li> </ul>	<ul style="list-style-type: none"> <li>• Identified if local market has expertise, capacity, and interest in a home upgrade program.</li> </ul>

Taken together, the strategy of using **stakeholder outreach that was paired with multiple local data and policy analyses** helped identify the best options for a home upgrade program that:

- Significantly reduce emissions that also appeal to homeowners.
- Homeowners will want to participate in.
- Reduce municipal financial contributions.
- Gain interest from stakeholders who are key to implementing the program (ex. contractors).

## 2.0 BASELINE DATA

This section summarizes key Burlington **housing, utility, and GHG emissions** data to inform program development and marketing tactics.

To provide a comprehensive starting point for program development and implementation key **Burlington housing information, utility data, and GHG emissions were collected**. Of note, program scope initially focuses on residential homes, which in this context refers to **detached homes, semi-detached homes, and row townhouses**. The following information summarizes important Burlington housing information relevant to the program:

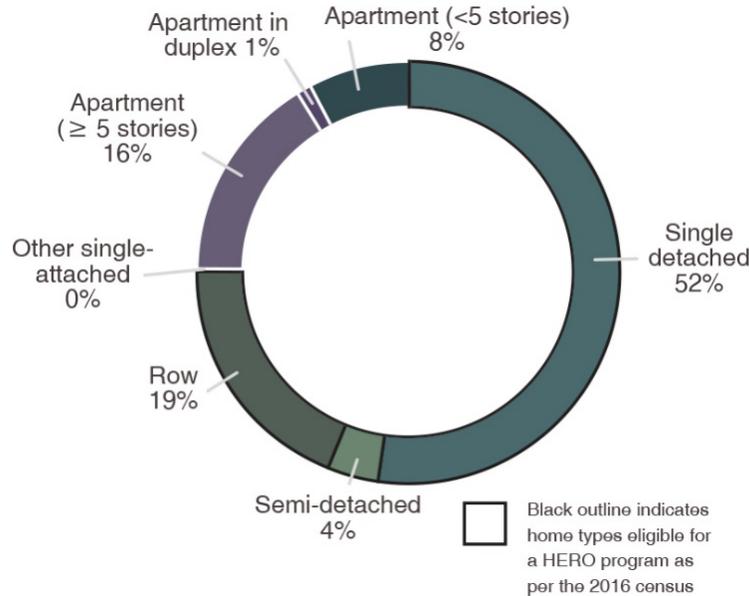
- **52%** of Burlington's homes are **single detached homes**. **74.6% of the City's housing stock would be eligible for the program**, equating to **53,270 total homes**.
- **34% of the City's housing stock was built between 1961-1980**.
- Burlington has seven primary housing categories; the majority of homes (89.9%) fall into two categories, single detached and row townhomes.
- Areas with high electricity use will typically also have high natural gas use.
- **Natural gas use is responsible for the majority of emissions in residential homes**.
- **Burlingtonians' pay an average of 69% more for utilities compared to the average Ontarian**. Utility costs vary greatly (**\$2,027 - \$7,000**) depending on home type and fuel source.
- **Burlingtonians' experience energy poverty**; program strategies should reflect what is needed to support homeowners to reduce energy poverty. Additionally, certain home categories are more susceptible to energy poverty.
- **Converting to air source heat pumps is the best "quick win" for GHG reductions**.

### Burlington Housing Stock

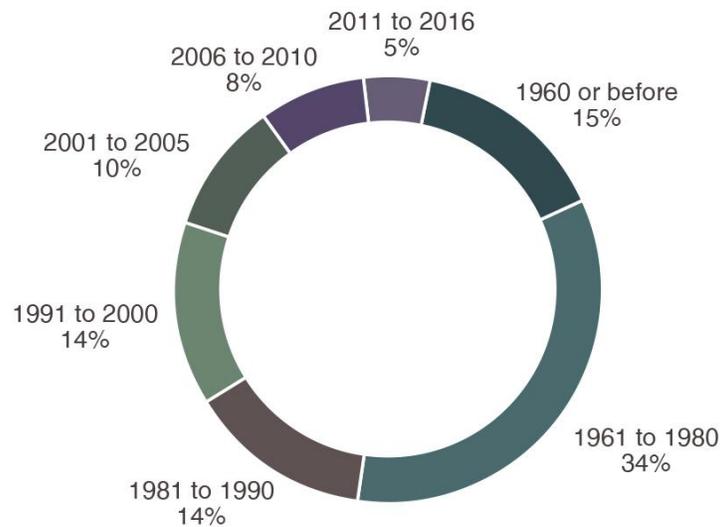
The 2016 census identified **71,353 private dwellings within Burlington organized into eight housing types**, five of which are eligible home types for a home upgrade program, and denoted with an asterisk (\*):

- Single-detached home\*
- Semi-detached home\*
- Row house\*
- Other single-attached house\*
- Apartment in duplex\*
- Apartment with 5 or more storeys
- Apartment with fewer than 5 storeys
- Movable home

Of the 71,353 private dwellings **53,270 (74.6%)** would be **eligible for program participation**, as they would fall within the "residential" definition of detached, semi-detached, row townhomes that are no larger than triplexes. The census also notes **76% of occupied private dwellings are owned**. Figures 2.1 and 2.2 summarize key elements of Burlington's housing stock.



**Figure 2.1:** Burlington housing stock breakdown as per the 2016 census. A black outline indicates residential home types that would be eligible for the initial offering of a home upgrade program.

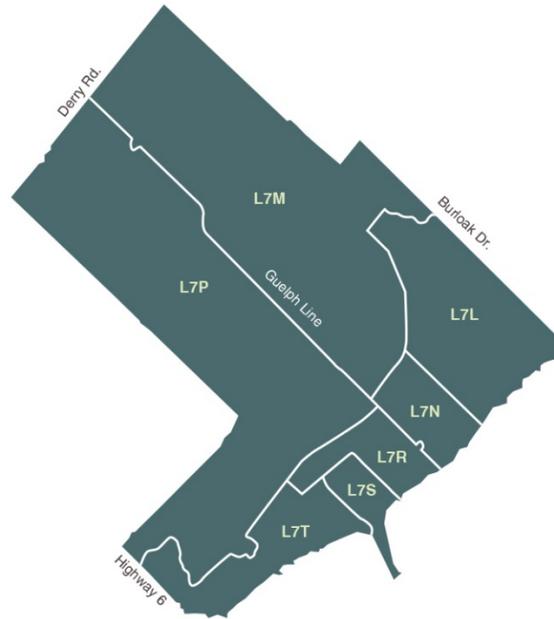


**Figure 2.2:** Burlington housing stock broken down by construction period as per the 2016 census.

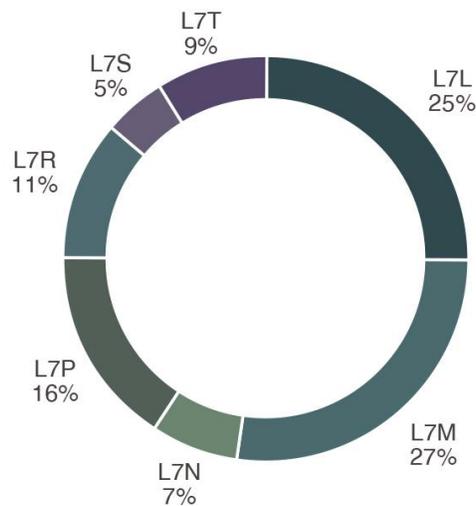
## Postal Code Breakdown

The City of Burlington is divided into seven Forward Sortation Areas (FSAs, i.e. the first three digits of a postal code) depicted in Figures 2.3 and 2.4. Including FSAs in this work adds further

detail for utility analysis, as utility data is provided by FSA, which can be linked to homeowner survey responses and drive areas of emphasis when recruiting program participants.



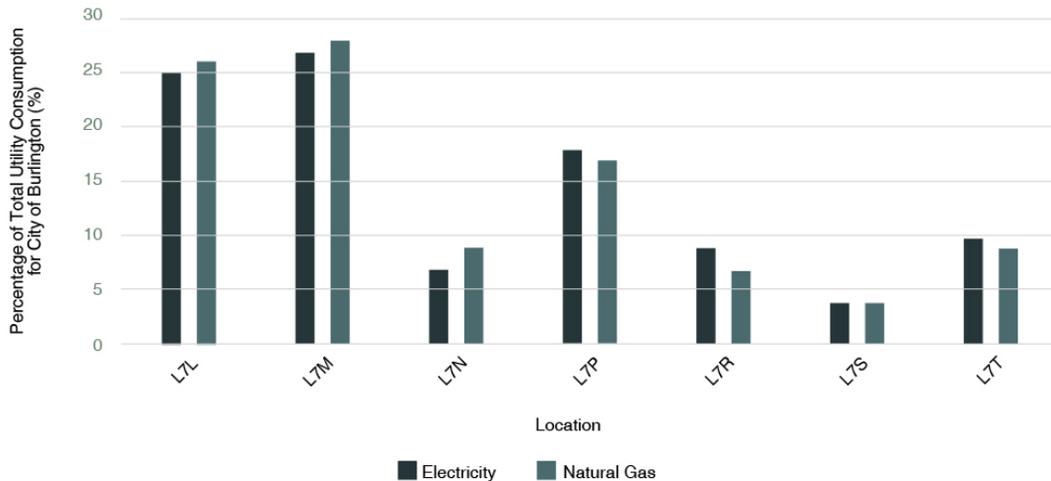
**Figure 2.3:** City of Burlington FSAs and associated boundaries. Burlington FSAs include L7L, L7M, L7N, L7P, L7R, L7S, and L7T.



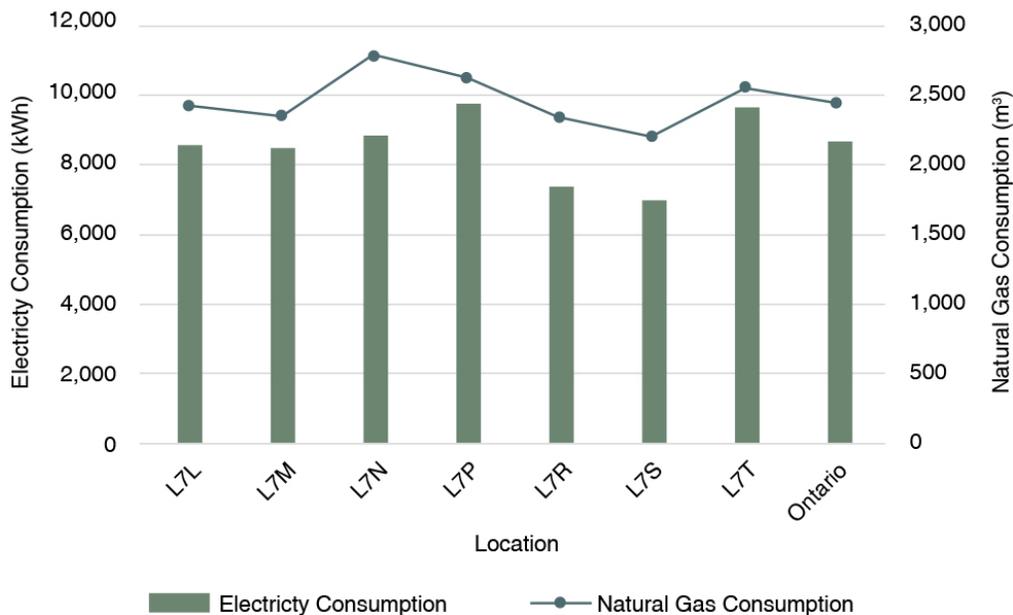
**Figure 2.4:** Proportion of homes within each Burlington FSA. Note, this includes all home types, such as apartment buildings, condominiums etc.

## Utility Consumption

Burlington’s utility (electricity and natural gas) consumption was analyzed for all home types for the years of 2019 and 2020 to identify potential significant changes due to COVID-19. The analysis did not find any significant differences, therefore only 2019 data will be presented below as this is more representative of typical consumption. Utility consumption for each FSA is summarized in Figures 2.5 and 2.6. Utility hotspots can be found within Burlington’s 2014 Community Energy Plan.



**Figure 2.5:** 2019 percent total utility consumption for electricity and natural gas per Burlington FSA.

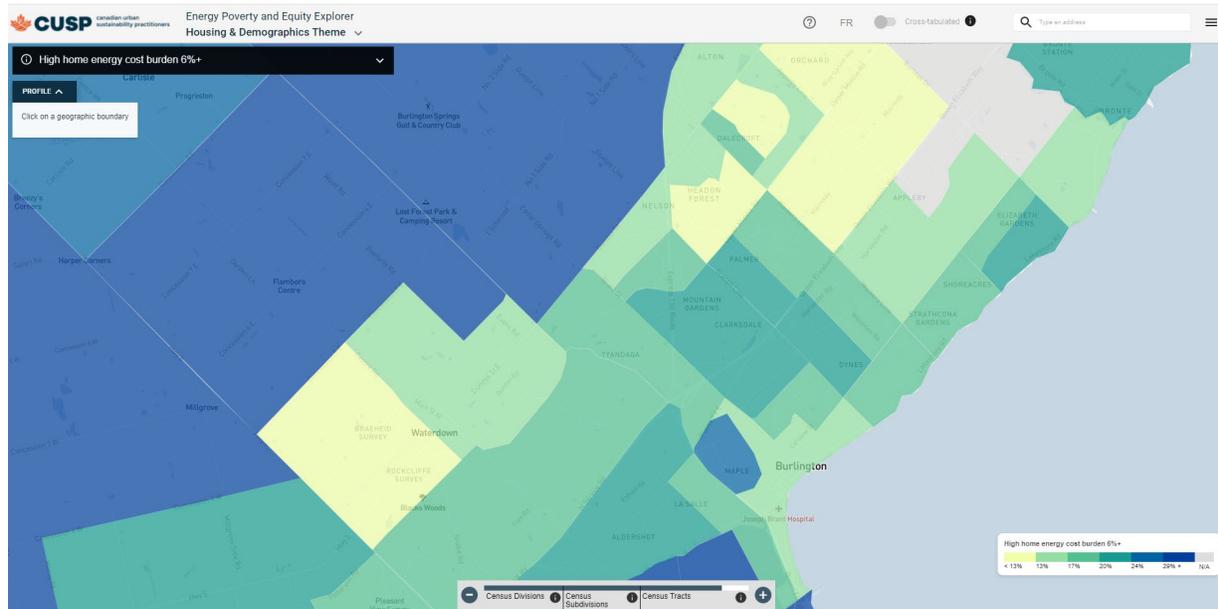


**Figure 2.6:** Average 2019 utility use per Burlington FSA with Ontario as a comparison.

## Energy Poverty

Annually, the average Canadian homeowner spends 3% of their total after-tax income on utilities. The term **Energy Poverty** is used to describe homeowners whose utility expenses total 6% or more of total after-tax income. Home upgrade programs have the ability to reduce energy poverty through targeted education, outreach, and cost-effective program upgrades that can reduce utility bills. The Canadian Urban Sustainability Practitioners (CUSP) network created a national mapping tool that breaks down the proportion of energy poverty Canadian cities experience, while also incorporating census data to provide further granularity. Tools like this play a key role in guiding policy decision making and informing who within our communities need what type of supports. CUSP's *Energy Poverty in Canada* report notes that **single detached homes make up the greatest proportion of energy poverty** Canada wide. Figure 2.7 captures Burlington's energy poverty rates using the CUSP mapping tool.

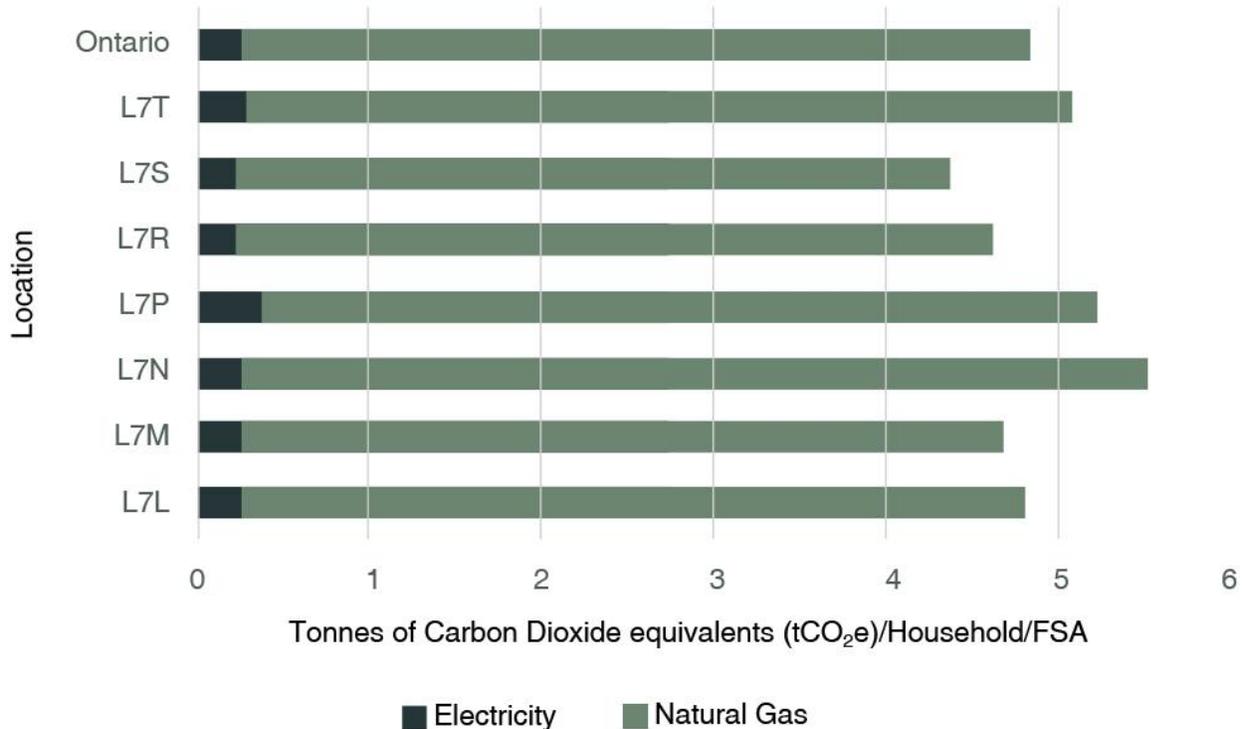
**Recommendations made throughout this report consider how energy poverty at all stages within Burlington can be alleviated.** Within Ontario there is an inherent challenge of reducing emissions from homes while also reducing utility bills; while electricity represents a much cleaner (i.e. less carbon intensive) source of energy, natural gas remains significantly cheaper, though prices will increase as the price of carbon rises. Strategies and rationale to help combat this is discussed further within the report.



**Figure 2.7:** Burlington energy burden overview from CUSP. Darker colours indicate a greater percentage of homes with an energy burden of over 6%.

## Greenhouse Gas Emissions

2019 utility data (natural gas and electricity) and information from Lightspark was used to calculate approximate GHG emission from Burlington homes. Figure 2.8 identifies overwhelming emissions generated from natural gas (94-96%) versus electricity (4-6%), with an average of **4.6 tCO<sub>2</sub>e per home per year**. [Appendix A](#) provides a further breakdown of residential emissions by end use within the home. Of note, the low carbon intensity of Ontario's electricity supply may change in the future depending on energy generation policies.



**Figure 2.8:** Household emissions per Burlington FSA for electricity and natural gas consumption, with Ontario as a comparison.

## Utility Costs and Carbon Tax

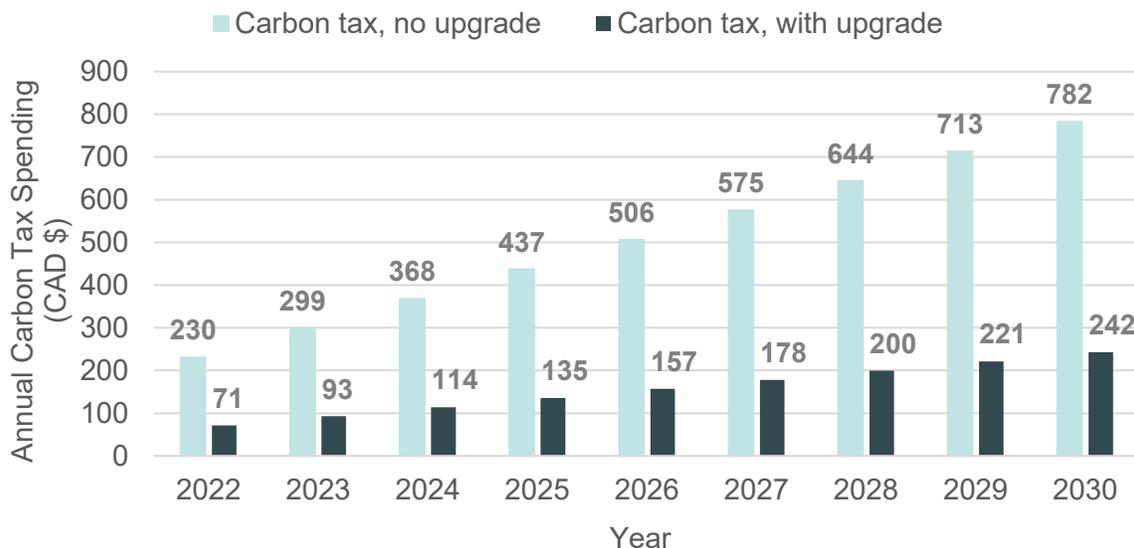
Average utility costs broken down by individual cities in Ontario is not typically reported, though the Financial Accountability Office of Ontario identified that in **2019 the average Ontario home spent 2.6% of after-tax income on home energy costs (\$2,165)**, which is broken down in Table 2.1, and **excludes carbon tax payments**. For this report, support from Lightspark was used to provide a more granular understanding of utility use within Burlington, which can also be found in [Appendix A](#).

**Table 2.1:** Utility cost comparison of Burlington versus Ontario.

Utility	Ontario Average (\$)	% Total	Burlington Average (\$)	% Total
<b>Electricity</b>	1,195	55	1,700	48
<b>Natural Gas</b>	842	38	1,009	28.5
<b>Other</b>	128	7	819	23.1
<b>TOTAL</b>	2,165	100	3,543	99.6

The table summarizes that **Burlingtonians’ spend approximately 69% more on utilities versus the average Ontario home**; this may be due to higher use of other fuel types beyond natural gas, such as propane, wood, and oil that emit more GHGs. Additionally, a larger proportion of detached, semi-detached and, and row townhomes compared to apartments and condominiums would increase overall utility spending.

Regarding carbon taxes, the average natural gas heated home in Burlington will spend approximately **\$230 in 2022 on carbon taxes** (based on the 4.6 tCO<sub>2</sub>e calculated). This would raise to **\$782 in 2030**, when the carbon tax reaches \$170/tCO<sub>2</sub>e, if the proposed upgrades within this program were not completed (Figure 2.9). Participants that complete the program are estimated to **save \$3,143 (69% reduction) in carbon-tax spending** between 2022-2030 (Table 2.2). **This significant increase in heating costs works to bridge the pricing gap between typical heating fuels and electricity as a heating source, therefore making cleaner energy sources more appealing to homeowners** due to a more favourable financial return on upgrades. Of note, there is no carbon tax associated with electricity use for homeowners, as emissions generated from electricity are created at the source of generation, not within homes.



**Figure 2.9:** Burlingtonian carbon tax payments over time under a business as usual scenario i.e. no upgrades completed. Payments reflect carbon tax payments based on 2019 natural gas consumption and implementation of the recommended home upgrades within this report.

**Table 2.2:** 2022-2030 carbon tax spending comparison.

Carbon Spending	No Upgrade (CAD \$)	Upgrade Completed (CAD \$)
2022	230	71
2030	782	242
<b>Cumulative 2022-2030</b>	<b>\$4,554</b>	<b>\$1,411</b>
<b>Savings</b>	<b>\$3,143 (69%)</b>	

## Lightspark Analysis

The CCCM worked with Lightspark to use available energy audit data from Natural Resources Canada (NRCan) to gain further insight into housing details (home age, total windows and doors, energy efficiency, fuel sources etc.), energy use, and GHG emissions from homes. Energy audit information is first gathered and then organized into different housing categories (archetypes) that allows for a complete understanding of the type and quantity of homes within Burlington. More specifically, Lightspark completed:

- A **City-Wide Analysis** outlining the number of single-family dwellings, heating systems, insulation, envelope, energy use, and GHG emissions.
- A **Deep Archetypes Development** representing existing home stock with highly representative data-rich archetypes, consisting of single-family dwelling types.
- A **GHG Analysis** to inform which archetypes to target for the most effective reductions.

Information below outlines key findings from the analysis. Additional information and detail can be found in [Appendix A](#).

- Burlington has seven primary housing archetypes (or categories) that represent **31,108 residential homes**. The **majority of homes (89.9%) fall into two categories**.
- The **majority of homes are heated with natural gas**, though oil, propane, and wood are also used.
- **Converting to air source heat pumps** is identified as the **best “quick win”** for GHG reductions.
- Certain home types are more susceptible to energy poverty.
- **Burlingtonians’ pay an average of 69% more for utilities** compared to the average Ontarian. Within Burlington, utility costs vary greatly (\$2,027 - \$7,000) depending on home type and fuel source.
- GHG emissions vary greatly (1.6 – 12.5 tCO<sub>2e</sub>/home/yr) depending on archetype.
- Capturing carbon savings by focusing on certain archetypes is an important first step in reducing GHG emission.

## 3.0 BURLINGTON HOMEOWNER SURVEY

This section summarizes Burlington homeowner survey results to help drive program strategy.

To help inform program design and delivery a Burlington homeowner survey was open for four weeks from October 6, 2021 to November 8, 2021. The survey was meant to gather homeowner feedback surrounding **interest in home upgrades, preferred financing, current knowledge, and climate action opinions**. Survey results were collected through the *Get Involved Burlington* online engagement platform as well as a phone survey.

### Survey Findings

A total of **383 surveys** (258 online surveys and 125 telesurveys) were completed, with approximately **78% of respondents living in a single detached home**. The **majority (98%) of respondents owned their home**. To effectively direct program offerings and understand homeowners' values the survey assessed five areas of interest. Key takeaways from each section are outlined below. A detailed copy of survey results can be found in [Appendix B](#).

#### *Home Upgrades and Motivators*

- Landscaping, bathroom and kitchen upgrades are of highest interest for homeowners to complete.
- 40% of respondents are also likely to upgrade their windows, HVAC system or insulation in the next few years.
- 33% of respondents plan on upgrading their roof and 20% may install solar panels.
- Home comfort is the most important decision-making factor, followed by cost saving on energy and utility bills.
- A large majority identified being more eco-conscious is important.
- 20% are planning to upgrade their heating system in the next few years. Improving energy efficiency and equipment age are the main reasons for doing so.

#### *Financing Preferences*

Comfort levels regarding home upgrade spending varied, with an **even split** between those comfortable spending less or more than \$15,000 – and **30% anticipating spending \$20,000 or more**. Additionally, **the primary reason identified to not complete a home upgrade were financial-related (15%)**.

- It is most likely that **those looking to upgrade their system will use incentive programs** to finance this upgrade.
- **Most will not require financing** to do so, while 20% say they will very likely use a line of credit.

### *Information Desired by Homeowners*

To ensure program services align with homeowner needs the survey touched on the information homeowners require to be comfortable in their choices, and who provides that information. Top responses included:

- Respondents **want to know their options and associated costs** before upgrading.
- Understanding what **incentives and rebates they may qualify** for is important, as is understanding how much they will save on utility bills.
- **Environmental benefits** are a **secondary factor to cost /cost savings**.
- The **City of Burlington is seen as the most trustworthy source** for information, followed by other levels of government and non-government groups. Businesses are seen as the least trustworthy on this topic.

### *Perspective of Climate Change*

- Most respondents believe that the **City should address climate change in its plans** and programs; at the same time, they also feel empowered to make an impact on a personal level.
- Homeowners noted that though **they do want to make an impact it cannot be at a huge financial cost**. Most respondents noted that it's useful to consider carbon pricing in future upgrade decisions.
- Respondents generally **do not feel that gas and electricity prices in Ontario are fair** and they also **do not feel that incentive programs are easy to understand and navigate**.

### *Program Feedback*

- The proposed program, as briefly described to participants, was well-received, with the majority saying it is a great or good idea. About a quarter is neutral (providing tacit support) and only 12% say it is a bad idea.
- There is interest among one in eight respondents, with 43% saying they are very interested.

## 4.0 INDUSTRY AND STAKEHOLDER TRENDS

The following section summarizes current market trends relating to a home upgrade program. This information was gathered through three main areas: **stakeholder outreach** initially completed to inform program design (see *Findings Report* in [Appendix A](#) for more detail), **homeowner survey results**, and **primary literature**.

### Industry Trends

**Higher climate prioritization by government, emphasis on individual climate action, increased energy prices, and added time at home due to COVID** has led to increased interest from homeowners in aesthetic and comfort upgrades, whether pursuing GHG reductions is the primary goal or not. Relevant home upgrade and renovation industry trends are included in Table 4.1 below.

**Table 4.1:** Current home upgrade market trends.

Focus Area	Trend(s)
<b>Homeowners</b>	<ul style="list-style-type: none"> <li>Increased program availability to homeowners for completing upgrades for environmental purposes.</li> <li>Due to COVID, greater money spent on home upgrades.</li> <li>Increased time spent working at home.</li> <li>Increasing interest from homeowners to reduce their carbon footprint, though upgrade cost and perceived value is more important.</li> </ul>
<b>Contractors</b>	<ul style="list-style-type: none"> <li>Increasing demand for contractor services, allowing for contractors to pick and choose jobs, delaying smaller jobs.</li> <li>Significant under the table work.</li> <li>Few contractors brand their work to highlight potential positive environmental impacts.</li> </ul>
<b>Workforce</b>	<ul style="list-style-type: none"> <li>Continued increase in demand for skilled and certified workers.</li> <li>Difficult to complete new training and professional development.</li> </ul>
<b>Climate Change</b>	<ul style="list-style-type: none"> <li>Large increase in municipalities creating home upgrade programs.</li> <li>Reducing environmental footprint as the primary driver for home upgrades is not the typical motivator, but is increasing.</li> <li>Increased public understanding of the contribution of housing to GHG emissions.</li> </ul>
<b>Technology</b>	<ul style="list-style-type: none"> <li>Transition to heat pumps identified as huge potential to reduce GHGs.</li> <li>Heat pump technology is advanced enough for Canadian weather.</li> </ul>
<b>Financing Home Upgrades</b>	<ul style="list-style-type: none"> <li>LIC loans issued by municipalities is an emerging financial incentive for homeowners.</li> <li>The split incentive for rental properties continues to be an issue.</li> </ul>
<b>Upgrade Interest</b>	<ul style="list-style-type: none"> <li>Huge increases in home upgrades since COVID.</li> <li>Federal 'Greener Homes' incentive program has driven further upgrade interest.</li> </ul>

## Factors Impacting Program Participation

Continued support for home upgrades to reduce GHGs can be impacted by various factors in a positive or negative way; a non-exhaustive summary of these factors is summarized in Table 4.2.

**Table 4.2:** Summary of external factors that may lead to a positive or negative influence in program uptake.

Factor	Description
<b>Factors leading to a positive impact</b>	
Funding of federal programs.	<ul style="list-style-type: none"> <li>Provides indirect awareness and emphasis on contribution of housing sector to GHG emissions.</li> </ul>
Education on the impact of housing as source of emissions.	<ul style="list-style-type: none"> <li>Provides indirect awareness and emphasis on housing contribution to GHG emissions.</li> </ul>
Rebates and grants.	<ul style="list-style-type: none"> <li>Provides indirect awareness and emphasis on housing contribution to GHG emissions.</li> <li>Program incentives are a significant driver to participation.</li> </ul>
Low interest loans and payback options to reduce financial barriers	<ul style="list-style-type: none"> <li>Increases access for larger range of homeowners.</li> </ul>
Collaborations with groups to leverage resources and expertise.	<ul style="list-style-type: none"> <li>Allows for cross promotion of programs to reduce costs and increase uptake.</li> <li>Helps to remove duplication of services.</li> <li>Allows for complementary programs and further incentives.</li> </ul>
Prioritization of Marketing.	<ul style="list-style-type: none"> <li>Improves program awareness, education, and generally is seen as a critical component for program success.</li> </ul>
Customer Service Support.	<ul style="list-style-type: none"> <li>Guiding homeowners through home upgrades and any program reduces their time required to participate in the program.</li> </ul>
<b>Factors leading to a negative impact</b>	
Removal of programs and incentives.	<ul style="list-style-type: none"> <li>Removes ability for stacking that may be useful for further incentive.</li> <li>Reduces education and outreach opportunities.</li> <li>Can lead to uncertainty and confusion for both homeowners and contractors</li> </ul>
Difficult and lengthy application and administration process.	<ul style="list-style-type: none"> <li>Increases administration costs.</li> <li>Increases contractor and homeowner frustrations and difficulties.</li> <li>Risk losing participants</li> </ul>
Lack of education and training.	<ul style="list-style-type: none"> <li>Limits ability for workforce to implement.</li> <li>Lack of technology and how to install reduces overall workforce and increases wait times.</li> </ul>
Poor marketing program.	<ul style="list-style-type: none"> <li>Does not drive interest and participation in program</li> </ul>

## Stakeholder Barriers and Skill Requirements

Table 4.3 summarizes stakeholder outreach completed by BACCC and CCCM and identifies barriers to program uptake and workforce requirements to prepare for future work needs. Some stakeholders have been omitted as workforce barriers are not applicable.

**Table 4.3:** Key stakeholders in home upgrade program implementation and associated barriers and solutions to increase uptake.

Stakeholder	Barriers	Needed Solution
Architects	<ul style="list-style-type: none"> <li>Lack of understanding of sustainable buildings and upgrades due to limited education and training programs offered.</li> <li>Building code may not reflect reduced GHG homes.</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing professional development for technology and training.</li> </ul>
Colleges and trainers	<ul style="list-style-type: none"> <li>Significant need for curriculum upgrades.</li> </ul>	<ul style="list-style-type: none"> <li>Updated technology theory and practical training.</li> <li>Integration of climate change with building technologies.</li> <li>Soft skills such as communication and project planning.</li> </ul>
Contractors	<ul style="list-style-type: none"> <li>Limited training on new technology and options for reducing GHGs in homes.</li> <li>Resistance to change</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing professional development on new technology, training, and installation, and value to business and homeowners.</li> </ul>
Developer/Reveloper	<ul style="list-style-type: none"> <li>Limited knowledge of link between homes, technologies and GHGs.</li> </ul>	<ul style="list-style-type: none"> <li>Similar to colleges and trainers, awareness through education and training (theory and practical).</li> </ul>
Energy auditors	<ul style="list-style-type: none"> <li>Homeowner difficulty in understanding energy audit results.</li> </ul>	<ul style="list-style-type: none"> <li>Improved homeowner education and engagement on how to understand an energy audit.</li> <li>Ability to link improved homeowner understanding to upgrade value i.e. If homeowners understand proposed home upgrades they are more willing to act on them.</li> </ul>
Landlords	<ul style="list-style-type: none"> <li>Limited knowledge of link between homes and GHGs.</li> <li>Potentially limited knowledge of contributions to home emissions (ex. space heating)</li> </ul>	<ul style="list-style-type: none"> <li>Awareness through education and communication.</li> </ul>
Local associations	<ul style="list-style-type: none"> <li>Potential for limited program awareness and benefits.</li> </ul>	<ul style="list-style-type: none"> <li>Awareness through education and communication.</li> </ul>



Low Income Homeowners	<ul style="list-style-type: none"><li>• Difficulty in program participation due to financing, and to a certain extent trustworthiness.</li><li>• Month to month living situations significantly reduce priority and ability to spend upfront money.</li></ul>	<ul style="list-style-type: none"><li>• Awareness through education and communication, including other programs with financial incentives.</li></ul>
Poverty advocacy groups	<ul style="list-style-type: none"><li>• May not be aware of programs and benefits.</li><li>• May not be aware of link between homes and climate change.</li><li>• Housing is one of many issues and upgrades may not be a high priority.</li></ul>	<ul style="list-style-type: none"><li>• Awareness through education and communication</li></ul>
Realtors	<ul style="list-style-type: none"><li>• May not be aware of programs and benefits.</li><li>• May not be a priority for realtors.</li><li>• May identify certain home upgrades as a barrier to selling, depending on public perception.</li></ul>	<ul style="list-style-type: none"><li>• Awareness/engagement program to improve practical knowledge on home links to climate change.</li></ul>

## 5.0 PROGRAM DESIGN

The basic premise of a home energy efficiency retrofit program is to support Burlington homeowners to upgrade their homes and lower their carbon footprint. This section summarizes program design recommendations including **program format** and recommended **eligible upgrades**.

### Guiding Principles

Increased interest in home upgrade programs as a key GHG reduction strategy within municipal CAPs stem from the high proportion of municipal emissions generated from housing, particularly residential homes. **Within Burlington, residential homes comprise 26% of total municipal emissions**. Home upgrade programs have been available for decades in the United States, and are termed Property Assessed Clean Energy (PACE) programs, though PACE programs are marketed as energy efficiency and renewable energy programs, not necessarily GHG reduction programs.

As outlined by BACCC, program design recommendations are meant to:

- **Incentivize** home upgrade projects with high GHG reductions.
- Efficiently **allocate** limited **resources**.
- Promote a **just transition** by providing low-barrier access to upgrades.
- Promote **transparency** and consumer choice.
- Instill **market confidence** for home upgrades.
- Promote high uptake.
- Prevent unintended harm to tenants.
- Ensure **low complexity**.
- **Promote equity** for low income homeowners.
- **Fill gaps** in existing home upgrade incentives and already available programs.
- Provide a **'gateway upgrade'** for hesitant homeowners.
- **Avoid consumer choice overload** (too many options).
- **Balance options** that will significantly **reduce GHGs** that also work to alleviate high upfront costs.
- Provide **flexibility** in program options.
- **Limit inconvenience** for homeowners and contractor.

A landscape analysis of other home upgrade programs show that financial support is only one aspect of the assistance required for homeowners to upgrade their dwellings. This report recommends several key design features to offer homeowners the full support required to participate in a program. The following considerations are made for this program that are based off of extensive local stakeholder outreach, outlined in the *Findings Report*, as well as survey results from Burlington homeowners:

- Attractive **financing options alone are not sufficient for** homeowners to see significant program participation.

- Most homeowners **will not invest in their homes for the sole purpose of reducing their GHG footprint.**
- Homeowners are **driven by the potential utility bill reductions and a simple process.**
- Past program experiences may cause skepticism if significant utility cost savings were guaranteed in the past and did not materialize.
- A significant **marketing and communications budget are critical** for program awareness and success.
- **Homeowners want to be able to quantify the impact of an upgrade**, such as GHGs reduced, changes in utility pricing, etc.
- Certain upgrades can be identified as “**gateway upgrades**”, such as windows and insulation. These are appealing to homeowners as they may improve home aesthetics, or the benefit of them is understood by homeowners. Gateway upgrades help to draw homeowners in and serve as starting point to build off of and add further upgrades, such as those that reduce GHGs further.

From an Ontario context, the following considerations should be noted regarding program design:

- The majority of home upgrade programs are designed with an **initial scope of detached, semi-detached, and row townhouses** due to **higher emissions per home versus** apartments, condos, etc. Furthermore, home types such as apartments and condos have a higher proportion of renters, which causes a **split incentive** where building/home owners are financially responsible for upgrades, but tenants pay utilities. This significantly reduces program value to the building owner/homeowner.
- Typically, an intention is set to **expand program scope to other housing types, such as apartments and condos** once logistics, experience and uptake of residential programs increases. This phased approach allows for different program needs, resources, communication tactics, etc. to be considered and developed, to avoid “jumping the gun” and doing too much too fast in an attempt to be the solution to everyone’s home upgrade needs.
- **Utility costing presently favours the use of natural gas** versus electricity and significantly reduces the financial return on investment for home upgrade programs. Although this is expected to change as the price on carbon increases. Homeowner value must therefore go beyond the potential financial return on investment.
- Many available programs are marketed for energy savings, though this does not always align with GHG reductions, particularly with electricity.

## Approaches to Home Upgrade Program Development

Home upgrade programs typically apply the **whole home approach**, where the components of a home’s energy system are **interconnected and therefore interact with, and impact one another**. For example, changes in one energy-related component, such as insulation, may have other impacts on a home that need to be considered, such as air flow, furnace sizing, etc. This means that when home upgrades are completed to reduce energy use and therefore reduce

GHGs all areas of the home should be considered, so programs may offer various types of eligible upgrades.

Home upgrade programs may also strategize energy conservation, energy efficiency, renewable energy, or a combination (see information below for an explanation of each). Within the context of sustainable energy use, the **energy hierarchy framework** was developed to guide decision-making and policy to effectively reduce energy consumption and adopt cleaner energy sources, with a focus on energy conservation first, followed by efficiency, and finally renewable energy ([Appendix C](#)).

- **Energy Conservation:** Refers to reducing consumption of energy through behaviour changes (ex. turning off lights when not in use). Conservation serves as the starting point in the energy hierarchy as it is the easiest and least expensive way to reduce energy use and therefore GHGs, i.e. not generating in the first place.
- **Energy Efficiency:** Leverages **technology to reduce the amount of energy used for the same function**, such as switching to efficient lightbulbs or more efficient appliances that require less energy to perform the same task at the same level. This is the second step in the energy hierarchy, as it can be simpler and more cost efficient than renewable energy.
- **Renewable Energy:** The use of cleaner energy sources builds upon energy and GHG reductions to transition the remaining necessary energy we need to cleaner, more sustainable sources.

This **hierarchy can be applied on the much smaller scale of home upgrades for the purpose of GHG reductions**. By pursuing conservation and efficiency first a lower total capacity for renewables is needed. Though conservation and efficiency will always play a part in an energy and GHG reduction strategy, our heavy reliance on natural gas for home heating (thermal energy) ensures that we cannot conserve or be efficient enough to hit GHG reduction targets. Achieving significant GHG reductions in residential homes may be tackled through conservation and efficiency measures combined with low carbon energy sources. The advantages and disadvantages of each strategy are summarized in [Appendix C](#), and include an Ontario context to reflect the high proportion and cost of electricity generation from low carbon energy sources and current incentives.

High GHG reductions per home have focused on the whole-home approach, where various upgrades are made in one large renovation. Unfortunately, there may be drawbacks to this approach, including:

- A **potentially high price tag** for homeowners that can limit program interest.
- The **need for a larger number of contractors and added logistics**.
- Higher levels of **inconvenience**.
- **Longer construction periods**.

**Deep GHG reductions for many homes only come after a conversion, either partially or completely, to cleaner energy sources.** Whole home upgrades focus highly on energy efficiency and conservation, but with low natural gas costs and high construction costs,

paybacks will never be realized and GHG reductions will be minimal, reducing overall program value. Program recommendations align with a **combination strategy of conservation/efficiency and cleaner (low carbon) energy sources**. Rationale for this strategy includes:

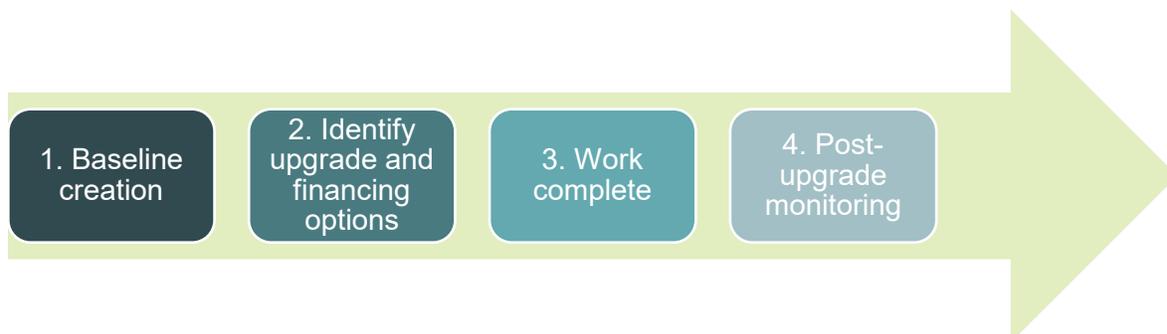
- **Maximizing GHG savings** through conservation and efficiency measures to improve overall energy efficiency as well as cleaner energy sources that reduce emissions further.
- As identified by BACCC, **avoid funding the inevitable, when the inevitable is efficient**. When replacing certain existing technologies, it is practically inevitable that they will be more efficient. For example, it is near impossible to buy a furnace in 2021 with an efficiency rating lower than 90%. Providing an incentive will not lead consumers to opt for this 90% efficient option, because the market ensures it is the only available option. Municipal governments need not allocate resources to incentivize the inevitable as a matter of efficient allocation of resources.
- Many **available programs already offer incentives for conservation and efficiency measures**. Focusing on upgrades that utilize cleaner energy sources expand overall eligible upgrades and work to fill overall programming gaps.

## Recommended Program Design

### *Program Overview*

Home upgrade programs often follow a linear path where a pre-audit is completed to understand a home's baseline performance and relevant upgrade options. The upgrades are then completed, and a post-audit is done to evaluate quantitative performance improvements and allow homeowners to claim financial rebates.

**Similar program steps (Figure 5.1 and Table 5.1) are recommended for a Burlington program, with additional flexibility built in to reduce homeowner barriers** and support further upgrades by developing a program that can be stacked with other offerings, such as utility and government programs.



**Figure 5.1:** Recommended program steps.

**Table 5.1:** Overview of proposed program steps.

Step	Description	Deliverable	Responsible Party
<b>Option 1:</b> <b>1. Baseline Creation</b> via NRCan Energy Audit	2-3 hour in-home visit to gather key home performance information, such as insulation type, HVAC information, window age, door types, completion of a blower door test etc.	Standard NRCan summary report.	NRCan certified energy advisor.
<b>Option 2:</b> <b>1. Baseline Creation</b> via RETScreen Home Energy Modelling	Use of energy bills and key home measurements to model home energy and GHG performance virtually.	High-level results overview of home energy use and emissions.	RETScreen trained individual.
<b>2. Identify Upgrades and Financing Options</b>	Homeowner and technical expert discuss upgrade options that align with homeowner and program goals.	Homeowners gains understanding and selects relevant home upgrade and financing options.	RDC representative or RETScreen trained individual.
<b>3. Work Complete</b>	Chosen upgrades completed.	Upgraded home.	Qualified contractor from program list.
<b>4. Post-Upgrade Monitoring</b>	Completion of post-audit to confirm work completion and proper installation.	Summary report.	NRCan certified energy advisor or RETScreen trained individual (same as baseline).

## Step 1: Baseline Creation

Generating a baseline for each home ensures a **quantitative estimation of the homes “starting point”** regarding GHG emissions and energy use while also helping to identify the most impactful upgrades that help to meet homeowner goals. Baselines support **evaluating program impacts while maintaining program accountability and transparency**. Additionally, a **baseline is usually required to access financial incentives through various programs**, such as rebates and grants.

Most home upgrade programs, regardless of who manages it, require a baseline through an energy audit completed by a NRCan trained Energy Advisor. Energy audits evaluate all aspects of the home regardless of homeowner upgrade plans or upgrade eligibility within a program. This means that an evaluation and home upgrade recommendations will occur even if a program does not offer financial support for upgrades, though does allow for a proactive approach for guidance regarding future potential home improvements.

During an audit, the advisor will spend approximately two hours gathering specific home information that is compiled into a report for the homeowner outlining items such as:

- The homes EnerGuide score (a measure of a home's energy performance on a scale of 1-100, with higher scores associated with more efficient homes).
- Where energy is used and lost.
- Home energy use and emissions.
- Upgrade options.
- An estimated EnerGuide score and GHG reductions if upgrades were completed.

Though the energy audit process is a well known and comprehensive baselining method there are drawbacks, including:

- **Cost** - Many programs will cover the cost of an energy audit, but this may not always be the case. In Ontario homeowners can expect to pay **\$400- \$600** for an audit, which does not include the cost of a post-upgrade evaluation.
- **Inconveniences** - Homeowners may find it difficult to book a time that works for them and the advisor. This also includes homeowners being potentially put off by someone being in the home, which may be amplified due to COVID.
- **Difficulty interpreting report** - Most individuals do not have a background in the workings of their home, and may find it difficult to understand next steps.
- **Long wait times** - Periods of weeks may go by between booking an audit and it being completed. This can be a significant deterrent for homeowners.

The proposed baseline alternative is meant to make baselining **simple, quick, flexible, and convenient** by working to reduce barriers.

### *RETScreen Clean Energy Management Software*

The use of programs such as *RETScreen Clean Energy Management* software, developed by NRCan, may serve as a viable alternative to energy audits (see [Appendix C](#) for a comparison). The software enables low-carbon planning of buildings and homes as well as upgrade monitoring either through a free version with limited functionality or a licensed version for full functionality for approximately \$900/yr/license. Typically, *RETScreen* has been used for aggregating facility data or for use in larger buildings, though high-level residential modelling is possible. If *RETScreen* is used as an energy audit alternative it's recommended that templates for standard home categories (approximately 10-12) are generated by a third party to streamline the process and increase turnaround time. Of note, home categories could be informed by the *LightSpark* analysis completed for this work. Once templates are developed and information provided it is estimated that a baseline could be **completed in 2-5 days**.

Currently, municipalities may use *RETScreen* to monitor their facilities energy use and GHG emissions, aggregate utility information, and help identify renovations or upgrades. Additionally, the *Green and Inclusive Community Buildings Program* offered through *Infrastructure Canada* requires *RETScreen* modelling of building energy and GHG emissions as a proposal requirement and may be a useful resource for feedback on the use of *RETScreen* for baselining. Of note, both Mohawk College and the City of Burlington have *RETScreen* licenses.

## How It Works

Home GHG modelling using *RETScreen* would be completed as follows:

1. **Homeowner gathers one year of utility data and some standard home information** that may include measurements, blueprints, home listing etc. This helps with baseline accuracy.
2. **A *RETScreen* trained individual inputs data to generate baseline**, ensuring modelled consumption matches utility data.
3. **Home upgrades are inputted and modelled**. This would also allow for an analysis of other home improvements such as window and door replacements, insulation upgrades etc. if homeowners are interested.
4. **Energy and GHG impacts are communicated** to homeowner to help inform upgrade decisions and environmental impacts.

Adoption of *RETScreen* as an alternative to energy audits may allow for the following advantages:

- **No in-home visit** required.
- **Less coordination**.
- **Lower costs**.
- Information provided specifically on upgrades of interest to homeowner.
- **Quicker turnaround**.

### *A Note on Baseline Accuracy*

How accurate are baselines and how accurate do they need to be? Typically, baselines aim to be within +/- 20-30% of actual energy use and related GHGs. It is important to understand that **upgrade programs evaluate the difference in energy and emissions before and after the upgrades**. Being accurate is also important, however, it is the change values that is important to capture. Therefore, if the same or very similar methodology is used to complete the pre and post audit the change will be measured accurate. If the pre-audit is accurate to 20-30%, so is the post-audit, and all is relative.

Increases in accuracy through energy modelling technology is possible, but a balance must be struck between the time required to gather data, time (and money) needed to model the data, and how accurate the information needs to be.

## Step 2: Identify Upgrades and Financing Options

The rationale for recommended eligible upgrades for a municipal program include:

- Attempting to **fill a gap** in already available programs to allow for program stacking with other programs provided by utilities and/or other levels of government. This would also allow for increased program impact.
- **Prioritizing high GHG reduction upgrades with a more affordable upfront cost** to improve accessibility and uptake.

- Identifying upgrades that can **support climate adaptation/resilience**.
- Align with recommendations made by other local groups, such as BACCC, TAF, and surrounding municipalities, to **support a long-term goal of a regional-approach** to home upgrade programs to streamline programming and share resources.

### *Local Analyses to Determine Eligible Upgrades*

To recommend the most effective and impactful home upgrades to reduce GHGs, BACCC completed a home upgrade analysis summarized in [Appendix C](#). Upgrades were compared based on:

- Changes in energy sources before and after an upgrade.
- Useful years and cost of the upgrade.
- Emission changes and marginal abatement cost (i.e. the cost to reduce 1 kg of GHGs).
- Utility bill impacts.

Extensive stakeholder outreach to understand the motivators and barriers to home upgrade programs was completed and summarized in a *Findings Report* ([Appendix A](#)). Additionally, a homeowner survey was completed to understand Burlingtonians’ home upgrade interests and climate change perspectives.

To determine eligibility, consideration was given to upgrades that:

- Offer **observable and substantive GHG reductions**.
- **Are already incentivized** by existing programs in the region, as this program should aim to fill gaps within existing programs to support program stacking.
- Consider **lessons learned** from other programs that are already available.

BACCC’s work summarized in Table 5.2 highlights GHG reductions associated with various home upgrades in their first year after installation. **Eligible upgrades should not go towards those that produce negligible GHG reductions.** If GHG reduction is one of the primary goals of the program, as opposed to aesthetics or community renewal, the program should not incentivize upgrade options that fail to reduce building emissions in a meaningful way.

**Table 5.2:** Home upgrades and associated GHG reduced in first year of installation.

Project CO <sub>2</sub> e Reduction	
Upgrade Project	kg CO <sub>2</sub> e
Fuel oil to heat pump full switch	-13,327
Gas furnace to heat pump full switch	-3,175
Fuel oil hybrid heat pump	-11,992
Gas furnace to hybrid heat pump	-2,857
Insulate exterior walls	-1,648
Heat pump water heater	-1,417
Electric water heater	-1,031

<b>Upgrade furnace</b>	-651
<b>Tankless gas water heater</b>	-541
<b>Air sealing</b>	-206
<b>Insulate existing gas heater</b>	-90
<b>Insulate attic</b>	-37
<b>Upgrade window</b>	-21
<b>Replace door</b>	-21

After eliminating the projects that fail to meet the standard for meaningful GHG reductions an analysis of what upgrades are currently covered under other programs was completed (Table 5.3). Of note, not all remaining upgrades are fully incentivized by current programs available to Burlington residents.

**Table 5.3:** Upgrades incentivized by other existing programs.

<b>Retrofit Project</b>	<b>Cost of Retrofit</b>	<b>Enbridge Home Efficiency Rebate Program</b>		<b>NRCAN Greener Homes Program*</b>	
<b>Heat pump for space heating</b>	\$9,000	-	No	\$2,500 - 5,000	Yes
<b>Insulate exterior walls</b>	\$8,000	\$3,000	Yes	\$660 - 5,000	Yes
<b>Heat pump water heater</b>	\$2,500	-	No	\$1,000	Yes
<b>Air sealing</b>	\$1,000	\$100	Yes	\$550 - 1,000	Yes
<b>Electric water heater</b>	\$1,000	-	No	-	No
<b>Energy audit</b>	\$600	\$550	Yes	\$600	Yes
<b>Energy audit</b>	\$600	\$550	Yes	\$600	Yes

\*Greener Homes will provide grants of up to \$5,000 for up to 700,000 homes across Canada over 7 years.

Based on **lessons learned from other incentive programs**, we can further narrow down upgrades that ought to be eligible through a program.

- The **City of Toronto** program, that utilizes LICs, **requires homeowners with a mortgage to acquire consent from their lender before participating in the program.** This is a feature of the program because failing to obtain lender consent can be a breach of the covenants of a mortgage, which could result in a default or, at the very least, significant difficulty in renewing the mortgage. **As a result of this program feature, about 50% of applicants to Toronto’s LIC are rejected.**
- The rejection largely rests on the lender’s balance of equity. **Many banks prefer to follow the 80/20 rule, meaning the loan lenders are paying down is equivalent to 80% or less of the value of the home.** If the LIC disturbs this equity ratio, banks are likely to reject the applicant.
- **To avoid the 50% applicant rejection rate found in Toronto, lowering the cap on LIC loans per household is an option.** A smaller LIC loan would have a smaller chance of disturbing the preferred equity balance of lenders, leading to a higher approval rate for applicants of varying wealth.

- Currently, the City of Toronto LIC funds retrofits up to \$75,000 in total. The **average funding amount is \$26,000. Any cap placed on Burlington LICs should therefore be below this amount.**
- **The higher the cost of upgrades the lower expected participation.** High upgrade costs, whether upfront or paid back through a loan are anticipated to be a deterrent as well as reducing interest from low- and moderate-income homeowners.

### *Eligible Upgrades: Heat Pumps and Air Sealing*

It is recommended for the program to **initially cover air sealing services, the purchase and installation of heat pumps(s), and any electrical service upgrades required to install the technology.** This combination should be required in tandem, unless proof of either can be provided. The city may want to allow air sealing to take place up to one month after the installation of a heat pump, as scheduling the two services may take time. Rationale for heat pumps include:

- The **highest GHG reduction potential of any single upgrade** project modelled, therefore reducing the number of upgrades required to see significant GHG reductions.
- **Limited coverage by other incentive programs** currently available.
- **Low marginal abatement cost** (i.e. high GHG reduction for the lowest cost).

When stacked with heat pump technology, **air sealing bolsters heat pump performance further, and at minimal cost.** Focusing on two cost effective upgrades makes the program more affordable, therefore supporting increased program uptake while keeping borrowing amounts low. Low upgrade amounts also stretch funding further to support a greater number of home upgrades.

### **Heat Pumps**

Heat pumps are devices that transfer heat from one location to another, following the principle that heat moves from higher to lower temperature spaces. Heat pumps do not create heat, they only move it, which is different than a typical furnace that combusts fuel to generate heat. **Heat pumps can also function as air conditioners, further increasing their value and for those that don't have air conditioning supports climate adaptation action.** Further high-level information on heat pumps is summarized in [Appendix C](#).

Table 5.4 summarizes BACCC's analysis of GHG savings via heat pump replacement in a typical home (space heating only).

**Table 5.4:** Expected GHG reductions after air source heat pump (ASHP) installation.

Heat Pump Type*	Heating Type	GHG reduced Annually (tCO <sub>2</sub> e)
<b>Full ASHP Conversion</b>	Natural gas to electric	3.175 (77% total reduction)
<b>Full ASHP Conversion</b>	Heating oil to electric	4.775 (83% total reduction)
<b>Hybrid ASHP</b>	Natural gas to electric	2.8745 (69% reduction)
<b>Hybrid ASHP</b>	Heating oil to electric	4.306 (75% reduction) of household GHGs

*\*In this example, a “full ASHP conversion” refers to an ASHP that was installed without a backup heating source. A “Hybrid ASHP” refers to an ASHP installed with a secondary heating source, such as the existing natural gas.*

*NOTE: This calculation for hybrid heat pumps was based on real, local, hybrid heat pump installation monitoring, where data showed the furnace kicking in about 5% of the time during the coldest months. However, the calculation involved a highly conservative prediction for the use of natural gas heating when a properly sized hybrid heat pump is installed, at 10% of the time.*

In Ontario **heat pumps are a way to switch to a much cleaner source of energy and reduce GHGs significantly through only one upgrade**, versus a whole home approach. Hybrid heat pumps also allow homeowners to keep their existing furnace as back up for occasional colder temperatures, providing peace of mind if unfamiliar with heat pump technology. However, modern heat pump technology works well in low temperatures found in Southern Ontario. Nonetheless, this assurance makes the product attractive, while offsetting the need for natural gas. Heat pumps can also provide cooling, allowing homeowners without air conditioning to access cooling in the hot summer months. This is a clear opportunity for equity in heating and cooling for low income populations and to address climate resilience.

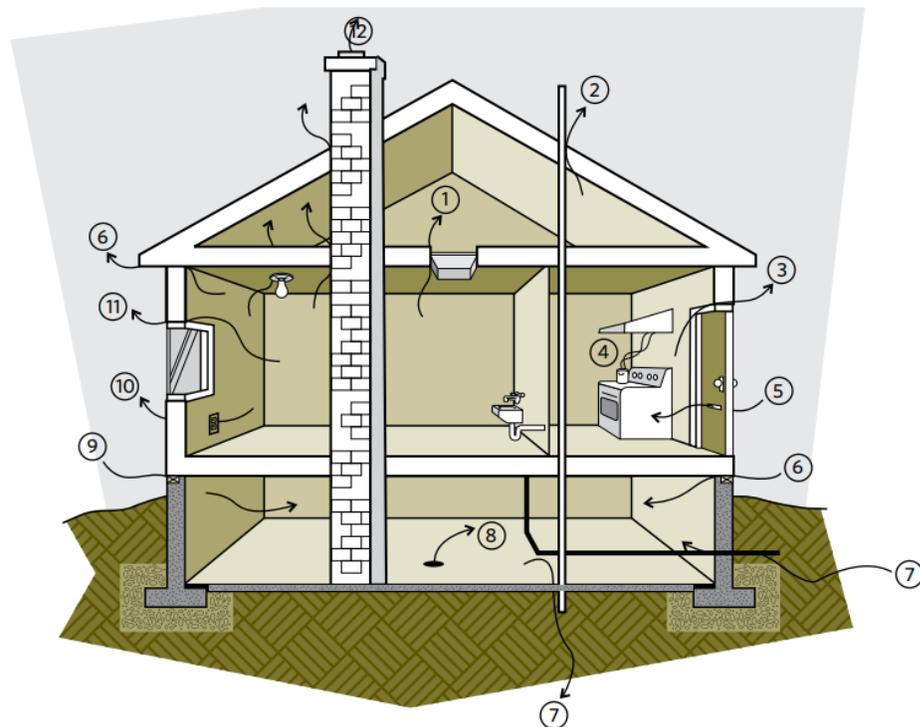
### Buying vs. Renting Heat Pumps

Installation of a heat pump is a significantly smaller investment versus some whole-home upgrades for the purposes of GHG reductions, although price may continue to be a barrier. **An alternative option is heat pump rental, similar to hot water tank rentals.** Rental options can be offered through partnerships with local HVAC companies that have already established heat pump rental programs or develop rental programs alongside smaller local businesses. One drawback of this strategy, like hot water heaters, is though upfront costs are reduced, lifetime costs are significantly greater. **Offering a rental program through the municipality is not recommended due to the logistics and rental program development needed, as well as ongoing oversight. Instead, working with already established programs or working alongside smaller, local businesses** to develop a program is recommended to improve program options and flexibility and reduce upfront costs further.

Of note, regardless of heat pump rental or purchase the City requires a permit for installation.

## Air Sealing

Air sealing consists of finding and sealing points of the home that are leaking air, such as the attic, walls, crawlspaces, basement etc. Getting your home air sealed will help improve air flow, reduce drafts in winter, reduce humidity, and improve overall indoor air quality, while also reducing energy use, and therefore GHG emissions. Air sealing is a low-cost upgrade that also works to improve heat pump performance by reducing overall energy needs, while also improving home comfort and draftiness, reducing moisture content, and reducing outdoor noise. A summary of locations targeted by air sealing options is outlined in Figure 5.2. Additional information on options for air sealing a home can be found in NRCan's *Keeping the Heat in Section 4: Comprehensive air leakage control in your home*.



### Where to look

Key locations to check for leaks

- |  |                    |                     |                       |
|--|--------------------|---------------------|-----------------------|
| 1. attic hatch                         | 4. exhaust vent    | 7. service entry    | 10. electrical outlet |
| 2. ceiling penetrations into the attic | 5. mail slot       | 8. floor drain      | 11. window            |
| 3. door                                | 6. sill and header | 9. foundation crack | 12. chimney           |

**Figure 5.2:**

### Upgrade Costs

A significant driver for the recommendation of heat pumps and air sealing is the cost of both items compared to other home upgrade programs. BACCC's analysis points to an **average cost for a heat pump installation of \$9,000, though costs can range between \$4,000 - \$20,000**. Cost of heat pumps is dependent on:

- Manufacturer.

- Expected low temperatures for the area.
- Heat pump type, as air source heat pumps are more affordable versus ground source heat pumps.
- Any electrical updates required before installation.
- Home size.
- Ducted versus ductless options.
- Homes using heating oil require the oil tank to be removed.

Similarly, air sealing based on BACCC's estimation, is a **low-cost upgrade at \$1,000, though pricing can range from between \$500 - \$1,500**. Coupling air sealing with a heat pump will increase the heat pump's efficiency for a relatively low cost.

### *Final Considerations*

The above recommendations focus on two initial upgrades instead of a larger offering for the following reasons:

- **To reduce overchoice** for customers, as too many choices can lead to no choice at all, especially if little is known about the options.
- To support overall **reductions in program operating costs**, such as having to manage a larger number of contractors with various expertise, paperwork for different upgrades, quality assurance management etc.
- To build on experience over time and assess **how to expand the program effectively**.
- To initially limit the required upfront work of finding qualified contractors, *RETScreen* modelling needs etc.
- To **build on and complement offerings** from other programs.
- To only incentivize lower cost, high GHG reductions.

Finally, the following program items were addressed to provide further comprehensive considerations for the program above eligible upgrades. Additional information on each is found within [Appendix C](#).

- Stacking
- Quality assurance
- Discounting
- Product conformity
- Embodied carbon

### **Expansion of Eligible Upgrades**

Regarding expansion of eligible upgrade measures, consideration should be given to:

- **Feedback from customers and general outreach** to identify upgrades of interest and comfortable price points.

- Assessment of home upgrade programs in other jurisdictions to **identify best practices and lessons learned**. For instance, some programs have seen significantly more uptake with solar installation versus other home upgrades.
- Review and/or update any analysis of new technology options since program launch, as well as the homeowner survey.

### Step 3: Qualified Contractors Identification and Work Completion

Using qualified contractors (QC) to complete home upgrade provides due diligence regarding quality, certification, and customer experience. Additionally, it simplifies the effort homeowners may experience trying to find a reputable contractor with the required skills. Other local programs, such as Hamilton’s Backflow Prevention Program, use a QC list, as do many home upgrade programs, such as Alberta’s Clean Energy Improvement Program.

QC lists are typically available online, with homeowners able to choose their contractor. The value for contractors lies in the potential for added work with minimal business development. Registration requirements for contractors should be as minimal as possible to encourage participation. Eligibility criteria to become a QC should include:

- **Registered (HST #)** to improve business legitimacy and reduce underground options.
- Proof of a **313A or 313D** license.
- Purchased **liability insurance** that covers all employees.

### Step 4: Post-Upgrade Monitoring

Regardless of how the baseline was completed, a post-upgrade evaluation is necessary to verify installation, quantify energy and GHG performance changes, and qualify for applicable rebates. Table 5.5 outlines what post-upgrade monitoring could look like to help quantify GHG reductions.

**Table 5.5:** Options for completing post-upgrade installation confirmation.

Baseline Option	Post-Upgrade Description
NRCan Energy Audit	Similar to the initial energy audit, an NRCan energy advisor will complete a second in-person home visit to take additional information and update the EnerGuide Score. This is the method most programs use.
<i>RETScreen</i>	Quantification of upgrades would be completed in the initial pre-upgrade evaluation. Confirmation of installation would still be required.

An annual summary could be provided to program participants to further demonstrate upgrade impacts such as:

- **GHGs saved** for the past **year** and **cumulatively**.
- **Changes in energy consumption**.
- **Carbon tax savings**.



- Contribution to **local jobs created**.
- Information on **financial payback period**.

The summary would help quantify the value of the program and could be completed for each home or the total program. This process could be completed through *RETScreen* via utility bills for comparison to the initial baseline. Ideally, the use of Green Button would make this process significantly easier. These ongoing touch points also provide a platform for updating past participants on changes to program offerings etc.

## 6.0 FINANCIAL INCENTIVES

This section summarizes options and recommendations for financial incentives available through the program to homeowners to help **increase program accessibility and participation**.

Financial incentives for home upgrades are one of the **most important program aspects to drive participation**, and therefore GHG reductions. Appealing incentives offer many individuals who would not be able to undertake home upgrades an opportunity to overcome upfront costs. The following items were considered when evaluating incentive options:

- Recommendations from City legal and financing staff.
- Appeal to residential homeowners.
- Implementation experience from municipalities.
- Ability to provide homeowner value.

### Overview of Incentives

Significant work has been completed by knowledgeable groups regarding financing options. A 2017 report completed by The Atmospheric Fund (TAF) summarized two main categories of financing tools, options within each category, benefits, market applicability, and roles of government. The two main incentives are:

- **Repayment incentives** that encourage long-term lending.
- **Credit enhancements** that encourage lenders to offer longer term financing and/or lower interest rates than they otherwise would.

Both options can be combined to provide additional value, flexibility, and be tailored to customer financing needs. Home upgrade programs typically offer one or more of the following three incentives to homeowners. Advantages and disadvantages of each, from a municipality perspective, are provided in Table 6.1:

- **Grants and Rebates** - For both options non-repayable money is given to homeowners to complete home upgrades, though grants provide the funds upfront, where rebates provide the money after work is complete. Grants are typically seen as more inclusive to homeowners, as they allow those that may not be able to pay upfront to participate.
- **Tax Incentives** - Reductions in taxes to incentivize program participation.
- **Local Improvement Charge (LIC) Loan - Special temporary charges that are added to a property tax bill to pay for improvements that benefit property owners.** Ontario amended LIC regulations in 2012 to allow municipalities to enter into voluntary LIC financing agreements with property owners, allowing for the option to create programs aimed at energy efficiency improvements, water upgrades, and climate action through home upgrades and improvements.

**Table 6.1:** Comparison of three primary financial incentives offered by home-upgrade programs.

		LIC	Grant/Rebate	Tax Incentive
Environment & Funding	GHG reduction potential	Highest	Lowest	Medium
	FCM funding available?	Yes	No	No
City Supports	Count towards municipal debt?	No	NA	NA
	Repayment to City?	Yes	No	No
	Impact per dollar spent?	High - Very High	Low - Moderate	Low - Moderate
	City personnel required?	Yes	Yes	Yes
	Agreement with City required?	Yes	Yes	Yes
Homeowner Needs	Homeowners required to pay upfront?	No	Typically	Yes
	Supports Low Income homeowners?	Yes	Only 100% Funded Grant	Yes <i>(To a Certain Extent)</i>
	Available to greater number of Burlingtonians?	Yes	No <i>(Typically Capped)</i>	Yes
	Do repayments stay with the home?	Yes	N/A	No
	Resell concerns?	Potential	No	No
Other	Requires FTEs to administer	Yes	Yes	Yes
	Requires marketing to run program	Yes	Yes	Yes
	Requires municipal bylaw	Yes	Yes	Yes

Red	Seen as hindrance to municipality
Yellow	Neutral option or not applicable
Green	Seen as beneficial to municipality

## Recommended Financial Incentive

Analyses completed by groups such as TAF, Clean Air Partnership, Dunsky Energy Consulting, the Pembina Institute, and BACCC ([Appendix D](#)) provide a **strong case for the use of Local Improvement Charges to incentivize program participation.**

## Local Improvement Charges

### *Key LIC Aspects*

The Pembina institute outlines the following principles that should be applied to all LIC programs:

- **Participation is voluntary.**
- Financing **covers most or all of upgrade costs.**
- **Long financing** terms (up to 30 years). Of note, shorter terms of 10 years is more realistic based on City of Burlington feedback.
- Financing **can be combined** with other programs.
- Finances are **permanently fixed to the property.**
- LIC assessment is filed with the local municipality as a lien on the property that is transferred between owners.

LICs are seen as a low-risk way to encourage investment in measures with long term paybacks or community benefits by giving homeowners access to capital to complete improvements that lead to utility bill savings, **then recuperating payments through property taxes.** Moreover, due to their status as a special charge on the tax roll, **LIC assessments stay with the property when it is sold**, rather than with the former owner, thus helping to overcome one of the main barriers homeowners face when considering potentially large capital investments in their home.

LICs are the preferred option over other municipal funding options ([Appendix D](#)) for the following reasons:

### **Lowest cost to the municipality**

- **Rebates and grants are non-repayable**, making this model **expensive for the municipality** to cover.
- **Municipal tax incentives reduce overall tax revenue**, making this model **expensive** for the municipality to compensate for while avoiding deficits.
- **LIC loans are recoverable** and therefore **do not count toward a municipality's debt.**
- **LIC loans are low risk** for the municipality: if loan repayments go in arrears, the overdue amount can be recovered from the property using a special priority lien that takes precedence over other liens on the property, including mortgage liens.
- Municipalities have **access to fixed cost**, long term financing that they can make available to homeowners through LICs.

- **LIC's can encourage private investors** in home upgrades by bundling portfolios of upgrades to achieve the scale of cashflow required by many private investors and by providing quality assurance.

### **Proven history of success**

- This model of upgrade program has been **proven successful in a number of different jurisdictions**, including Toronto, Melbourne, and San Francisco ([Appendix D](#)).
- The **Ontario Municipal Act, 2001** (O. Reg. 586/06) **allows LIC** loans to facilitate the implementation of home upgrade programs by financing energy efficiency and renewable energy measures voluntarily carried out by individual property owners on their buildings.

### **Makes upgrades affordable to a larger population of homeowners**

- **Does not require** homeowners to possess **upfront capital**, thereby allowing low income individuals to upgrade their homes.
- Provides access to **favourable loan terms**, otherwise unavailable to some homeowners.
- **Low income households**, with few collateral assets or limited access to credit, **may qualify for financing**.
- Allows homeowners facing energy poverty to access capital to purchase technology that can improve utility costs.
- **Loan stays with the property**, and is not tied to an individual, ensuring homeowner does not continue to payback a loan for a home they are no longer living in.
- **Reduces homeowner risk in case of moving**.
- **Used to complement other programs to see additional savings**.
- Increases equity by allowing greater number of individuals to access.
- Can be designed to be **cost-neutral** through admin fees from participants.
- Improvements **may increase property value**.
- **Potential for lower utility bills** through program participation.
- Other aesthetic and comfort benefits.

### **Other**

- **Long term, low fixed-rate financing**.
- **More GHG emissions reduced** through ability to support greater potential number of homeowners versus grants and rebates, which usually have capped funding.
- Easier to integrate for long-term regional approach, as LIC's is financing option of choice for most programs.

### *LIC Considerations*

As with any of the potential options, the following are considerations that need to be understood when undertaking an LIC financing mechanism:

- Homeowners will incur **larger property tax payments** one to two times per year, until the loan is paid off.
- Depending on the circumstance, interest rates may be higher than traditional loan, though this is rare.
- If ever selling the property, it may be a **deterrent for potential buyers**. This has not been an issue with other programs to date.
- If proper homeowner qualification due diligence is not complete there is an **increasing risk of foreclosure**. Of note, default rates for Canadian programs are incredibly low (less than 1%) and have typically arisen due to COVID personal circumstances.
- Working with municipalities means following the necessary financial policies that can be difficult to plan around. For instance, Burlington would allot debt for an LIC program once a year in allotments of \$100,000, as per their Debt Policy.

### *LIC Eligibility, Approval Process, and City Capacity*

The following information provides suggestions for LIC eligibility with the goal of:

- **Minimizing City administration.**
- **Increasing homeowner loan uptake** by simplifying the application process to key information that is needed from the municipality to reduce their risk and increase comfort level.
- **Providing de-risking strategies** for both the municipality and homeowner.
- Providing the **highest value** to homeowner.

A balanced approval process should be applied to ensure due diligence to reduce risk, but not be so rigorous that it deters homeowner participation. Keeping steps and information requirements to a minimum for homeowners is key, as is reducing the burden that LIC requirements may have on City finance and legal staff.

**Table 6.2:** Overview of advantages and disadvantages of City LIC program.

LIC Provider	Advantages	Disadvantages
<b>Municipality</b>	<ul style="list-style-type: none"> <li>• Added control.</li> <li>• Potential for lower interest rates and longer terms.</li> <li>• Identified as trustworthy source.</li> <li>• Aligns with other municipalities easier.</li> <li>• Reduced predatory sales tactics.</li> </ul>	<ul style="list-style-type: none"> <li>• Limits on total funding.</li> <li>• Increased staff time needed.</li> <li>• Processing LIC requests needs to be created.</li> </ul>

It is recommended that Burlington’s program use municipal funds as loan capital versus a financial institution, at least in the short to medium term. The ability of **municipalities to secure lower interest rates, longer financing terms, not require mortgage lender consent, and remove stigma regarding poor sales tactics** are important homeowner considerations. Administering LIC’s through a municipality requires the following staff resources:

- Initial involvement from legal to review any obligations of offering LIC’s.
- Creating and implementing a process to register LIC’s on the municipal tax roll.
- Issue property tax bills with LIC repayment charges.

Table 6.3 outlines recommendations from Dunsky Energy on key financing items, with Table 6.4 outlining recommended approval process information for program participants, though follow-up with financing is recommended. Regardless of terms, applying to the program follows the steps below:

1. Homeowner completes short application to ensure eligibility.
  - This is high-level information that includes: Address, property type and confirmation of primary residence, proof of address, interest in LIC financing, age of home. Examples from other municipalities include:
    - PEI’s Energy Efficiency Loan Program
    - The Yukon’s Home Repair Program
    - Halifax’s Solar City
    - The Northwest Territory’s Energy Efficiency Incentive Program
2. Application is reviewed by program staff and requests any additional information from the homeowner.
3. LIC is granted and set up on tax roll.
4. Remaining steps from “Program Design” section are completed.

**Table 6.3:** LIC financing recommendations to increase program participation as outlined by Dunsky Energy Consulting.

Suggestion	Rationale
Offer the minimum interest rate possible	Program should aim to be cost neutral to municipality. Any rates paid by municipality are also charged to participants.
Set a project financing minimum that is high enough to justify administration costs	Groups have recommended a minimum of \$5,000. Consideration to a level of approximately \$2,000 - \$3,000 should be given due to the lower cost of proposed program.

Offer 15-20 year financing	Likely the biggest selling point during time of low interest rates.
Identify maximum financing amount	This can be percent of property value, a fixed amount, capped at value of equity the owner has in the property etc.

**Table 6.4:** Requirements and due diligence recommendations for LIC approval.

Eligibility Requirement	Required by Homeowner	Additional Information
<b>Verified by municipality (via MPAC and title search)</b>		
Participant is the property title holder	Yes	<ul style="list-style-type: none"> <li>All other owners listed on the title must provide signatures to the application.</li> <li>Property is located in Burlington.</li> </ul>
Property taxes are not in arrears	Yes	<ul style="list-style-type: none"> <li>This may be applied to the previous year or go back longer, depending on finance comfort level.</li> </ul>
No involuntary liens on property	Yes	<ul style="list-style-type: none"> <li>No outstanding construction liens from past renovations on the property.</li> </ul>
Property value assessed	No	<ul style="list-style-type: none"> <li>Only needed if financing limits are a percent of total home value or owner equity, which is not recommended.</li> </ul>
<b>Provided by Applicant</b>		
Recent bankruptcy	Yes	<ul style="list-style-type: none"> <li>None in last 3 years.</li> </ul>
Mortgage in good standing	Yes	<ul style="list-style-type: none"> <li>No recent history of defaults (past 3-5 years).</li> </ul>
Credit check	No	<ul style="list-style-type: none"> <li>Adds an extra layer of work that may not speak to current ability to pay, while making homeowners feel uncomfortable. Discussion with finance is recommended.</li> </ul>
Household income	No	<ul style="list-style-type: none"> <li>It is not recommended to request participants to divulge their annual income; however, if the program provides low-income support this would be required. All participants may be informed of low-income options through other programs to understand there are options without divulging their earnings.</li> </ul>
Mortgage lender sign off	No	<ul style="list-style-type: none"> <li>Mortgage lender signoff has been identified as a significant barrier for program uptake, with programs that do require it seeing rejection rates of 50%.</li> </ul>

### *LIC By-Law Template*

Though Ontario amended *O. Reg 586/06* to allow for the creation of LIC programs within Municipalities, the City must enact a bylaw to allow for energy-related home upgrades on private residential property.

The Clean Air Partnerships LIC toolkit outlines within Appendix B1 a sample municipal-by-law to enable a LIC program. Furthermore, section 3 of Pembina Institutes *Property Assessed Clean Energy in Canada: Design considerations for PACE programs and enabling legislation* outlines key aspects of provincial or territorial legislation, but context for inclusions for municipal by-laws may be useful as well. The Clean Air Partnership toolkit outlines additional language that should be included, such as permitting municipal borrowing or bond issue, establishing priority lien status, and creating annual LIC roll.

Finally, an excellent overview of considerations for enacting a LIC bylaw was created by Dunsky Energy Consulting, who supported Halton Hill's *Pilot Program Design Report* development.

### *Loan Loss Reserves*

Loan loss reserves (LLRs) are considered a credit enhancement tool where a **reserve fund is set up and can be drawn from if homeowners cannot make a LIC loan payment.**

Total LLR amounts are a **certain percentage of the overall loan portfolio** (ex. 10%-20%, within FCM's Capital Program requiring 5%), but the total amount should reflect the loan risk. For example, if a municipality has a total debt of \$1,000,000 from a home upgrade program, their LLR may have approximately \$100,000 in it for municipalities to draw from. Of note, the larger the number of loans in the portfolio, the smaller percentage of the loan balance is typically needed. Governments are particularly well-suited to offering an LLR given their ability to aggregate large loan portfolios.

As summarized by Pembina Institute, government entities often set up third-party LLRs for clean energy financing to help advance their energy priorities or catalyze private investment in clean energy projects. Third-party LLRs can offset some of the risks for private investors and mortgage holders by providing bridge payments for any losses incurred on PACE investments (for lenders), or on properties with LIC assessments (for mortgage holders) in the case of default.

LLRs are also able to reduce cost of capital and increase access to capital. Additionally, risks to government and mitigation approaches during periods of high default rates, LLRs can be drawn down significantly, even to the point that claims from lenders exceed the fund balance. Governments should be obligated only to maintain the LLR balance up to a portion of the initial loan values, and should not be obligated to rebalance the funds after drawdowns are made. This strategy requires funds being set aside and potentially provided by the municipality.

In the case of a Burlington program there are two main options to cover an LLR:

- The City itself creates its own LLR.
- Partial coverage is available through funding opportunities, such as FCM, for the first 4 years of program implementation.

### *Default Rates within Residential Home Upgrade Programs*

Research in the US regarding LIC default rates is more prominent versus Canada due to the significantly longer implementation period. **Research of over 52,000 homes with the US indicated a 1% or less default rate.** Toronto's HELP program has seen an incredibly low

default rate, though the program does require mortgage lender approval and homes insured under the Canadian Mortgage and Housing Corporation insured mortgages are not eligible to participate (though this provision has significantly reduced program participation). Finally, it's interesting to note that some programs may not even have an LLR as defaulting has not been an issue, which has been seen in Halifax's Solar City program.

### *Burlington Debt Policy Alignment*

Implementation of the LIC mechanism must take into considerations the City's Debt Policy to ensure responsible debt management and align with the City's long-term framework.

**LIC's are not included in the determination of the city's total reported provincial debt capacity.** However, the **debt issued under a proposed LIC program would still be a liability for the city should any loans fall into default**, and would still be part of the city's overall debt obligation.

## 7.0 PROGRAM DELIVERY CENTRE

This section summarizes recommendations for a retrofit delivery centre (RDC) that houses and implements the program, including:

- Overall **purpose of an RDC**.
- Options for what types of organizations can implement and oversee the program. The organization responsible for the RDC is called the **Program Delivery Agent (PDA)**.
- **Additional services** to support increased participation and long-term scaling and sustainability of the program.
- **Staffing requirements** for effective program uptake.
- **Future incorporation of climate adaptation** programming.

### Guiding Principles

In the context of a home upgrade program, an **RDC is a central hub of resources and support services**, such as useful information and technical expertise, meant to **accelerate the participation** of home upgrades. RDCs do this by guiding (primarily) homeowners through available options and benefits that support decision-making based on what aligns with their housing goals and financial options.

In short, **RDCs are meant to alleviate identified participation barriers by simplifying the home upgrade process and improving trust with homeowners and contractors**. The **RDC services** that reduce time required of homeowners and contractors is the **primary value of the program**.

The rationale for creating a Burlington RDC stems from identified barriers during the stakeholder engagement process. Namely, the need for ongoing **education of homeowners and contractors** as well as **logistical guidance** throughout the upgrade process to enhance program interest and uptake. This need stems from confusion amongst homeowners and contractors, the two key stakeholders of a home upgrade program, regarding:

- Constant changes to funding programs by senior levels of government.
- Understanding the **benefits** of home upgrades.
- Assessing the **best options** for upgrades based on homeowner needs and wants.
- How homeowners can leverage multiple programs to increase financial incentives.

**An RDC can build relationships with local stakeholders, businesses and contractors to help increase program participation and community impact.** By coordinating with other existing programs, Burlington can focus on a simple streamlined program with measures that can achieve meaningful GHG emission reductions.

Program implementation may include various activities that contribute to a successful program. The RDC may be responsible for initial set-up, management/coordination, day to day operations etc. with delivery entities falling into one of three categories; public sector, community-led, and market-based (see [Appendix E](#) for more information on each option).

Home upgrade programs have a variety of options for who oversees the RDC and implements the program, and as noted above, the organization responsible for this is the Program Delivery Agent. The selected PDA (municipality, non-profit etc.) for a program will depend on program goals, support from various levels of government, interest in profit etc. For instance, in Ontario municipal support for home upgrade programs is high due to a lack of provincial programming. Additionally, municipalities are not interested in profiting off these programs and invest City money; this leads to many local programs having the municipality or local non-profit be selected as a PDA.

Further categorization for RDC options is summarized in Table 7.1. Consideration should be given to the following administrative items:

- **Assisting homeowners** to assess financing incentives and completing applications.
- Conducting post-retrofit inspection and arranging homeowner sign-off.
- **Incentive program navigation.**
- **Marketing** to grow applicant base.
- **Monitoring** and reporting on the program.
- Home upgrade **education.**
- **Screening** homeowners for eligibility.
- **Training** and maintaining a list of qualified contractors.

Note: LIC retrofit loans must be managed by the City of Burlington. Ontario law requires municipalities be responsible for registering LICs and collecting payments through property taxes.

**Table 7.1:** Summary of advantages and disadvantages of home upgrade Program Delivery Agent options (adapted from BACCC). Expanded information found in [Appendix E](#).

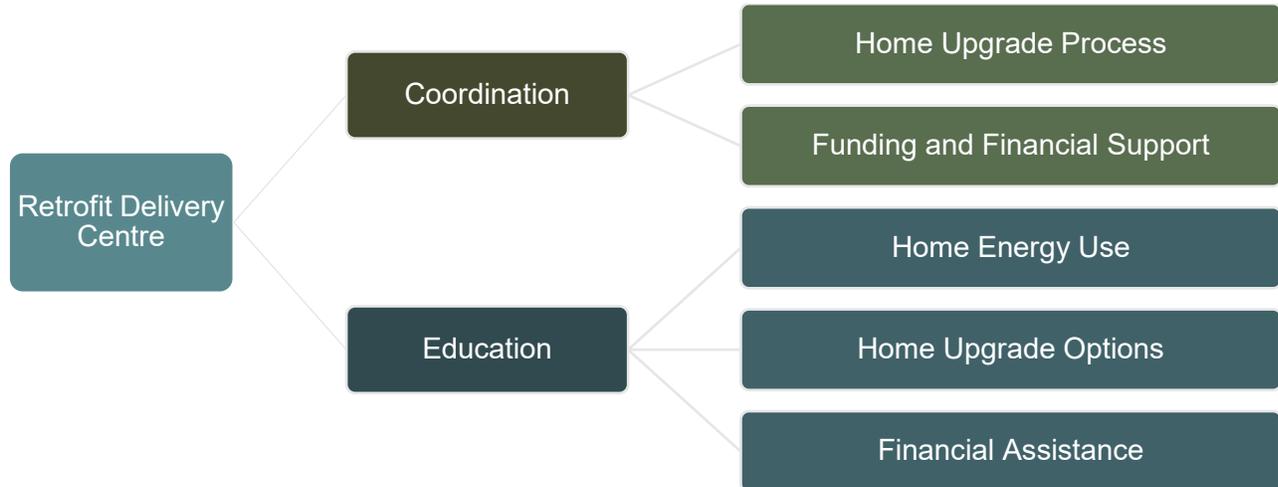
	Municipality	Not-for-Profit	For-Profit	Municipal Services Corporation	Utility Provider
Ability to complete program start up?	Green	Green	Green	Green	Green
LIC administrative ability?	Green	Red	Red	Red	Red
Technical expertise?	Red	Yellow	Green	Yellow	Green
Available capacity?	Red	Yellow	Green	Yellow	Green
Legislative and bureaucratic flexibility?	Yellow	Green	Green	Yellow	Yellow
Incentive for profits?	Green	Green	Red	Yellow	Yellow
Incentive for product/service recommendations?	Green	Green	Yellow	Yellow	Yellow
Political incentive?	Yellow	Green	Red	Yellow	Yellow
Easy to work outside of municipality?	Yellow	Green	Green	Yellow	Green
Start up time?	Red	Green	Green	Yellow	Green
Ease for private sector partnerships?	Red	Green	Green	Yellow	Green
Citizen and business trust?	Yellow	Green	Red	Yellow	Yellow
Recommendation	Yellow	Green	Red	Yellow	Yellow

■ Green indicates preferred option or entity strength  
■ Yellow indicates potential or limited abilities to deliver  
■ Red indicates perceived entity weakness

## Delivery Centre Services

To support GHG reductions through a home upgrade program the RDC should prioritize:

- **Supportive customer service** to reduce homeowner and contractor coordination efforts. This may include items such as setting up energy audits, gathering contractor quotes, identifying paperwork that needs to be submitted for grants etc.
- **Accessing appropriate financing options** so homeowners can take advantage of rebates, incentives, grants, loans, etc.
- **Building trust through accountability, honesty, and transparency** to create a positive reputation. Recommended RDC supports are summarized in Figure 7.1 and Table 7.2. Note these services are customer focused, not operations focused.
- Provide awareness of other programs available through other groups, such as climate adaptation programming (see [Appendix E](#) for potential complementary programs).



**Figure 7.1:** Summary of RDC supports.

**Table 7.2:** Rationale for core RDC customer-focused services.

RDC Focus	Description	Barrier(s) Addressed
<b>Coordination</b>		
<b>Home Upgrade Process</b>	<ul style="list-style-type: none"> <li>Helping homeowners coordinate baseline GHG analysis, such as helping to gather data, communicating with <i>RETScreen</i>, setting up energy audits etc.</li> <li>Identifying local contractors available to complete work and gather quotes.</li> <li>Point of contact for contractor and homeowner.</li> </ul>	<ul style="list-style-type: none"> <li>Homeowner and contractor capacity.</li> <li>Removing some technical knowledge requirements from homeowner.</li> <li>Reduces inconveniences.</li> <li>Customer distrust.</li> </ul>
<b>Funding and Financial Support</b>	<ul style="list-style-type: none"> <li>Identifying funding opportunities that align with home upgrade goals.</li> <li>“Go to” for funding inquiries.</li> <li>Support funding submissions that may be required.</li> </ul>	<ul style="list-style-type: none"> <li>Difficulty linking upgrade to financial incentives.</li> <li>Would support improved ROI due to ability to understand and stack financial incentives.</li> </ul>
<b>Education</b>		
<b>Home Energy Use</b>	<ul style="list-style-type: none"> <li>Once baseline is complete the RDC takes homeowner through how their home is using energy, upgrade options, homes as a system etc.</li> </ul>	<ul style="list-style-type: none"> <li>Lack of information awareness regarding retrofit benefits.</li> </ul>
<b>Home Upgrade Options</b>	<ul style="list-style-type: none"> <li>Communicating options for homeowner based on their end goals and needs at their level of understanding.</li> </ul>	<ul style="list-style-type: none"> <li>Lack of understanding upgrade options for each</li> </ul>

		homeowner's unique home and priorities. <ul style="list-style-type: none"> <li>• No confidence in ROI.</li> </ul>
<b>Financial assistance</b>	<ul style="list-style-type: none"> <li>• Understanding what options are available, eligible upgrades, submission requirements.</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of knowledge navigating programs.</li> </ul>

### *Delivery Centre Staffing*

Development of an RDC presents employment opportunities or expansion of responsibilities. Table 7.3 summarizes key staff and recommended responsibilities based on lessons learned from other programs. Staffing requirements will change over time in response to program progression, including added customer service and sales staff, increased expansion marketing and communications, and added emphasis on partnership development.

**Table 7.3:** RDC launch staffing recommendations.

<b>Area</b>	<b>FTEs</b>	<b>Priority Upon Launch</b>	<b>Responsibilities</b>
<b>Customer Service Staff</b>	1	Medium	Timely, effective, and positive customer service will be key to developing an early positive reputation. Duties may include helping homeowners gather and coordinate baseline data needs, contractor quote development, logistics, and funding options available etc.
<b>Technical Staff</b>	0.5-1	Medium	Launch should include access to technical expertise to help identify best upgrade options, though awareness, customer acquisition, and customer service should take initial priority.
<b>Communication and Marketing Coordination</b>	1	High	Required to complement business development, sales, and program uptake through outreach, education, and communication.
<b>Business Development</b>	1	High	Program launch should be followed by heavy business development with citizens and partners to show program uptake and partnership development. Ensure proper business support is in place for program delivery and develop partnerships with community stakeholders and potentially other jurisdictions.
<b>Program Manager</b>	1	High	Acts as liaison to the City, manages staff, responsible for helping the RDC grow and scale over time.

*\*Full time equivalent staff*

## *Value-Added Services*

Above and beyond the main services of financing support, process logistics, and planning for home adaptation options, further partnerships and collaborations with local businesses that provide value to the homeowner may be seen as a benefit. By pairing non-GHG related offers with more aesthetic or functional incentives additional value is provided, which can support uptake. Homeowner survey results ([Appendix B](#)) summarizes high value items already being considered. It's recommended the RDC work with an already established program or business, instead of adding to the scope of the RDC. Examples may include:

- Discounted garden-related items for landscaping, such as seeds, plants, compost etc.
- Item or experience giveaways for participation.

## **Climate Adaptation and Resilience**

Mitigation is one aspect to consider in the context of climate change. **Climate adaptation and resilience** i.e. **preparing and reducing a community's vulnerability to the severity of climate-change related impacts** is also key as communities continue to feel the impacts of climate change. The City's climate resiliency plan (*Climate Resilient Burlington: A Plan for Adapting to Our Warmer, Wetter, and Wilder Weather*) to be released late 2022, presents an opportunity for the RDC to support and promote climate resilience programming for homes. [Appendix E](#) is a non-exhaustive list of currently offered resiliency-related programs the RDC may choose to promote. **Adaptation programs may focus on areas such as “future proofing” homes against extreme weather, enhancing and increasing the tree canopy, consideration of air source heat pumps to provide cooling during warmer weather etc.** One key adaptation area relates to the education of homeowners on home insurance to ensure adequate coverage for severe weather events and flooding. Providing a simple document of what to consider coverage for and key language will support this with minimal input.

## *Long-Term Delivery Centre Goals*

The scale and requirements to support significant GHG reductions in a financially sustainable manner will change over time as the program grows and expands services etc. To ensure the long-term stability of the program the following future goals are recommended for consideration:

- **RDC to partner with other Municipalities** to streamline program offerings to reduce confusion and financial needs.
- As the program progresses consideration should be given to other entity options that can support key areas of the project, such as marketing. This also includes changing funding models that allow for stability, but also for the expansion of the program to increase impact. This may include investor options etc., as the scale of the required undertaking is not feasible for municipalities to take on.
- **Program scaling into other eligible upgrades** may occur based on technology improvements, pricing changes, and customer wants.

## 8.0 COMMUNITY ENGAGEMENT AND MARKETING

### Program Marketing and Communications

The following guidelines were used to develop program marketing and communications:

- The **brand speaks to increased enjoyment of the home.**
- Obvious **references to an environmental-related program are avoided.**
- **Simple, concise language** is used to communicate the program to all stakeholders.
- Marketing involves multiple stakeholders.

Stakeholder input and feedback on marketing elements was received from the City of Burlington's Climate Action Plan Stakeholder Advisory Committee and BACCC's Buildings Implementation Team where we heard input on the need for targeted communications that adapt messaging to the various market actors' internal drives and considerations. More specifically, the BACCIT offered several potential segments requiring unique messaging: contractors and suppliers, realtors, price conscious consumers, low income homeowners, seniors, and environmentally conscious consumers. The education campaign discussed in this report utilize these segment categories.

#### *Communication Tools*

##### **Branding**

A strong brand identity reinforces the idea of high-quality service offerings and trusted programming. A brand, logo, and brand guidelines have been developed to identify the recommended name of **Better Homes Burlington** program and differentiate it within the market. The logo and brand have been developed to build a loyal-customer base in the market. Branding exercises were completed to understand program values and guide logo development, where themes of comfort, home improvement and equity were incorporated. These are the elements that make our brand familiar, correct in all communication and unmistakable. All brand elements meet Web Content Accessibility Guidelines 2.0 at Level AA.

Key to the success of our new brand and visual identity system is consistent activation. As such, the Better Homes Burlington branding has been applied within this report.

We use the symbol of a group of homes to indicate our diverse community

The homes come together to form arrows a symbol that indicates the raising of energy efficiency, the improvement to individuals lives, their finances and the beneficial effect to our whole community and environment.



Our colours intentionally are balanced between indicating a modern welcoming habitat and an expression of environment.

The overlapping expresses the shared benefits to all our community.

**Figure 8.1:** Better Homes Burlington logo design and meaning.

The name Better Homes Burlington (BHB) was chosen to reflect the program’s end goal of a better home without the obvious link to reduced GHGs. **Additionally**, numerous Canadian programs use the “Better Homes” terminology, **which creates continuity while simplifying any future collaborations or aggregation of municipal programs.**

### Key Messaging

To increase uptake from homeowners and service providers, it is recommended that the following key messages and best practices, outlined by the Clean Air Partnership, remain central to program communications.

#### *Best Practices*

- Understand the target audience and highlight the benefits that are convenient and that appeal to them.
- Engage homeowners at the moment of decisions (i.e. through a contractor at the time of equipment replacement).
- Engage the wider community (i.e. councilors, not-for-profits, neighbourhood associations).
- Offer specific and transparent information targeted to Burlington homeowners.
- Coordinate repetitive communication, messaging and exposure from trusted sources that is easy to understand.

### *Terminology & Key Messaging*

- Avoid 'Energy Jargon' and keep language simple.
  - Use 'home upgrades' instead of 'home retrofits'.
  - Consider using 'Home Upgrade Support Centre' instead of 'retrofit delivery centre'.
- Comfort is a more universally accepted motivator for program uptake, as compared to energy use, climate, or environmental impact.
- Home upgrades increase comfort of a home, not just energy efficiency.
- Efficient homes are less likely to face mould and drafts, making for healthier home air quality.
- Efficient homes can lower utility bills and save homeowners money.
- Home upgrades can future-proof a home, increasing market value.
  - Upgraded homes are more resilient to power outages and climate change
  - Efficient homes create less GHGs.

### **Targeted Market Segments**

Stakeholder research and market analysis identified five distinct market segments within the targeted audience for the Better Homes Burlington program. Promotional success and increased awareness are strengthened by understanding the typical profiles of each segment. Common characteristics of each segment should be considered when marketing the Better Homes Burlington program and information centre. The key segments identified include:

#### Homeowners

1. Price Conscious Homeowners
2. Low Income Homeowners (i.e. Seniors)
3. Environmentally Minded Homeowners

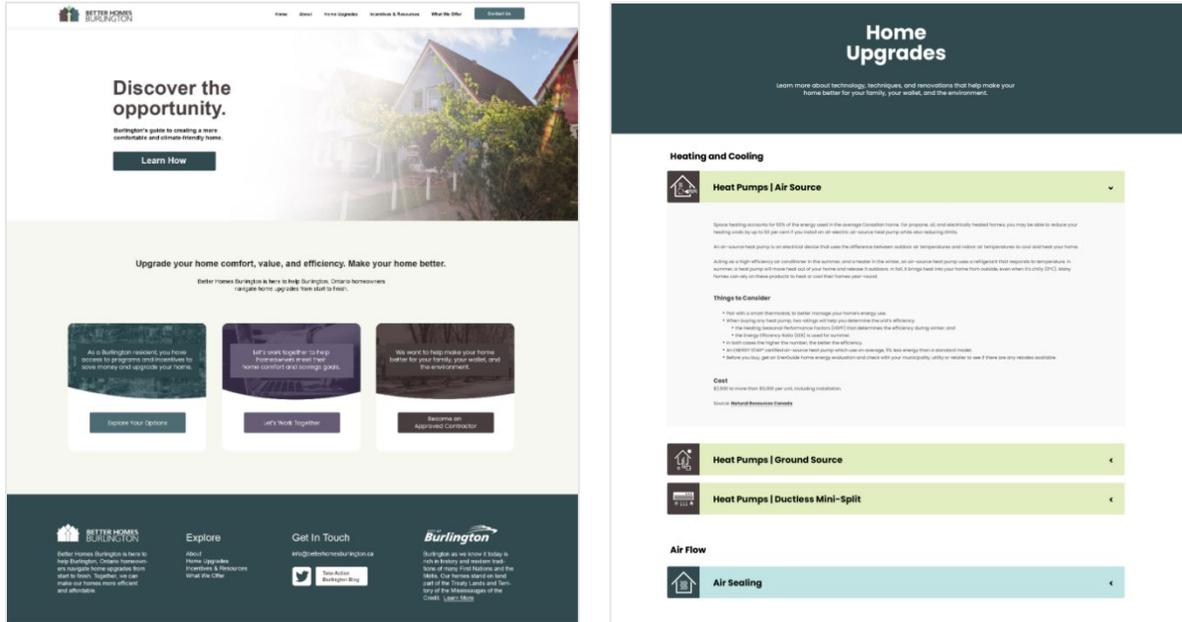
#### Service Providers

4. Contractors, Suppliers, Associations
5. Realtors and Associations

### **Website and Online Resources**

In order to create an immediate impact for homeowners, it is recommended that the Retrofit Delivery Centre functions first as a virtual resource. Preliminary work has been completed to develop a Better Homes Burlington website providing an overview of the program, linking to available incentives and resources, and providing a direct line of virtual contact to the program delivery agent.

Website development is expected to be complete for January 2021 and will be maintained and operated by the RDC. It is recommended that the City of Burlington include a link to the program website and resources, however, it should be hosted externally and independently by the RDC.



**Figure 8.2:** Screenshots of the *Home* and *Upgrades* pages of the developed website – [www.betterhomesburlington.ca](http://www.betterhomesburlington.ca).

## Marketing and Communications Strategy

The following strategy outlines high-level recommendations for potential marketing efforts for the program and delivery centre. In order to align with program uptake, it is recommended that a phased approach be adopted—first offering virtual services only, then expanding into in-person support as well.

**Table 8.1:** Recommendation marketing strategy, tactics and actions for City of Burlington home upgrade program.

		Tactics	Recommended Actions
<b>Phase 1: Virtual Delivery</b>			
<b>A. Stakeholder Outreach</b>	<b>1A i) List of Stakeholders and Audiences</b> Define a comprehensive list of relevant stakeholders to identify areas for engagement		<ul style="list-style-type: none"> <li>☑ Identify list of relevant stakeholders and collect contact information</li> <li>☑ Develop outreach strategy with BACCC</li> <li>☑ Define key target audiences for programming</li> <li>☑ Identify list of questions and desired outcomes for conversations with stakeholders</li> </ul>
	<b>1A ii) Stakeholder Consultations</b> Engage relevant stakeholders to better inform marketing techniques		<ul style="list-style-type: none"> <li>☑ Initiate and schedule consultations</li> </ul>
	<b>1A iii) Homeowner Survey</b> Gather input from community to understand current barriers and opportunities		<ul style="list-style-type: none"> <li>☑ Identify desired outcomes of survey</li> <li>☑ Locate and acquired a trusted surveying consultant to advise and deliver survey</li> <li>☑ Deploy survey online and by telephone</li> <li>☑ Assess findings to improve delivery centre service</li> </ul>



<b>B. Offer Virtual Support</b>	<p><b>1B i) Website and Brand Identity</b> Develop a website and brand identity to build credibility and awareness</p>	<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Contract marketing services to support project branding and graphic design</li> <li><input checked="" type="checkbox"/> Engage stakeholders in brand development process</li> <li><input checked="" type="checkbox"/> Utilize brand</li> </ul>
	<p><b>1B ii) Virtual Resources and Materials</b> Create online resources, hosted on the website, to support and educate homeowners</p>	<ul style="list-style-type: none"> <li>• Develop sample roadmap for homeowners to offer transparency of expected process, timelines, outcomes, and expectations of program</li> <li>• Develop one pager document to address inquiries and high-level program interest</li> </ul>
<b>C. Build Awareness</b>	<p><b>1C i) Social Media</b> Engage community and relevant audiences through targeted social networking channels to support project awareness and relevant opportunities</p>	<ul style="list-style-type: none"> <li>• Post actively within Twitter, Facebook, Instagram, LinkedIn</li> <li>• Target key market segments through respective associations and accounts</li> <li>• Utilize paid ads to increase reach</li> <li>• Incorporate multimedia content, interaction and infographics as opportunities for engagement</li> <li>• Engage local influencer accounts (i.e. Mayor, Councillors, local media, etc.)</li> </ul>
	<p><b>1C ii) Webinars</b> Offer virtual seminars, lectures, and engagements to educate home owners on programming and options for home upgrades</p>	<ul style="list-style-type: none"> <li>• Work with services providers, utilities to offer educational sessions</li> <li>• Host panels with experts to offer insight and tips for home upgrades</li> </ul>
	<p><b>1C iii) Print Advertising</b> Engage community and relevant audiences through printed material to support access and awareness of programming</p>	<ul style="list-style-type: none"> <li>• Municipalities to utilize existing mailout packages to include program information handouts (i.e. property tax mail package)</li> <li>• Offer branded material, print material, and marketing guidelines to contractors and suppliers for promotion to their clients</li> <li>• Consider posters/billboards in community centres, libraries, recreation centres, transits hubs (i.e. GO Station, Burlington Transit, box stores, etc.)</li> <li>• Explore handout material for events, information booths, public offices (i.e. Service Ontario, etc.)</li> </ul>
	<p><b>1C iv) Stakeholder Engagement and Existing Networks Referrals</b> Leverage existing networks to encourage referrals and word of mouth promotion</p>	<ul style="list-style-type: none"> <li>• Offer training sessions and webinars to approved contractors, suppliers and local realtors to educate them on opportunities they can share with clients</li> <li>• Actively engage local influencers (i.e. Mayor, Councillors, local media, etc.)</li> <li>• Utilize news letter mailing list of local organizations</li> <li>• Consider internal updates through staff at large local employers, schools, etc.</li> </ul>

Phase 2: Virtual <i>and</i> In-Person Delivery		
A. Offer In-Person Support Option	<b>2A i) Resources and Materials</b> Engage visitors with guidance to online resources and printed material to support awareness and use of programming	<ul style="list-style-type: none"> <li>Develop take away resources for homeowners, associations, and other visitors</li> <li>Expand and display handout material for events, information booths, public offices (i.e. Service Ontario, etc.) as outlined in <i>Item 1C iii</i></li> </ul>
	<b>2A ii) 1:1 On-Site Delivery Centre Support</b> Provide access to direct contact who can help navigate home upgrade programming, services, and opportunities on location	<ul style="list-style-type: none"> <li>Offer same services as virtual centre but with added in-person support</li> <li>Offer demonstration sites to provide homeowners with understanding of upgrade options</li> <li>Consider opportunities for grand opening promotion</li> </ul>
B. Grow Awareness and Perception	<b>2B i) Social Media and Print Advertising</b> Continue existing efforts	<ul style="list-style-type: none"> <li><i>Refer to Item 1C</i></li> </ul>
	<b>2B ii) Events and Outreach</b> Engage and educate homeowners and key market segments through in-person events	<ul style="list-style-type: none"> <li>Utilize showrooms that offer homeowner's insight into the realities of home upgrades</li> <li>Consider Brickworks Mobile Truck as education tool</li> <li>Host pop-up information sessions at events, stores, and gatherings</li> </ul>
	<b>2B iii) Progress Reports</b> Provide regular access to progress reports to ensure transparency of project progression	<ul style="list-style-type: none"> <li>Develop process for progress reporting</li> <li>Publicly share key milestones, timelines and strategy for communication</li> <li>Record project progress to ensure thorough documentation and make interactions with city council available to all homeowners</li> </ul>
	<b>2B iv) Grow Applicant Base</b> Use virtual benchmark ( <i>Item 1B iv</i> ) to grow awareness and increase visibility evidenced by new applicants	<ul style="list-style-type: none"> <li>Set clear goals for periodic growth and align with goals for total homes upgraded</li> </ul>
	<b>2B v) Expand Partnerships</b> Seek additional partners for funding, referrals, marketing and engagement	<ul style="list-style-type: none"> <li>Consider formalizing or expanding partnerships with utility provides, neighbouring municipalities, community groups, box stores, or private funders</li> </ul>

## Knowledge Transfer Strategy

One of the most common barriers to success of home upgrade programs is effective marketing and knowledge mobilization. **A successful program is only possible if the target markets are aware of and understand the opportunities available.** To effectively transfer knowledge to relevant stakeholders (i.e. representatives from real estate associations, home builders and construction associations, trade schools, energy advisors, equipment supplies, utility providers, environmental non-profit organizations and chosen PDA) it is recommended that a **multifaceted approach be utilized to reach respective groups.**

### *Inform Target Markets of All Aspects of Home Upgrades*

A key principle for **effective program participation is that homeowners understand and feel comfortable engaging with the idea of a home upgrade.** It is recommended that through the

use of social media, informational videos, and visual infographics, that all identified market segments are educated on key elements of an upgrade.

The Bay Area Climate Change Council (BACCC) developed a communications and education campaign to educate homeowners and other market actors on home retrofits.

BACCC staff produced four mediums of educational materials for this campaign: Infographics, graphic ads, long form videos, and short form videos.

Staff created two infographics for each of the five market segments: contractors/suppliers, realty, price conscious consumers, low income homeowners/seniors, environmentally conscious consumers. In total, BACCC staff produced ten 'poster-style' infographics. These infographics have been made publicly available on the BACCC website.

The infographics were distributed via email to thirty-one local stakeholders, covering the five market segments. Stakeholders included: Enbridge, Burlington Hydro, Alectra, nonprofits such as Neighbour to Neighbour, Canadian Home Builders, West End Home Builders Association, various neighbourhood associations, realtors, and the Heating, Refrigeration and Air Conditioning Institute of Canada. Many of the contacted stakeholders committed to further disseminating the infographics among their networks: internally among staff, in upcoming member newsletters, with clients, at training sessions etc.

Along with the ten 'poster-style' infographics, BACCC staff created two social media ad versions of the price conscious consumers, low income homeowners/seniors, environmentally conscious consumers market segment infographics. The ads were optimized for audience reach and were targeted to specific audiences that matched the corresponding market segment. These six social media graphic ads ran on Facebook and Instagram in November and December 2021. The results of these ads can be found below.

Next, BACCC staff created six 'long-form' educational videos. On social media, 'long form' content is considered to be any video over fifteen to thirty seconds in length. These six videos covered the following topics: the connection between home choices and utility bills, support programs for home retrofits, air tightness & air sealing, what to expect from an energy audit, how to understand an energy audit, and heat pumps. The videos are publicly available on BACCC's YouTube channel and on BACCC's website.

The Facebook versions of the long form videos were converted into paid advertisements. The ads were optimized for video views, and were targeted to residents. These six long form video ads ran on Facebook in November and December 2021. The results of these ads can be found below.

Finally, BACCC staff created twelve 'short form' educational video clips for social media: two clips corresponding to each of the six long form videos. These videos covered much of the key concepts of the long form videos, but in a brief and more casual format.

The videos were shared on BACCC's Instagram page as Reels, and BACCC's TikTok account. The Instagram Reels versions of the short form videos were converted into paid advertisements.

The ads were optimized for video views and were targeted to residents. These twelve short form video ads ran on Instagram between November and December 2021. The results of these ads can be found below.

**Table 8.2:** BACCC educational social media campaign results.

	Reach*	Impressions**
<b>Graphic Ads</b>	62,092	175,008
<b>Long Form Videos</b>	38,276	46,767
<b>Short Form Videos</b>	43,900	74,990
<b>TOTAL</b>	<b>121,314</b>	<b>296,765</b>

\*Reach is the number of people who saw the ad (unique view)

\*\*Impressions are the number of total times that any ad content entered a person's screen (total views)

A summary of campaign results can be found within [Appendix G](#).

### *Educate Home Upgrade Market Actors*

Engagement with a homeowner at the moment of decision allows for serious consideration and interest in home upgrade opportunities. As such, it is essential to leverage the networks of realtors, local contractors, suppliers, manufacturers, and trade associations as they offer advice directly to homeowners in times of interest (i.e. upon inquiry of home renovations contractors can suggest energy efficient solutions). It is recommended that training sessions and open webinars be offered to approved contractors and local realtors to educate them on opportunities they can share with homeowners.

## 9.0 GOVERNANCE AND BUSINESS PLAN

The following section outlines recommendations regarding governance activities of the RDC and relationship with City staff as well as high-level budget recommendations.

### Governance

In the context of a home upgrade program, governance refers to the processes and **decision-making** procedures for achieving program goals while **maintaining accountability and transparency**.

The program is recommended to have **two key groups supporting the program**, above and beyond the PDA, **City staff and a program advisory group**. Governance should align with any established municipal practices, as the **City should hold PDA decision-making power** regarding staffing. Responsibility considerations are outlined in Table 9.1.

**Table 9.1:** Key groups in home upgrade program delivery and associated responsibilities.

Group	Responsibilities
City of Burlington	<ul style="list-style-type: none"> <li>Decision making regarding program PDA leadership.</li> <li>Work with PDA to move through application processing, approval, and payment.</li> </ul>
Program Advisory Group	<ul style="list-style-type: none"> <li>No formal decision-making power and cannot issue directives.</li> <li>Provides recommendations, expertise, and contacts to support program goals.</li> <li>Act as program ambassador.</li> <li>Evaluates program performance and metrics.</li> <li>Reviews program metrics and feedback to support program or strategy changes.</li> <li>Act as an independent and unbiased sounding board.</li> </ul>
Program Delivery Agent	<ul style="list-style-type: none"> <li>PDA leader responsible for staff hiring and training.</li> <li>All aspects of program implementation.</li> <li>Reporting to Advisory Group and City Sustainability Staff.</li> <li>Reporting to Council, as needed.</li> </ul>

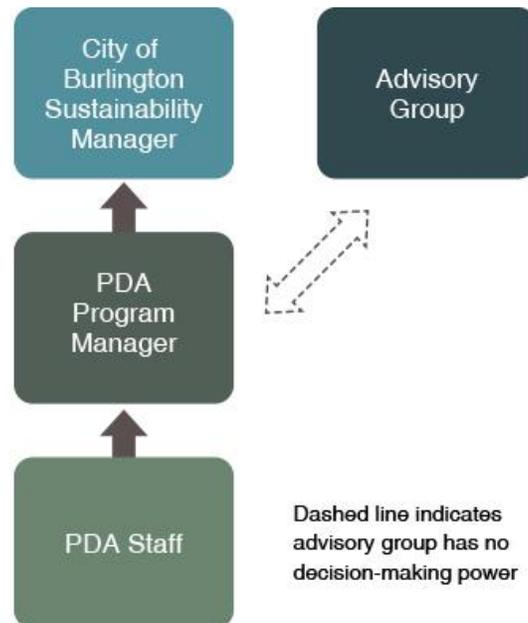
### *RDC Relationship with City of Burlington*

Expanding on Table 9.1, the PDA's ongoing relationship with the City may include:

- Consistent contact between Program Manager and municipality regarding program direction, feedback, and how City departments, such as marketing and communications, can support the program.
- The RDC is responsible for updating the City's Sustainability Manager on program goals and impacts at regular intervals.
- City serves as **link to other municipalities** for discussion, input, and planning for any program aggregation opportunities.

- RDC and City **work together in reporting to Council**, as needed.
- **RDC helps guide budget direction** that is informed and finalized by the City.

Figure 9.1 outlines the recommended governance structure works to ensure transparency and accountability of the PDA towards performance goals and metrics.



**Figure 9.1:** Recommended governance structure. Dashed line indicates advisory group has no decision-making power.

### *Program Advisory Group*

The program is recommended to be overseen by an Advisory Group that meets monthly or semi-monthly to provide advice, feedback, and program accountability. As outlined by BACCC, representation from the group should include:

- A **citizen representative from each municipality** where the program is offered.
- **Relevant municipal staff** from each municipality where the program is offered. This may be Sustainability staff, with guest invitations to finance, legal, and other relevant groups, as needed.

Advisory Group composition should include local representation of individuals with different knowledge and skills. This ensures that all program areas and associated impacts are considered when decisions are made. Group members may include:

- Representatives from diverse populations, including but not limited to: communities of colour, Indigenous peoples, social service organizations with experience with immigrants and/or low-income populations.

- Local businesses with technical expertise.
- Building scientist or building code expert.
- Local environmental group(s).
- Utilities.
- Economic development or Chamber of Commerce.
- Marketing.

### *Anticipated Program Cost Areas*

As the program progresses focused spending on different areas will be necessary. A high-level overview of costs is summarized in Table 9.2.

**Table 9.2:** Home upgrade program costs over time. Adapted from Dunsky Energy Consulting.

Area	Description	Costs	Lead	Frequency
<b>Bylaw pre-work</b>	Preparing bylaw and completing due diligence for LIC financing	Municipal staff time to draft bylaw and complete due diligence review.	Municipal legal, financing, and sustainability staff	One-time
<b>Program setup</b>	Securing capital funding to issue loans, creating administration components for program delivery	Municipal staff time to review and prepare documentation and processes.  Municipality staff time to complete PDA selection.	Municipal legal, financing  Municipal Sustainability staff	One-time
<b>Program launch</b>	Planning launch details	Developing processes and operation procedures (applications, contractor networks, initial marketing and sales materials, evaluation forms etc.)	PDA	One-time
<b>Operating costs</b>	Ongoing costs needed to deliver the program	All aspects of program implementation, such as staffing, communications i.e. day to day costs	PDA	Annual
<b>Individual participant costs</b>	Costs incurred to enroll participant in LIC.	Per participant costs incurred, these include including registering liens, title searches, application reviews, and other documentation. Estimation of \$400 per participant as per Dunsky Energy research	Municipal staff (finance) and PDA	Annual and per participant

## Budget

A more gradual buildup of the program should be considered to reduce initial City funding and complete pre-launch tasks, such as finalizing legal and financial questions relating to the LIC, begin program communications and marketing, building stakeholder and homeowner knowledge etc. The budget in Table 9.3 outlines spending to add one full-time staff member to complete identified pre-launch tasks. This assumes a maximum \$10,000 per participant loan and 50% of participants using the LIC option, as the survey indicated the use of other funding options such as personal savings, lines of credit, banks loans etc. are the preferred payment method.

**Table 9.3:** Proposed year one program costs.

Budget Item	Year 1 Costs (10 homes)
<b>Salary</b>	
Program Coordinator Base Salary	\$65,000
<b>Program Costs</b>	
<b>Marketing and Communications Materials</b>	\$10,000
<b>IT</b>	\$3,000
<b>RETScreen Templates</b>	\$2,000
<b>Supplies</b>	\$3,000
<b>LIC Costs</b>	
Loan Capital Budget	\$50,000
Loan Loss Reserve (5%)	\$5,000
<b>TOTAL</b>	<b>\$138,000</b>

Upon program expansion and selection of the Program Delivery Agent to administer the program through the RDC a more comprehensive program budget is located in Appendix H and summarized in Table 9.4; this budget outlines a robust RDC and estimates costs for the first four years of program implementation, which aligns with FCM's Capital Program duration. Additionally, the targets outlined in Table 9.5 are recommended annual home upgrade goals that are meant to provide context for RDC performance:

**Table 9.4:** RDC budget for a home upgrade program with four-year financial support from FCM's Loan and Grant Capital Program.

<b>FCM + Municipal Support</b>					
<b>REVENUE</b>					
		Year 1	Year 2	Year 3	Year 4
<b># Homes upgraded</b>		<b>20</b>	<b>40</b>	<b>100</b>	<b>150</b>
<b>Payment Type</b>	<b>Frequency</b>	<b>Amount (\$)</b>	<b>Amount (\$)</b>	<b>Amount (\$)</b>	<b>Amount (\$)</b>
<b>Admin and Service Fees</b>					
Customer Admin	One-time	2,000	4,000	10,000	15,000
<b>Grants</b>					
<u>FCM</u>	One-time	465,000	465,000	465,000	465,000
<b>Government</b>					
<b>Municipality 1 (Burlington)</b>	Multi-year	(72,000)	(78,000)	66,000	66,000
Municipality 2	Multi-year			66,000	66,000
<b>External</b>					
Municipal in-kind, partnerships, sponsorships, utilities, youth hiring etc.	Annual	125,000	125,000	170,000	170,000
<b>TOTAL PROGRAM REVENUE (\$) without City Funding</b>		592,000	594,000	645,000	650,000
<b>EXPENSES</b>					
		Year 1	Year 2	Year 3	Year 4
<b>Staff</b>	<b>Frequency</b>	<b>Amount (base salary) (\$)</b>			
<b>TOTAL PAYROLL</b>		<b>335,000</b>	<b>335,000</b>	<b>515,000</b>	<b>515,000</b>
<b>Other</b>	<b>Frequency</b>	<b>Amount</b>			

Marketing and Promo	Annual	30,000	30,000	60,000	60,000
IT	Annual	12,000	12,000	12,000	12,000
RETScreen templates	Startup	2,000	0	0	0
Supplies	Annual	7,000	5,000	5,000	5,000
Communication	Annual	7,000	5,000	5,000	5,000
<b>TOTAL OTHER (\$)</b>		<b>58,000</b>	<b>52,000</b>	<b>82,000</b>	<b>82,000</b>
<b>LIC Loan</b>					
Loan Loss Reserve (5% of loan amount provided by FCM as backstop)	Annual	10,000	20,000	50,000	75,000
Loan Capital	Annual				
		200,000	400,000	1,000,000	1,500,000
<b>TOTAL LIC LOAN</b>		<b>210,000</b>	<b>420,000</b>	<b>1,050,000</b>	<b>1,575,000</b>
<b>TOTAL (\$)</b> (Does not include "TOTAL LIC LOAN" as FCM covers this)		<b>393,000</b>	<b>387,000</b>	<b>597,000</b>	<b>597,000</b>
<b>Per Year Burlington \$</b>		(72,000)	(78,000)	132,000	132,000
<b>Total Burlington Financing (\$)</b>	<b>264,000</b>				
<b>Loan Amount (max of \$10 mil)</b>	<b>3,100,000</b>				
<b>Max Grant Amount (50% of loan)</b>	<b>1,550,000</b>				
<b>Max 4 Year Spending (so grant amount is 80% of costs)</b>	<b>1,860,000.0</b>				

**Table 9.5:** Recommended annual home upgrades during first 10 years of program.

Year(s) after Launch	Homes Upgraded per Year
1	20
2	40
3	100
4	150
5	200
6	300

7	350
8	400
9	450
10	500

## 10.0 FUNDING STRATEGY

### Program Financing

There are key considerations when budgeting for a home upgrade program with a LIC as a financial incentive, including:

- **Capital funding** required for loans.
- An **LLR** to mitigate risk.
- **Staffing** to implement the program successfully, and other operational costs.

#### *Guiding Principles*

Canadian home upgrade programs typically rely on municipalities for core staff and other key budget areas. Conversely, US programs that have been available for decades mainly rely on private funding. **It is anticipated core funding for the program will come from the municipality or external funding (i.e. Federation of Canadian Municipalities, FCM, funding programs) that is required to be administered through the municipality.** Considerations for program funding goals include:

- **Reducing the overall percent contribution** of the municipality over time, though municipal support is anticipated to always be required in some manner.
- **Diversifying funding sources** to support funding consistency and reduce risk of funding inconsistencies.
- **Leveraging in-kind options**, whether being advice for local experts on key program areas, post-secondary institutions, volunteer supports etc.
- **Aggregating program delivery** with neighbouring municipalities to share resources.
- Long-term, fully transitioning to third party delivery and funding to increase program scaling and reduce financial needs from the municipality.

Annual program costs are outlined within [Appendix H](#). Costs do not reflect legal, finance, and sustainability costs required for by-law prework and program setup. **The following considerations were made when developing the financial model:**

1. The **most likely option for initial core funding is either from the municipality or funding through FCM that would still require some municipal support**, but significantly less.
2. **Programs are not meant to bring in revenue**, but to recoup costs over the long-term. To date, Canadian programs continue to rely heavily on municipal funding and have not

broken even. Conversely, US programs delivered by third-parties do bring in revenue, but at potentially significant cost increases to homeowner.

3. The Program Manager and business development position will most likely be new full-time positions for the RDC, with 100% of their time dedicated to the program. The use of a local RDC will ensure staff can speak to Burlington citizen needs.
4. If the PDA is an established entity **there may already be available capacity for key activities** such as communications and marketing.
5. The **PDA may already support programming related to home upgrades**, allowing for easy integration and potential expansion of responsibility to reduce initial position funding.
6. There is **potential for working with other municipalities to aggregate services and delivery** to reduce the overall cost burden for each municipality.
7. **Third-party funding considerations may be used to scale and support cost-neutrality** over the long-term.
8. The PDA may **significantly leverage youth funding, post-secondary institutions, and volunteers** to support capacity and experiential learning to add further program value.

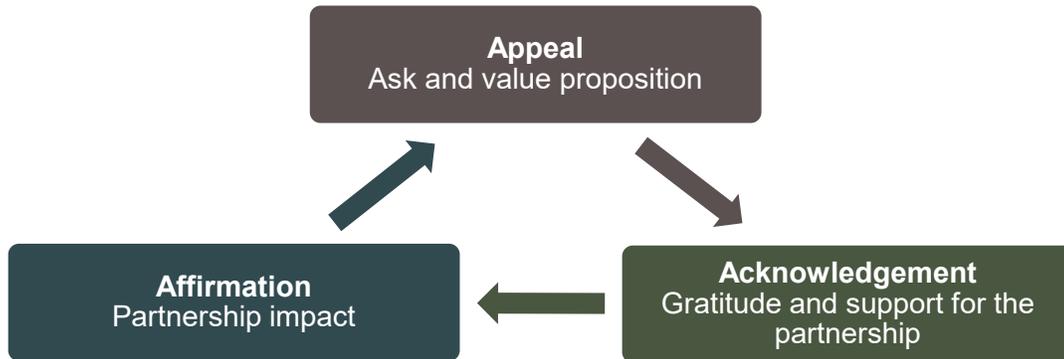
## Program Funding and Partnership Strategy

Funding and partnerships provide value by allowing others to **undertake an activity that could not be achieved by one partner acting alone**; funding provides key monies required to complete an activity the funder could not complete, and partnerships enhances the impact and effectiveness of action through combined and more efficient use of resources. **This shared value must be realized by all parties involved**, and a clear understanding of the expertise, capabilities, and roles of all partners is important for success i.e. they are based on sharing.

The proposed strategy is meant to achieve the following goals:

- Work to identify **partners to financially support** the program through long-term partnerships that are beneficial to both parties, and not simply a financial donation.
- Collaborate with local businesses, groups, and organizations with similar interests, or end goals that can **increase outreach through cross-promotion** of program materials etc.
- Identify **partnerships that further incentivize participation that also benefits the partner.**

The partner/funder retention cycle outlined in Figure 10.1 summarizes the process partners and funders must take to understand the value and impact their support is providing. Potential partners must first understand the **appeal** i.e. ask and unique value collaboration provides, which must be communicated to them regularly to **acknowledge** that their support is needed. Finally, **affirmation** needs to be provided to the partner to reinforce the benefit of their contribution, which is dependent on what is important to them (ex. increasing local employment, improved education of the community, environmental impacts etc.). Potential tactics for each step in the cycle are outlined in Table 10.1 and considerations for partnership and funding planning are summarized in Table 10.2.



**Figure 10.1:** Partner/funder retention cycle.

**Table 10.1:** Description of partner/funder retention cycle for partnership retention and value realization.

Retention Cycle Step	Tactics
<b>Appeal</b>	Value proposition may include local climate action, acting on individuals carbon footprint, innovation, technology adoption, doing the right thing, improved home comfort, improved business reputation or business marketing. Work with partner/funder to identify impactful metrics/goals that are meaningful to them.
<b>Acknowledge</b>	Email or phone check-ins, social media posting etc.
<b>Affirm</b>	Link partner to program goals and metrics, communicate impact of work through quantitative and qualitative options.

**Table 10.2:** Outline of suggested steps to developing a partnership and funding plan.

Step	Description
Identify type of partnership(s) desired	What goal is the partnership looking to fulfill? Long-term core funding? Outreach support? Engaging and working with local businesses?
Identify partner with similar interests	To help develop the value proposition for funders/partners need to understand your interests as well as the ideal funder/partner interests. These shared opportunities may relate to goals, skills gaps, overall visions, offering gaps, reducing duplicated efforts etc.
If applicable, plan out donor timing	Particularly relevant for core funding, understanding funding cycles and key dates may need to be identified.
Determine value proposition and ask for particular partner	Once potential partners selected, need to build relationships based on identifying how to work together and the value provided.

## Direction and Strategy

Getting slightly more granular, Table 10.3 provides suggestions for guiding strategy and priorities. It's the hope that this information can be used to guide fundraising and partnership development to reach program financing goals.

**Table 10.3:** Suggested strategic pillars, goals, and priorities to help frame financing strategy. AS a reminder, the primary goal being worked towards is *a municipal program that works to reduce residential GHGs significantly by 2050.*

Strategic Pillars		
1. Diverse Partnerships	2. Collaboration for Financial Efficiency	3. Demonstrate Program Value and Impacts
Strategic Goals		
The program utilizes in-kind support on an ongoing basis to help fill program and delivery gaps.	The program will plan to partner with one municipality by year 4 to streamline delivery.	Annual quantitative and qualitative metrics for each partner funder are generated.
Value added partnerships that primarily focus on home comfort and aesthetics will be established for launch and beyond.	Additional financing options are identified by year 2 that will support increased uptake.	
Priorities		
Identify how post-secondary institutions can work to fill knowledge gaps and provide capacity.	Identify other municipalities that would be interested in collaborating.	Set up partnerships to identify information and metrics partners are interested in.
Establish volunteer network to support program.	Research funding options and grants that go beyond environment and climate change. For example, housing equality, infrastructure, local employment etc.	Create template that can be sent to partners annually on the impact of their support.
Create list of local businesses, organizations, and groups that can support program cross-promotion.	Complete stakeholder outreach and research on larger-scale options for funding and homeowner financing, such as third-party funding, green bonds etc.	

The above strategies and priorities are expected to change over time. Table 10.4 below provides options for funding and partnership focus in the short (1-4 years), medium (5-7 years), and long-term (8+ years). Each timeline hits on three key funding priorities: core (staff) funding, improving marketing and outreach, and adding additional value for homeowners.

**Table 10.4:** Funding and partnership suggestions to increase program funding stream and value.

Timeline	Funding/ Partnership Objectives	Rationale	Examples
Short Term	Sponsorships	<ul style="list-style-type: none"> <li>• Work to reduce percent of municipality contribution.</li> <li>• Reiterates interest in program and end goals.</li> </ul>	<ul style="list-style-type: none"> <li>• Home renovation stores, insurance groups.</li> </ul>
	Program uptake through marketing and outreach support	<ul style="list-style-type: none"> <li>• Helps stretch marketing budget.</li> <li>• Outreach critical for program uptake.</li> </ul>	<ul style="list-style-type: none"> <li>• Local experts to serve advisory role.</li> <li>• Local non-profits and groups with similar interest to cross promote programs.</li> </ul>
	Burlington local business partnership	<ul style="list-style-type: none"> <li>• Provide value added to homeowner and business owner</li> </ul>	<ul style="list-style-type: none"> <li>• Hamilton Burlington SPCA partnership with Big Yellow Bag.</li> </ul>
Medium Term	Collaboration with second municipality	<ul style="list-style-type: none"> <li>• Work to reduce percent of municipality contribution.</li> <li>• Streamline process and reduce confusion. For example, different municipalities will have different program offerings and delivery options, which can be confusing to homeowners and contractors.</li> </ul>	<ul style="list-style-type: none"> <li>• Neighbouring municipalities, similar to Nova Scotia.</li> </ul>
	Investigate the use of bonds within Halton Region	<ul style="list-style-type: none"> <li>• Fiscally responsible manner to raise significant long-term funding.</li> </ul>	<ul style="list-style-type: none"> <li>• Green Bonds Toronto</li> </ul>
Long Term	Incorporation of private funding	<ul style="list-style-type: none"> <li>• Support program scaling.</li> <li>• Potential for additional business development expertise.</li> </ul>	<ul style="list-style-type: none"> <li>• US PACE programs</li> </ul>

### *Funding Sources – RDC Operations*

The following funding options speak to operational costing of the RDC:

- 1. Government** (all levels)
  - Municipal government core funding.
  - Grant support from Provincial and federal governments, though this is typically sporadic and one-off situations.
- 2. Program fees**
  - Programs may charge annual contractor fees to appear on a qualified contractor list. These may be charged annually or one-time when registering.
  - Vendor fees.



- Administration fees as either a percent of the total project cost or a standard fee that is usually between \$100-\$500.
  - 3. Grants**
    - May be through utilities or energy services, government, banks etc. to support various areas of the program.
  - 4. Sponsorships and partnerships**
    - Sponsorship funding may come from groups with an interest in the program, such as utilities, big box stores etc.
    - Partnerships may include co-promoting with other similar programs, municipal departments etc.
  - 5. Private donors/ philanthropy**
    - Though infrequent, private donorship is an option, but should not be built into expected income.
  - 6. Youth employment funding and experiential learning opportunities**
    - Employment opportunities through programs such as Canada Summer Jobs, ECO Canada etc. will subsidize between 50-100% of youth employment opportunities for eligible groups. Typically, between 4-6 months, these opportunities allow for additional capacity at a significantly reduced cost, while also helping to support upcoming talent.
    - Local Universities and Colleges may offer experiential learning opportunities at no cost to increase capacity or focus on specific expertise, such as technical skills support, marketing, communications, data analytics etc.
  - 7. In-kind and volunteer**
    - Local in-kind support for specific expertise, such as marketing and communications may be leveraged to support the program. This may also include support from the Municipality for marketing etc.
  - 8. Green bonds**
    - As outlined by the Ontario Financing Authority, green bonds are “debt securities where the issue proceeds are utilized to fund projects with specific environmental benefits”. These bonds can incentivize waste heat diversion technology by providing private sector financing. Since 2014, Ontario has released annual green bonds to help finance transit and other environmentally friendly projects across the province. In fact, Ontario is the largest issuer of Canadian dollar green bonds, totaling \$5.25 billion (OFA). In Ontario, the selection of eligible projects is done by Ontario Financing Authority staff and the Green Bond Advisory Panel. Of note, as Burlington is a lower tier municipality, meaning it cannot issue bonds; however, the region of Halton may do so, and may be an additional motivator to collaborate with Halton Region and other municipalities.
-

## 11.0 IMPLEMENTATION

### Launch Timeline

[Appendix I](#) outlines high-level tasks to be completed within the first two years of the program. Tasks are broken down by area, such as marketing and communications, operations, business development etc. as well as their frequency. It should be noted that the timeline does not consider time required to pass bylaws, apply for funding (if needed), and transfer funds.

It is anticipated that upon PDA selection and program manager hiring the program could be launched in 9-10 months. Table 11.1 outlines the steps required for launching.

**Table 11.1:** Key steps required prior to program launch.

Item	Details	Lead
<b>1. Legal and Financial Review</b>	Pre-work to be completed by City, primarily financing and legal departments, to develop proper forms and procedures for LIC use, confirm source of capital dollars for LIC loans; confirm funding for operational costs, application and review process.	City staff
<b>2. Draft Bylaw and Approval by Council</b>	Creating by-laws to issue LIC loans in accordance with O. Reg. 586/06.	City staff
<b>3. Launch Website</b>	City launches BHB website to engage community on the development and implementation of the program	City staff
<b>4. Funding</b>	Submit application to FCM to support overall program and delivery centre.	City staff
<b>5. PDA Selection and hiring</b>	City completed RFP process to hire PDA.	City staff
<b>6. Program Setup</b>	Prework required to launch.	Program Delivery Agent/Program Manager
<b>7. Program Launch</b>	Execute.	Program Delivery Agent/Program Manager
<b>8. Monitoring, Evaluation &amp; Reporting</b>	Track program metrics and annual report (# of participants, # loans issues, GHG emissions reduced)	Program Delivery Agent/Program Manager

## Program Scaling

The proposed **initial program is meant to be a lean offering of specific upgrade options to ease into program launch without overwhelming homeowners with choice**, allow RDC staff to focus on key items of implementation/launch, and overall streamline program implementation. The information below outlines options for future scaling of the program, with actual scaling to be dictated by program experiences and feedback. Table 11.2 outlines recommended annual home program targets.

- **Building Type**
  - Increasing participation from a variety of home ages. Many programs start with home ages of 1960-1990, and this can be extended over time.
  - Apartments and condominiums (multi-residential), though this is expected to be a very different program.
- **Eligible Upgrades**
  - Ceiling insulation.
  - Solar thermal.
  - Solar photovoltaics.
  - Domestic hot water.
- **Home Resilience Program**
  - Flood prevention home audits.
  - Flood proofing measures.
  - Other resilience initiatives as identified.
- **Financing options**
  - Working with local municipalities to share resources, including funding, to support a regional approach.
  - Assess opportunities for private investors/green bonds etc.
- **Partnerships and Collaborations**
  - Working with local businesses to offer incentives/price reductions for other key areas (landscaping, room painting etc.)
- **Incentives**
  - Increase options and flexibility of already available options, for example, LICs may be offered through the municipality.
- **Bundled Solutions**
- **Working towards a regional approach**
  - Aggregate multiple programs, with the goal of one large program regionally, and ideally provincially in the long term.
- **RDC Staff**
  - Any initial scaling of staff should focus on business development, marketing, and communications to increase uptake.

## Monitoring and Evaluation

Monitoring and evaluation (ME) allows for comprehensive assessment of program performance and impact and reporting to community stakeholders on **progress to achieving program goals and targets**. The following program ME framework is meant to balance time spent on data

gathering and analysis with useful information to drive effective program changes. The framework aims to be:

- **Flexible** - Able to be modified as program offerings alter.
- **Scalable** - Able to be scaled throughout program changes and uptake rates.
- **Simple** - Identify SMART goals that are incorporated into the program.

The framework will follow a continuous improvement loop (Figure 7.1, Table 7.5, Table 7.6). It is recommended that ME focus around two key areas: **process improvements** to keep a lean, streamlined program and **goal driven** to meet GHG reduction goals, which is intimately tied to participation rates.

It is recommended to follow the steps below when developing a ME system:

- Link ME objectives to program goals and targets.
- Identify reporting requirements: Who needs to be informed? What are they interested in? This may include City staff departments, Council, the public, environmental groups, sponsors etc.
- Identify timeframes for reporting: What needs to be reported when and to who? Quarterly?
- Identify performance indicators, how each metric is defined, how data will be gathered and by who.



**Figure 7.1:** Recommended program ME framework.

**Table 7.5:** Brief description of framework steps.

Step	Description
<b>Objectives/ Goals</b>	Identify program goals and the “why” behind the program.
<b>Input</b>	Identify what is needed and priorities for each area (sales, marketing, education etc.).
<b>Program Activities</b>	Implement program.
<b>Impacts</b>	Measure impacts through ME.
<b>Learning</b>	Critically assess what is working, what is not, and why.
<b>Review and Update</b>	Update objectives and reiterate.

**Table 7.6:** Sample template for implementation of the framework that can be to evaluate chosen goals. Such detail for each metric may not be needed long-term. *Italicized* wording indicates optional ME component to track.

Metric <sup>^</sup>	Definition (how is it calculated?)	Baseline	Target	Data Source (how to measure?)	Frequency (how often?)	Lead Staff	Who Requires Information?
<i>Homes upgraded</i>	<i>Number of Burlington homes that complete program in calendar year</i>	<i>20 homes (year of baseline)</i>	<i>40</i>	<i>Total installations</i>	<i>Annual</i>	<i>Customer Service</i>	<i>Program Manager, City Sustainability Staff, Council</i>

## Data Gathering

Useful ME requires quantitative and qualitative data gathering. Table 7.7 outlines data that can be gathered throughout the home upgrade process. Research completed by Dunsky Energy Consulting provides further details regarding ME of LIC home upgrade programs.

**Table 7.7:** Data gathering opportunities for ME.

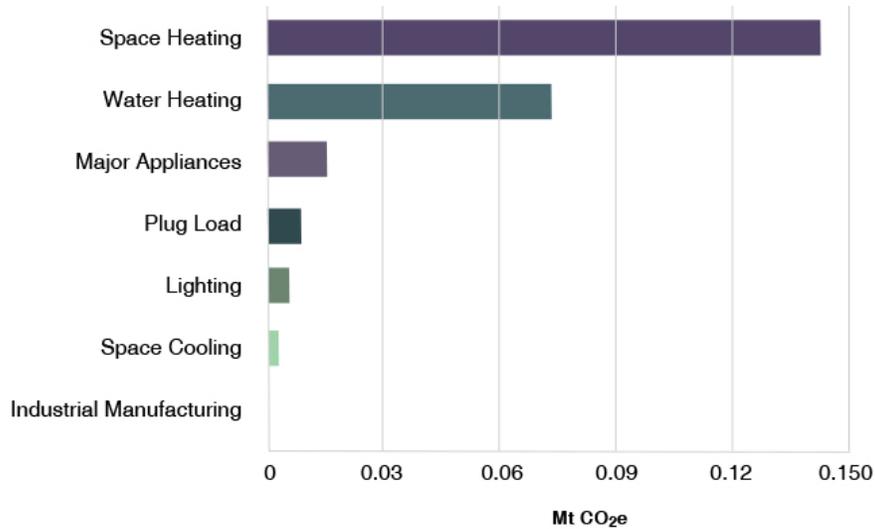
Step	Purpose	How is Data Gathered?
<b>Initial Application</b>	Collect demographic information, understanding interest in participation, marketing and communications.	Included in online application.
<b>Baseline</b>	Identify baseline GHGs, energy consumption, and utility costs.	Directly through customer and/or relevant utility.
<b>Post-Installation</b>	Number of completed projects and types of measures implemented; Loans issued by municipality; Identify changes in energy consumption, GHG changes, and utility costs	<i>RETScreen</i> or <i>NRCAN</i> post-audit



**BETTER HOMES  
BURLINGTON**

# Appendices

## APPENDIX A: BASELINE DATA



**Appendix A Figure 1:** Residential emissions by end use. Adapted from Hamilton and Burlington Low-Carbon Scenario and Technical Report 2016-2050.

## Findings Report

### **Stakeholder Findings Report: Home Energy Retrofit (HERO) Program**

Prepared by:  
The Centre for Climate Change Management at Mohawk College



Report Published and Submitted to Burlington City Council  
May 2021

## Executive Summary

The City of Burlington's Climate Action Plan (CAP) identifies reducing greenhouse gas (GHG) emissions from residential buildings as a key opportunity for Burlington to achieve its goal of becoming net zero by 2050. In recognition of this opportunity, in September 2020 Council approved undertaking a feasibility study to explore the development and delivery of a home energy retrofit (HERO) program. This study is being undertaken by the Centre for Climate Change Management at Mohawk College (CCCM), in partnership with City staff. Recommendations on program design and delivery, including a pilot program, are anticipated to be presented to Council prior to year end 2021.

To date, the CCCM's research progress has focused heavily on stakeholder engagement to understand:

1. **Barriers and drivers** – learning from best practices in HERO program delivery and challenges identified by experts in the field
2. **Market development** – supporting contractors to grow their businesses to meet the demand for retrofits
3. **Program administration** – designing a sustainable, feasible program that best meets homeowners' needs while reducing the administrative burden on the City, contractors and homeowners.

Stakeholder outreach to over 40 groups, businesses, program delivery centres, utilities, other municipalities and experts identified two main audiences that must be considered for a successful retrofit program, **homeowners and contractors**. To engage in the program, homeowners must understand the value of the retrofit and have a convenient experience using the program. Contractors must be engaged in selling retrofit products to their clients and also experience little friction in buying equipment, installation, and administration. If both groups experience friction in the program – such as delays, equipment backlogs, or outsized administrative burdens – this will likely result in poor program uptake.

Additionally, a wide range of key considerations for program design were recognised to optimize success. This report discusses 5 key findings that will inform the program design recommendations, including that of a pilot project.

In general, stakeholders identified that the technology or retrofit options on offer are only one component of a successfully implemented program. A program which does not consider the implementation process, co-benefits, and stakeholders beyond the homeowner will see limited uptake. Other success factors include:

- Effectively communicating program benefits beyond financial and GHG savings, such as improved home comfort and aesthetics
- Providing clear, simple information to homeowners on program offerings, price points, and payment methods

- Setting up a Retrofit Delivery Centre that acts as a “one-stop shop” for homeowner and contractor questions, helps both groups navigate the administration of the program, and provides general education to reduce confusion and improve convenience
- Initiating local small-scale pilots on a select group of homes; this tangibly demonstrates the impact of retrofits on homes
- Promoting relationships with contractors as the on-the-ground advocates for home retrofits
- Enabling quality assurance mechanisms that build trust between homeowners and contractors (e.g. recommended certifications)
- Harmonizing HERO programs with adjacent cities (e.g. Hamilton and Oakville) to minimize confusion for homeowners, maximize business opportunities for contractors, and drive the scaling of a regional market
- Using effective marketing programs to drive awareness amongst homeowners and local contractors
- Ensuring the best positive experience for homeowners.

Moving forward, a Burlington homeowner survey will be delivered to gather information regarding homeowner priorities. This will help the CCCM and City verify the relevance of program offerings and understand how best to market the program. Furthermore, the CCCM is working alongside the Bay Area Climate Change Council (BACCC) to work on a long-term plan for regional offering with complementary programs.

## Introduction

In recent years, municipal home energy retrofit (HERO) programs have been recognized as a key opportunity for cities and towns to fight climate change. Approximately 11 Ontario municipalities have either identified the need for a HERO program to meet municipal climate goals, completed a business case, or plan on completing one. The City of Toronto’s Home Energy Loan Program (HELP) is Ontario’s only home retrofit program with the primary goal of reduced GHGs.

Within Burlington, 98% of pre-2017 homes need to be retrofitted for Burlington to meet its net zero-carbon by 2050 goal. If successful, Burlington will reduce its greenhouse gases by as much as 1,413ktCO<sub>e</sub>, or 7.8% of its total emissions. In recognition of this significant opportunity for emissions mitigation, in September 2020, the City of Burlington Council approved the development of a feasibility study for of a HERO program, with the direction to also recommend the development of a pilot program. Financial support from the City has recently been complemented by additional funding from the Federation of Canadian Municipalities (FCM).

HERO programs are typically built on the premise of “the home as a system”, as renovating one area of the home (ex. improving insulation) can alter the energy requirements of other areas of the house (ex. furnace size, the need for increased air exchange from the outside environment, etc.). To incentivize these renovations, financing is offered through local improvement charges (LICs). LICs allow homeowners to access low-interest loans, typically offered through municipalities. Loan payments are tied to the property, not the homeowner and are repaid

alongside property tax payments; if homeowners sell their home, the loan stays with the home. The rationale is that the benefits of the renovation rest with the current owner and are financed by energy savings from the retrofit.

This report focuses on stakeholder outreach completed by the CCCM, in partnership with the BACCC, to help understand the concerns, priorities, and lessons learned from other home-upgrade retrofit programs. This holistic approach investigates how the construction and retrofit sector works as a system, how key players act within the sector, and it helps to identify barriers and constraints while focusing on the opportunities to optimize the process to increase participation and satisfaction.

## Methodology

To understand Burlington and the surrounding area's retrofit supply chain and ecosystem, the CCCM completed 40+ stakeholder outreach interviews. Prior to this, an initial literature review of available national programs, progress reports, and primary literature was completed. This was followed by stakeholder outreach, with the goals of:

- Understanding current supply chain process of available programs and retrofit work
- Identifying the motivators and barriers on solutions relating to the development of an effective, streamlined residential home retrofit program that would significantly reduce greenhouse gas emissions from the greatest number of homes in Burlington.

To date, approximately 40 stakeholders falling within the following categories have provided feedback:

- Architects
- Bylaw and Permitting offices
- Colleges and trainers
- Contractors
- Developer/Renovator
- Development Consultants
- Educational institutions
- Energy advisors
- Energy auditors
- Environmental organizations and non-profits
- Equipment specialists
- Manufacturers
- Municipal retrofit program staff
- Incentive providers
- Landlords
- Lawyers
- Local associations
- Low income homeowners
- Poverty advocacy groups
- Realtors
- Researchers
- Retailers
- Utilities
- Suppliers and wholesalers

Stakeholder engagement will be continuous throughout the project, including a homeowner survey for Burlington citizens; this survey will aim to gather information on:

- Homeowner interest in retrofits and associated motivators as well as perceived benefits of retrofits
- The priorities of homeowners related to their dwelling
- Knowledge on home retrofit options currently available
- Financial preferences for funding home retrofits
- General support and interest in climate action and the role of municipalities and individuals to contribute to GHG mitigation.

Survey delivery to Burlington citizens is anticipated for late spring/early summer 2021.

Additionally, the project team has been meeting with and reporting process back to City Staff and a key group of expert stakeholders:

- Monthly meetings with the City of Burlington Advisory Committee beginning December 2020. The advisory committee is a cross-section of City staff who advise on the project.
- Bi-monthly updates and discussions with the Burlington Climate Action Plan community Stakeholder Advisory Committee on the project.
- Monthly updates and discussions with the BACCC Implementation Team on Building Retrofits. This committee is a collection of local leading experts in home energy efficiency.

Taken together, stakeholder outreach and survey results will inform program design and implementation to ensure the design of a scalable program that drives homeowner uptake and benefits, and incentivizes a market shift to meet demand.

## Stakeholder Findings

Stakeholder discussions led to feedback on a wide variety of retrofit and supply chain topics. The following table summarizes five key findings from the research.

**Table 1:** Summary of Findings from Stakeholder Engagement

<p><b>Finding #1: A local municipal HERO program is feasible and desirable.</b></p> <p>Research showed that potential positive impacts of home retrofits for GHG reduction are of interest to the majority of stakeholders.</p> <p>However, the current complexity of the retrofit market has made uptake and participation difficult. Solving for this complexity – by creating a scalable, customer-focused HERO program – will help residents invest in their homes’ value, protect against future impacts of climate change and help Burlington become a net zero community by 2050.</p>	
✓	<p><b>Technology for retrofitting residential homes to significantly reduce greenhouse gases is available and affordable.</b></p>
✓	<p><b>There are significant co-benefits for both homeowners and local businesses.</b></p> <p>Homeowners can realize greater home comfort, the potential for reduced energy bills, and increased home value.</p> <p>The demand for retrofit services drive more jobs and increased revenue for local home renovation businesses.</p>
✓	<p><b>A municipal program will drive participation.</b></p> <p>A municipal program can drive consistency, trust, and complement programs offered by local utility companies, as well as the federal and provincial governments. As the market grows, non-profits and private actors will also likely enter with their own offerings.</p> <p>For example, the federal government has announced that they will be providing a Greener Homes retrofit incentive program, providing grants and loans to homeowners across Canada. Unfortunately, these programs will only reach about 700,000 households across Canada (in the case of currently available grants, only 200,000). A local program and delivery centre can help Burlington</p>



	residents navigate these programs and incentives, while also providing additional options for those who are unable to participate because of the program limitations.
	<b>Inconsistent program offerings (i.e. programs only offered for 1-3 years) reduces interest and dissuades contractors from participating.</b>
	Until now, a lack of consistent government financial incentives has reduced supply chain actors' interest in retrofit technology and delivery.  A consistent municipal program would help create and then support the development of a stable market for retrofits and help homeowners and contractors plan for the long run.
<b>Finding #2: A municipal program should support a “phased” approach to retrofits.</b>	
While desirable, a “whole home” solution – extensive retrofits that help homeowners achieve near net zero greenhouse gas emissions – are unfortunately cost and time-prohibitive for most residents. This solution would require a near-total renovation of the home, which would require a sizeable (often \$50,000 or more) loan and be disruptive to homeowners, taking months to complete.	
Instead, the CCCM will recommend a program that can provide a simple, foundational offering that will significantly improve energy efficiency and reduce greenhouse gas emissions. The homeowner can then add additional retrofit services over time to further reduce their impact and prepare their home for the challenges of climate change.	
	<b>Current whole house retrofit programs typically see lower than expected participation due to the cost and time-consuming nature of extensive home renovations.</b>
	<b>Homeowners have difficulty accessing necessary financing to complete a “whole home retrofit.”</b>
	Programs that provide \$5,000-\$12,000 loans to upgrade are able to be accessed by a greater number of people of varying income levels and/or equity in their home.
	<b>With guidance, stacking eligible retrofit measures will maximize energy efficiency and reduce GHGs.</b>
	Creating a simple, affordable program will enable homeowners to realize immediate energy efficiency savings and co-benefits. And then, over time, homeowners can continue to “stack” home energy projects to multiple the impact.



	<p>The City can also include more programs, include offerings that help support climate adaptation or neighbourhood beautification over time.</p>
✓	<p><b>The “phased approach” also allows the City to offer additional programs to promote equity for low-income homeowners and tenants.</b></p> <p>Separate or complementary programs that work directly to support low income homeowners will be needed in the future to support total equity and access to retrofits.</p>
<p><b>Finding #3: Education and outreach to homeowners <i>and</i> contractors is needed.</b></p> <p>Outreach identified two stakeholder groups critical to program success, homeowners and contractors. Considerations to be addressed for both groups include education on program availability and inclusions, communication of retrofit benefits, and a simplified process. By addressing these program components, a more appealing program for these key stakeholders will work to improve participation and a positive experience.</p>	
✓	<p><b>Homeowners need to clearly understand the financial return on investment (ROI) and energy savings to help reinforce their decision to retrofit.</b></p> <p>Marketing efforts should focus on clear, simple communications on benefits to homeowners.</p>
✗	<p><b>The decentralized nature of the construction industry and inconsistency of programs</b> makes it difficult for homeowners to understand and navigate incentive programs.</p>



 	<p><b>A lack of supporting regulations in the home renovation sector creates challenges for guaranteeing quality of work and the advertisement of low carbon technologies.</b></p> <p>A local HERO program, administered with quality assurance checks in place, can help drive the market for green renovations.</p>
 	<p><b>There is a limited number of trained individuals to complete retrofits using low carbon technologies (e.g. air source heat pumps, air sealing).</b></p> <p>The City can work with local business associations and training partners to ensure that trained and certified contractors can participate in the program.</p>
	<p><b>Informed contractors can provide a wealth of knowledge regarding homeowner feedback and interest in programs, as well as advocate and educate homeowners on the programs.</b></p> <p>Marketing efforts targeted at contractors may have a greater impact than direct marketing to consumers.</p>
	<p><b>The market will need to scale to meet demand.</b></p> <p>Before starting this program, the City should work to give suppliers and manufacturers 6 months lead time to stock equipment and work to educate their customers (e.g. contractors).</p>
<p><b>Finding #4: A HERO program can help homeowners “future proof” their homes.</b></p> <p>A HERO program can help homeowners realize value over time.</p>	
	<p><b>The current low cost of natural gas reduces financial incentives for homeowners.</b></p>

✓	However, with the increasing carbon tax, there is an opportunity to help homeowners “future proof their homes” by reducing energy needs now to significantly save money over time.
✓	<p><b>Homeowners using fuel oil (which is more common in rural areas) are already paying higher prices to heat their homes.</b> This premium will only increase with the carbon tax increase.</p> <p>A retrofit can help these homeowners reduce costs now, and in the future.</p>
✓	<p><b>Retrofits that use heat pumps can be used for heating <i>and</i> cooling.</b></p> <p>This will help homeowners be able to install air conditioning – which is becoming more important as the region sees high summer temperatures due to climate change.</p>
<p><b>Finding #5: A “retrofit delivery centre” will drive participation and positive outcomes for homeowners and contractors.</b></p> <p>A local retrofit delivery centre can be one of the most effective tools to drive uptake in deep energy retrofits. A retrofit delivery centre acts can act as a “one stop shop” for information about retrofits. Expert “energy coaches” at the centre can work with local homeowners and contractors to navigate incentives, streamline the application process, and provide trustworthy, clear advice.</p>	
✓	<p><b>A retrofit delivery centre can improve convenience for homeowners and contractors.</b></p> <p>The centre can streamline information and application processes.</p> <p>Developing homeowner trust is critical to a positive experience and encouraging program participation through word of mouth marketing.</p>
✓	<p><b>Acting as the delivery arm for the municipality, it can also reduce the burden on City staff.</b></p> <p>“Energy coaches” help homeowners and contractors navigate the application and verification processes. It can also liaise with the City to streamline the application process.</p>
✓	<p><b>A retrofit delivery centre can help homeowners and contractors navigate multiple but complementary programs.</b></p> <p>The centre will support homeowners looking to access programs offered through the municipality, federal and provincial governments, and local utilities to maximize incentives and greenhouse gas emission reductions.</p>



 	<p><b>Diversity of housing stock means scaling programs can be difficult.</b></p> <p>Homeowners will have individualized needs and need a trusted, helpful expert to speak to about what retrofit best fits their needs.</p>
 	<p><b>Accurate methods to measure GHGs pre- and post- retrofit are difficult to implement.</b></p> <p>Measuring impact is difficult. A delivery centre can help with centralizing and assessing program evaluation.</p>
	<p><b>A local retrofit delivery centre can be regional – shared amongst several municipalities to reduce costs for operating the centre.</b></p> <p>This can also be helpful for contractors who work across the region to be able to speak to one point of contact about incentives.</p>

Overall, the research emphasized that the success of a program is not entirely dependent on the technology and financial support offered to homeowners. Instead, additional considerations including involvement and convenience for contractors, homeowners, and allowing a smooth transition for the supply chain are critical. Additionally, ensuring adequate resources for marketing and communications of the program itself is a key lesson learned from other programs.

## Pilot Program

Stakeholders identified that ideally, programs would build towards a whole-home retrofit solution with the primary goal of nearly eliminating GHG emissions. Conversely, this option was noted as currently not realistic for homeowners due to steep upfront financing, lack of clear financial return on investment, and perceived inconvenience during retrofit completion.

Instead, this study found overwhelming evidence to support offering a simple, foundational program that would provide small scale (\$5,000- \$12,000) loans to local homeowners to undertake specific kinds of renovations. This program could also complement already existing programs (offered through governments and local utilities) and scale over time. This approach would prioritize smaller retrofit projects that reduce GHGs while also being less burdensome on upfront financing and reducing stress on the supply chain.

The CCCM is currently investigating the development of a pilot program that would target homes using heating oil, propane, or electricity for heating and cooling. These energy sources are either high GHG emitting sources of energy, or are costlier than the typical electricity/natural gas home heating combination, or both. This approach would focus on piloting a program with homeowners who would realize a significant ROI while also targeting those most at risk of energy poverty (which is defined as a minimum 10% of take-home income dedicated to utilities).

This program would inform future programs, testing solutions to ensure broader applicability for Burlington residents. The CCCM will provide more details on this proposed pilot project in its report to Council prior to year end 2021.

## Next Steps

Stakeholder outreach will continue to inform all aspects of the work going forward.

Immediate next steps planned for summer 2021 include:

- The completion of a Burlington homeowner survey will be delivered to understand customer priorities and interest, pending final approval and signing of the FCM funding agreement
- Further stakeholder outreach to key groups in the home financing sector to help build out recommended program offerings, including additional work with the BACCC
- Research, design and discussion with City staff on the best possible financing options for the HERO program, to ensure sustainability and scalability

- Continued discussions with local advocacy groups, such as BACCC, to provide ongoing feedback
- Discussions with the City of Hamilton on regional, resource-sharing approaches to harmonize programs across the region
- Recommendations on a marketing plan to drive uptake and participation from homeowners and contractors.

By fall 2021, the CCCM will be prepared to report back to Council on the pilot project and next steps to develop and offer the HERO program.

## Lightspark Opportunity Map Report

Confidential and Proprietary  
For City of Burlington Distribution Only

(C) Lightspark Software Inc 2021

### **Analysis and Mapping of Housing and Energy Data to Inform Policy Development**

For: Emily Vis & Adrienne Madden, Mohawk College  
By: James Riley & Tim Cashion, Lightspark Software Inc.  
Date: 2021-12-02





## TOC

Scope of Work

Methodology

Breakdown by FSA

Data Sources

Archetype Definitions

Executive Summary

Lightspark Burlington Map

## Scope of Work

- 1** Executive summary Summary of analysis and recommendations
- 2** City-Wide analysis and Visualization Use data models to produce key city-wide statistics, representing our Single Family Housing stock
- 3** Archetype development Represent the Burlington's existing home stock with representative home types
- 4** GHG Analysis The Burlington can influence GHG emissions, so annual GHG emissions are a key factor for analysis. To answer: how much and how quickly do we need to move to achieve our targets?



## Data Sources

- 1** Energuide Audit Data : Subset of building characteristics, heating systems, energy use in the Burlington
- 2** Utility Consumption Data: Household and postal code level Electricity and Gas consumption numbers, respectively. Enbridge provided data.
- 3** Canadian Census: FSA level income, occupancy, ownership
- 4** Building Footprints : All building shapes in the Burlington
- 5** Building Energy Modelling: Iterative modeling of varying conditions and characteristics
- 6** Property Tax report : All building tax reports in the Burlington - **Age, address, floor area, parcel identifier.**

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## Definitions

Archetype A data methodology used to define a grouping of housing types using data science techniques

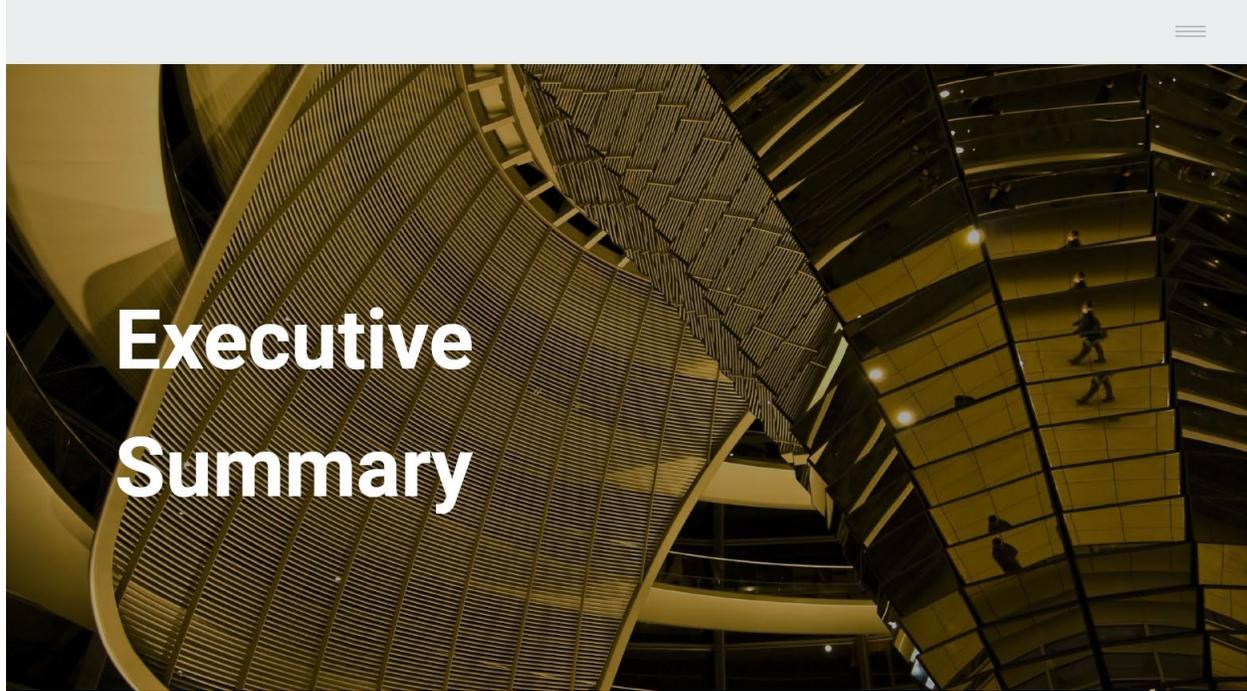
FSA The first three letters of a postal code, called a “Forward Sortation Area”

Average Annual Energy Costs Average electricity and natural gas usage

tCO<sub>2</sub>e Tonnes of carbon dioxide equivalent, which is a measure that allows you to compare the emissions of other greenhouse gases relative to one unit of CO<sub>2</sub>

GJ Gigajoule a unit of energy for both natural gas and electricity

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## Carbon Reduction Opportunity

Potential tCO<sub>2</sub>e Reduced

**1.6%**

With the following Archetypes recommendations made, the city's carbon footprint would be reduced by 3,017 tCO<sub>2</sub>e (of a total of 188,093 tCO<sub>2</sub>e across the City)

Potential GJ Reduced

**1.2%**

The data shows that *quick win* carbon reduction wins could be found by the following upgrades to **5% of households**

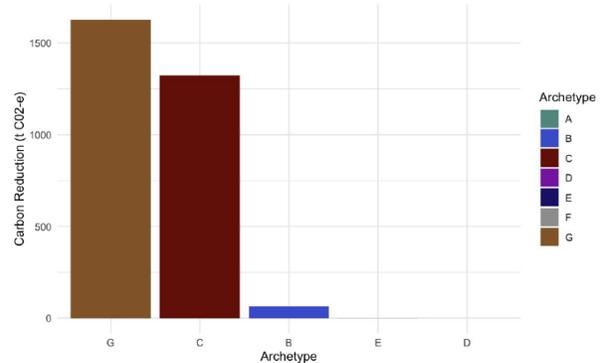
Archetype	Upgrade from Fossil Fuels	Archetype	Upgrade
B	converting to Air Source Heat Pumps	C	upgrading wall insulation and reducing air leakage
D	converting to Air Source Heat Pumps		
E	converting to Air Source Heat Pumps		
G	converting to Hybrid heating systems		

The selected archetypes are found throughout most FSA's and account for 90% of the housing stock and 87% of the tCO<sub>2</sub>e emitted by Single-Family homes.

## Key Insights: Carbon Reduction

There is a strong opportunity to reduce carbon usage in these key archetypes (G, C, and B), across most FSAs by upgrading wall insulation and reducing air leakage (C) converting to Hybrid heating systems (G) and converting to Air Source Heat Pumps (B, E, and D). **These archetypes account for the majority of carbon emissions.**

- Current carbon emission (tonnes)
  - C - 107,545 tCO<sub>2</sub>e
  - G - 54,149 tCO<sub>2</sub>e
  - B - 1,404 tCO<sub>2</sub>e
- **Total emission - 163,098 tCO<sub>2</sub>e**
- Potential carbon reductions achieved by upgrading archetypes:
  - G - 1,629 tCO<sub>2</sub>e
  - C - 1,324 tCO<sub>2</sub>e
  - B - 63 tCO<sub>2</sub>e
- **Total reduction - 3,017 tCO<sub>2</sub>e**



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## Breakdown of Archetypes - Comparison

Archetype	Year of Construction	Floor Area (m <sup>2</sup> )	Primary Heat Source	Primary Fuel Type	Hot Water System	Hot Water System Fuel Type	Energy Intensity (GJ/m <sup>2</sup> )	Carbon Intensity (GJ/m <sup>2</sup> )
A	1942	351.4	Condensing Furnace	Natural Gas	Conventional Tank	Natural Gas	0.79	0.04
B	1954	258.2	Furnace With Flame Retention Head	Oil	Conventional Tank	Electricity	0.8	0.04
C	1969	198.2	Condensing Furnace	Natural Gas	Conventional Tank (Pilot)	Natural Gas	0.68	0.03
D	1960	205.3	Advanced Airtight Wood Stove	Wood	Conventional Tank	Natural Gas	0.49	0.01
E	1968	331.9	Baseboard/Hydronic/Plenum(Duct) Htrs.	Electricity	Conventional Tank	Electricity	0.35	0.0
F	1972	235.9	Induced Draft Fan Furnace	Natural Gas	Conventional Tank (Pilot)	Natural Gas	0.75	0.03
G	1987	334.1	Condensing Furnace	Natural Gas	Conventional Tank (Pilot)	Natural Gas	0.48	0.02

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## Energy Burden Across Archetypes

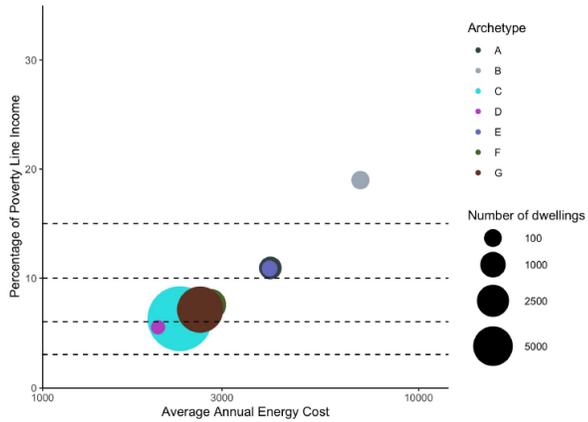
Energy Burden is the percentage of income spent on heating/cooling and electricity

Archetypes B, A, and E have the highest burden.

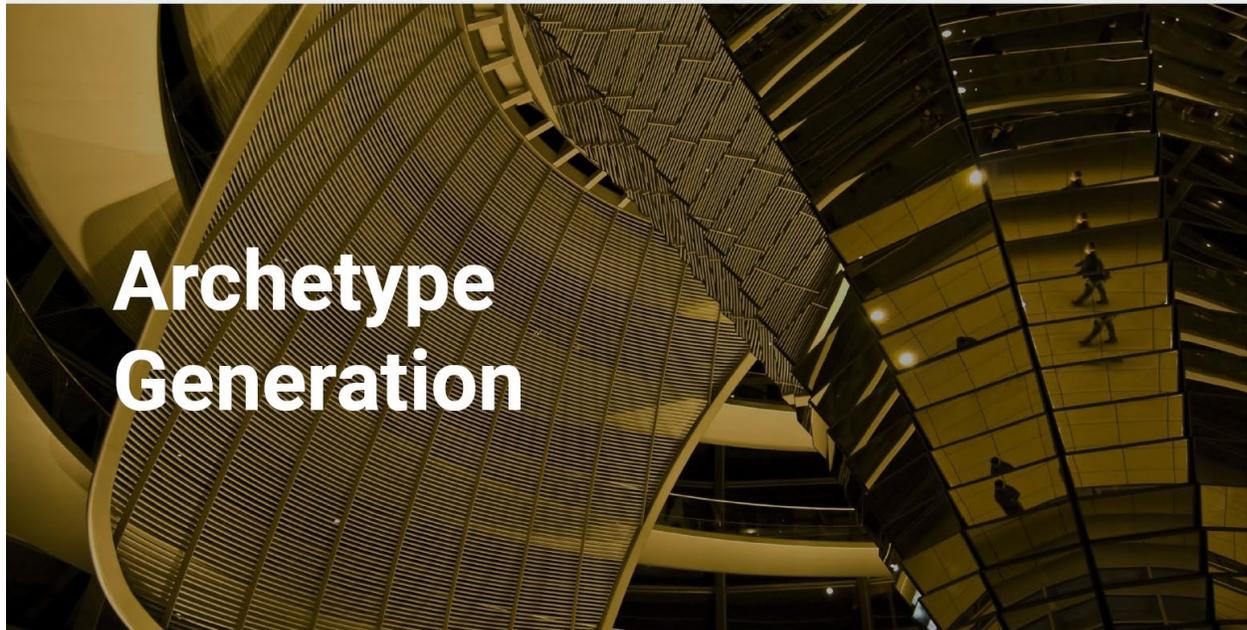
Using a benchmark annual household income of \$38,910, such a household living in a home in Archetype B would be paying 18.0% of their income on heating/cooling and electricity

Archetypes A and E spend 10.4 and 10.3%, respectively, on heating/cooling and electricity.

Moreover B, C, D and E account for 2.2% (695) of the dwellings



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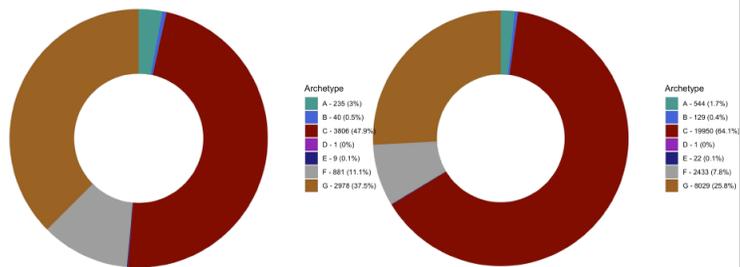
**Archetype  
Generation**

## Key Assumptions Behind Archetype Analysis

- **Emissions factor:** 12.8 gCO<sub>2</sub>e/kWh
- **Electricity cost:** \$0.11601 + Additional Charges
- **Oil cost:** \$1.283/L
- **Propane cost:** \$0.8596/L
- **Natural gas cost\*:** \$4.24/GJ + Additional Charges
- **Standard Heat Pump COP<sub>h</sub>** = 2.55
- **Recommended windows U-value** = 0.32 BTU/ft<sup>2</sup>.F.h
- **Recommended wall insulation R-value** = 15.8 ft<sup>2</sup>.F.h/BTU
- **Poverty line for Burlington household of 4:** \$38,910
- Archetype parameters represent average for homes with and without retrofits
- For the home having multiple audits, the latest audit was selected for the analysis

## Breakdown of Archetypes

- Archetypes C, G, and F account for 97.7% of the housing stock and 96.4% of the EnerGuide audits of Single-Family homes.
- A higher number of homes (dwellings) with audits increases data accuracy.



Audit Breakdown

Dwelling Breakdown

Total dwellings = 31,108



## Archetype A 01



These homes have a relatively large floor area, and are natural gas heated with high efficiency furnaces and use natural gas hot water systems

Average annual electricity costs: \$1,315  
 Average annual natural gas costs: \$2,631  
 Average annual propane costs: \$73

**Average annual energy costs: \$4,034**

### Client Implications:

These homes consume 278.7 GJ (1.63 GJ/m<sup>2</sup>) of energy on average and produce 12.51 tCO<sub>2</sub>e (0.073 tCO<sub>2</sub>e/m<sup>2</sup>) on average. They represent 1.7% of the housing stock and 3.0% of the dwellings that have been audited in the City of Burlington.

Variable	A	ESNH Standard*
Year of Construction	1942	-
Floor Area (m <sup>2</sup> )	351.4	-
Primary Heat Source	Condensing Furnace	-
Primary Fuel Type	Natural Gas	-
Primary Heat Source Efficiency (%)	90.7	96
Heat Pump	No	No
Hot Water System	Conventional Tank	Tankless condensing
Hot Water System Fuel Type	Natural Gas	Natural Gas
Hot Water System Energy Factor	0.6	0.95
Ventilation Type	No	HRV 75% SRE
Ceiling Insulation (RSI)	3.46	10.56
Wall Insulation (RSI)	1.43	3.7
Foundation Insulation (RSI)	0.8	3.52
Number of Windows	24	-
Number of Doors	3	-
Electricity Consumption (GJ)	36.4 GJ (10,113.7 kWh)	-
Natural Gas Consumption (GJ)	239.4 GJ (6,417.1 m <sup>3</sup> )	-
Energy Score (GJ)	278.75	-
Carbon Score (tCO <sub>2</sub> e)	12.51	-
Air Tightness (ACH50P)	7.81	2.5+

\* Minimum standard based on Energy Star  
 † Maximum standard value based on Energy Star



## Archetype B 02



These homes have a relatively large floor area, and are oil heated with low/mid efficiency furnaces and use electricity hot water systems

Average annual electricity costs: \$1,907  
 Average annual oil costs: \$5,041

**Average annual energy costs: \$7,000**

### Client Implications:

These homes consume 206.3 GJ (1.66 GJ/m<sup>2</sup>) of energy on average and produce 10.89 tCO<sub>2</sub>e (0.088 tCO<sub>2</sub>e/m<sup>2</sup>) on average. They represent 0.4% of the housing stock and 0.5% of the dwellings that have been audited in the City of Burlington.

Variable	B	ESNH Standard*
Year of Construction	1954	-
Floor Area (m <sup>2</sup> )	258.2	-
Primary Heat Source	Furnace With Flame Retention Head	-
Primary Fuel Type	Oil	-
Primary Heat Source Efficiency (%)	77.0	96
Heat Pump	No	No
Hot Water System	Conventional Tank	Tankless condensing
Hot Water System Fuel Type	Electricity	Natural Gas
Hot Water System Energy Factor	0.71	0.95
Ventilation Type	No	HRV 75% SRE
Ceiling Insulation (RSI)	4.07	10.56
Wall Insulation (RSI)	1.69	3.7
Foundation Insulation (RSI)	0.75	3.52
Number of Windows	16	-
Number of Doors	2	-
Electricity Consumption (GJ)	52.8 GJ (14,671.7 kWh)	-
Natural Gas Consumption (GJ)	3.8 GJ (100.8 m <sup>3</sup> )	-
Energy Score (GJ)	206.27	-
Carbon Score (tCO <sub>2</sub> e)	10.89	-
Air Tightness (ACH50P)	7.32	2.5+

\* Minimum standard based on Energy Star  
 † Maximum standard value based on Energy Star





## Archetype C 03



These homes have an average floor area, and are natural gas heated with high efficiency furnaces and use natural gas hot water systems

Average annual electricity costs: \$1,199  
Average annual natural gas costs: \$1,099

**Average annual energy costs: \$2,317**

### Client Implications:

These homes consume 134.0 GJ (0.96 GJ/m<sup>2</sup>) of energy on average and produce 5.39 tCO<sub>2</sub>e (0.039 tCO<sub>2</sub>e/m<sup>2</sup>) on average. They represent 64.1% of the housing stock and 47.9% of the dwellings that have been audited in the City of Burlington.

Variable	C	ESNH Standard*
Year of Construction	1969	-
Floor Area (m <sup>2</sup> )	198.2	-
Primary Heat Source	Condensing Furnace	-
Primary Fuel Type	Natural Gas	-
Primary Heat Source Efficiency (%)	96.1	96
Heat Pump	No	No
Hot Water System	Conventional Tank (Pilot)	Tankless condensing
Hot Water System Fuel Type	Natural Gas	Natural Gas
Hot Water System Energy Factor	0.6	0.95
Ventilation Type	No	HRV 75% SRE
Ceiling Insulation (RSI)	4.57	10.56
Wall Insulation (RSI)	1.97	3.7
Foundation Insulation (RSI)	1.22	3.52
Number of Windows	14	-
Number of Doors	2	-
Electricity Consumption (GJ)	33.2 GJ (9,226.1 kWh)	-
Natural Gas Consumption (GJ)	100.0 GJ (2,680.3 m <sup>3</sup> )	-
Energy Score (GJ)	134.01	-
Carbon Score (tCO <sub>2</sub> e)	5.39	-
Air Tightness (ACH50P)	6.17	2.5+

\* Minimum standard based on Energy Star  
+ Maximum standard value based on Energy Star



## Archetype D 04



These homes have an above average floor area, and are wood heated with and use natural gas hot water systems

Average annual electricity costs: \$1,167  
Average annual natural gas costs: \$310  
Average annual wood costs: \$550

**Average annual energy costs: \$2,027**

### Client Implications:

These homes consume 100.1 GJ (0.97 GJ/m<sup>2</sup>) of energy on average and produce 2.7 tCO<sub>2</sub>e (0.026 tCO<sub>2</sub>e/m<sup>2</sup>) on average. They represent 0.0% of the housing stock and 0.0% of the dwellings that have been audited in the City of Burlington.

Variable	D	ESNH Standard*
Year of Construction	1960	-
Floor Area (m <sup>2</sup> )	205.3	-
Primary Heat Source	Advanced Airtight Wood Stove	-
Primary Fuel Type	Wood	-
Primary Heat Source Efficiency (%)	70.0	96
Heat Pump	No	No
Hot Water System	Conventional Tank	Tankless condensing
Hot Water System Fuel Type	Natural Gas	Natural Gas
Hot Water System Energy Factor	0.55	0.95
Ventilation Type	No	HRV 75% SRE
Ceiling Insulation (RSI)	6.29	10.56
Wall Insulation (RSI)	4.16	3.7
Foundation Insulation (RSI)	3.87	3.52
Number of Windows	14	-
Number of Doors	2	-
Electricity Consumption (GJ)	32.3 GJ (8,974.5 kWh)	-
Natural Gas Consumption (GJ)	28.2 GJ (755.9 m <sup>3</sup> )	-
Energy Score (GJ)	100.1	-
Carbon Score (tCO <sub>2</sub> e)	2.7	-
Air Tightness (ACH50P)	5.52	2.5+

\* Minimum standard based on Energy Star  
+ Maximum standard value based on Energy Star



## Archetype E 05



These homes have a relatively large floor area, and are electricity heated baseboard/hydronic/plenum(duct) htrs. and use electricity hot water systems

Average annual electricity costs: \$3,876  
Average annual natural gas costs: \$68  
Average annual propane costs: \$69

**Average annual energy costs: \$4,013**

### Client Implications:

These homes consume 115.6 GJ (0.76 GJ/m<sup>2</sup>) of energy on average and produce 1.63 tCO<sub>2</sub>e (0.011 tCO<sub>2</sub>e/m<sup>2</sup>) on average. They represent 0.1% of the housing stock and 0.1% of the dwellings that have been audited in the City of Burlington.

Variable	E	ESNH Standard*
Year of Construction	1968	-
Floor Area (m2)	331.9	-
Primary Heat Source	Baseboard/Hydronic/Plenum(Duct) Htrs.	-
Primary Fuel Type	Electricity	-
Primary Heat Source Efficiency (%)	100.0	96
Heat Pump	No	No
Hot Water System	Conventional Tank	Tankless condensing
Hot Water System Fuel Type	Electricity	Natural Gas
Hot Water System Energy Factor	0.74	0.95
Ventilation Type	No	HRV 75% SRE
Ceiling Insulation (RSI)	5.17	10.56
Wall Insulation (RSI)	2.33	3.7
Foundation Insulation (RSI)	1.91	3.52
Number of Windows	19	-
Number of Doors	3	-
Electricity Consumption (GJ)	107.3 GJ (29,819.0 kWh)	-
Natural Gas Consumption (GJ)	6.1 GJ (164.8 m <sup>3</sup> )	-
Energy Score (GJ)	115.64	-
Carbon Score (tCO <sub>2</sub> e)	1.63	-
Air Tightness (ACH50P)	5.97	2.5+

\* Minimum standard based on Energy Star  
+ Maximum standard value based on Energy Star



## Archetype F 06



These homes have an above average floor area, and are natural gas heated with low/mid efficiency furnaces and use natural gas hot water systems

Average annual electricity costs: \$1,224  
Average annual natural gas costs: \$1,558

**Average annual energy costs: \$2,790**

### Client Implications:

These homes consume 176.2 GJ (1.31 GJ/m<sup>2</sup>) of energy on average and produce 7.46 tCO<sub>2</sub>e (0.055 tCO<sub>2</sub>e/m<sup>2</sup>) on average. They represent 7.8% of the housing stock and 11.1% of the dwellings that have been audited in the City of Burlington.

Variable	F	ESNH Standard*
Year of Construction	1972	-
Floor Area (m2)	235.9	-
Primary Heat Source	Induced Draft Fan Furnace	-
Primary Fuel Type	Natural Gas	-
Primary Heat Source Efficiency (%)	79.2	96
Heat Pump	No	No
Hot Water System	Conventional Tank (Pilot)	Tankless condensing
Hot Water System Fuel Type	Natural Gas	Natural Gas
Hot Water System Energy Factor	0.57	0.95
Ventilation Type	No	HRV 75% SRE
Ceiling Insulation (RSI)	4.4	10.56
Wall Insulation (RSI)	1.93	3.7
Foundation Insulation (RSI)	1.16	3.52
Number of Windows	15	-
Number of Doors	2	-
Electricity Consumption (GJ)	33.9 GJ (9,416.0 kWh)	-
Natural Gas Consumption (GJ)	141.7 GJ (3,800.1 m <sup>3</sup> )	-
Energy Score (GJ)	176.21	-
Carbon Score (tCO <sub>2</sub> e)	7.46	-
Air Tightness (ACH50P)	5.87	2.5+

\* Minimum standard based on Energy Star  
+ Maximum standard value based on Energy Star



## Archetype G 07



These homes have a relatively large floor area, and are natural gas heated with high efficiency furnaces and use natural gas hot water systems

Average annual electricity costs: \$1,215  
Average annual natural gas costs: \$1,400

**Average annual energy costs: \$2,624**

### Client Implications:

These homes consume 161.5 GJ (0.68 GJ/m<sup>2</sup>) of energy on average and produce 6.74 tCO<sub>2</sub>e (0.029 tCO<sub>2</sub>e/m<sup>2</sup>) on average. They represent 25.8% of the housing stock and 37.5% of the dwellings that have been audited in the City of Burlington.

Variable	G	ESNH Standard*
Year of Construction	1987	-
Floor Area (m <sup>2</sup> )	334.1	-
Primary Heat Source	Condensing Furnace	-
Primary Fuel Type	Natural Gas	-
Primary Heat Source Efficiency (%)	96.0	96
Heat Pump	No	No
Hot Water System	Conventional Tank (Pilot)	Tankless condensing
Hot Water System Fuel Type	Natural Gas	Natural Gas
Hot Water System Energy Factor	0.59	0.95
Ventilation Type	No	HRV 75% SRE
Ceiling Insulation (RSI)	5.02	10.56
Wall Insulation (RSI)	2.28	3.7
Foundation Insulation (RSI)	1.38	3.52
Number of Windows	20	-
Number of Doors	2	-
Electricity Consumption (GJ)	33.7 GJ (9,348.7 kWh)	-
Natural Gas Consumption (GJ)	127.4 GJ (3,416.1 m <sup>3</sup> )	-
Energy Score (GJ)	161.49	-
Carbon Score (tCO <sub>2</sub> e)	6.74	-
Air Tightness (ACH50P)	3.8	2.5+

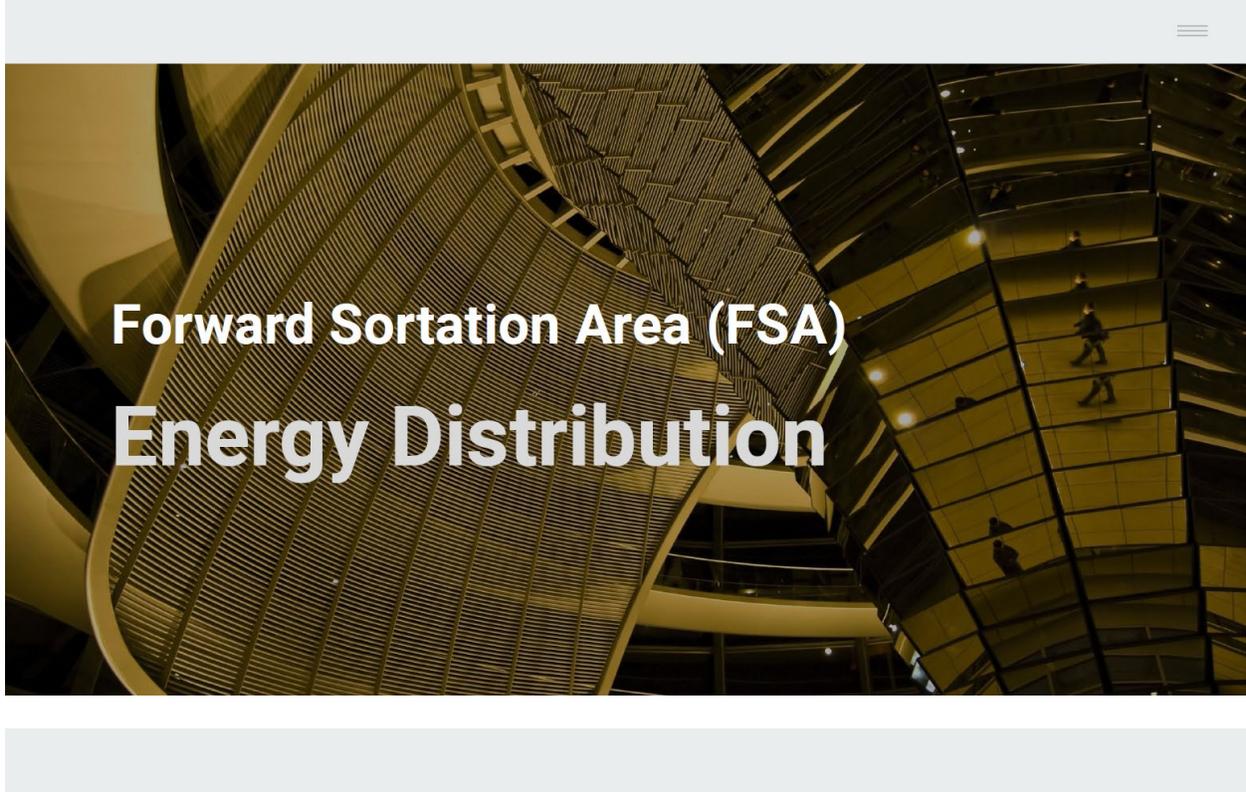
\* Minimum standard based on Energy Star  
+ Maximum standard value based on Energy Star

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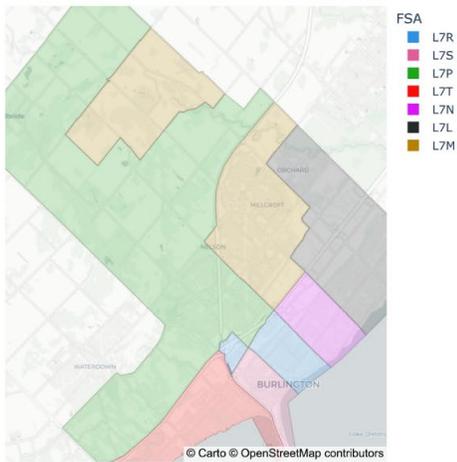
## Archetype Carbon Ranking

- Archetype A, B, and F are the most carbon intensive homes
- Capturing carbon savings by focusing on these homes is an important first step in decarbonization of the full city stock

Archetype	t CO <sub>2</sub> -e / year	GJ / year	Fuel Costs (\$ / year)
A	12.5	279	\$4,034
B	10.9	206	\$7,000
F	7.5	176	\$2,790
G	6.7	161	\$2,624
C	5.4	134	\$2,317
D	2.7	100	\$2,027
E	1.6	116	\$4,013



## Burlington FSA Level



Forward sortation areas (FSA) are the first 3 letters of a post code and provide a means to segment the city using a uniform methodology.

<b>Number of FSAs</b>	7
<b>Number of households</b>	31,108
<b>Total Energy Use (GJ)</b>	4,579,708
<b>Total Electricity Use (GJ)</b>	1,043,133
<b>Total Natural Gas Use (GJ)</b>	3,489,531
<b>Total tCO<sub>2</sub>e</b>	188,092

## Archetype Distribution

Total number of archetypal single detached dwellings in the Burlington by FSA.

**31,108 Single Family Dwellings**

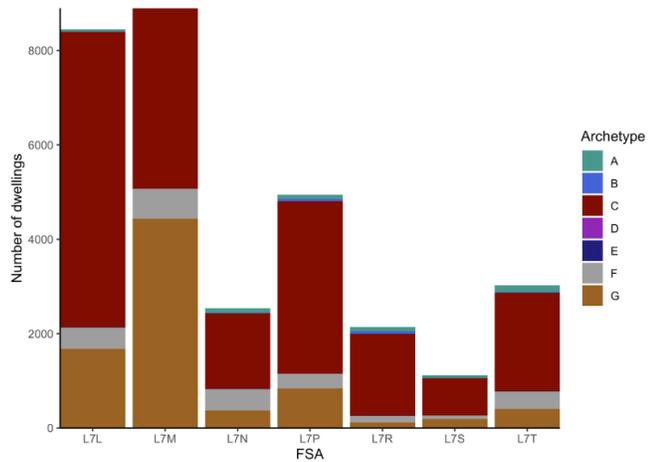
**7 Archetypes**

Archetype C, G, and F are the most numerous across all FSA's

**C - 19,950 dwellings**

**G - 8,029 dwellings**

**F - 2,433 dwellings**



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## Total Energy Distribution

Total GJ by archetype distributed across FSA's:

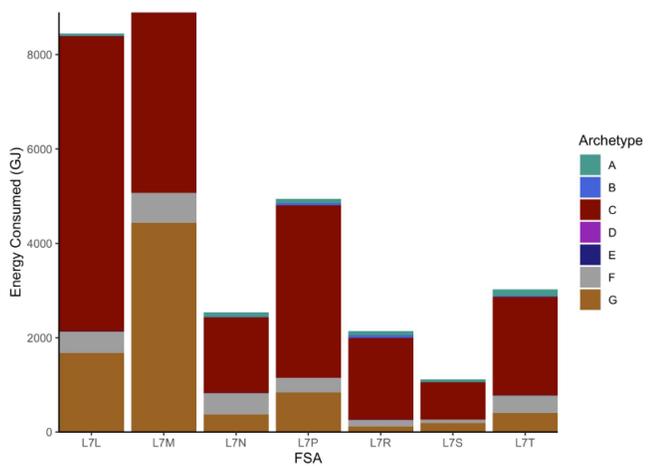
**4,579,708 GJ consumed**

Archetype C, G, and F consume the highest amount of total energy:

**C - 2,673,517 GJ**

**G - 1,296,580 GJ**

**F - 428,719 GJ**



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## Total Tonnes CO2e Distribution

Total tCO2e by archetype distributed across FSA's:

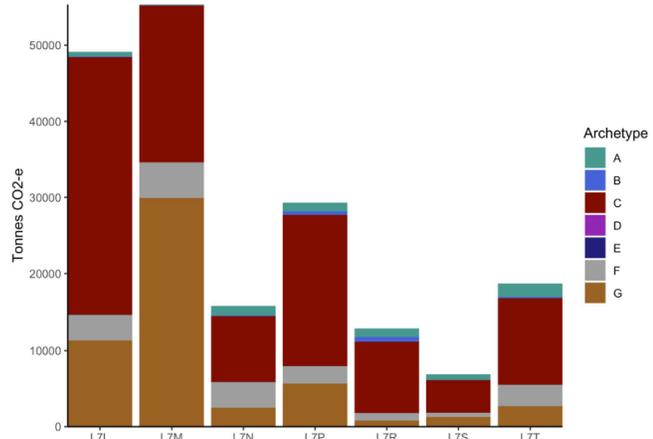
**188,092 tCO2e**

Archetype C, G, and F contribute the highest amount of CO2e:

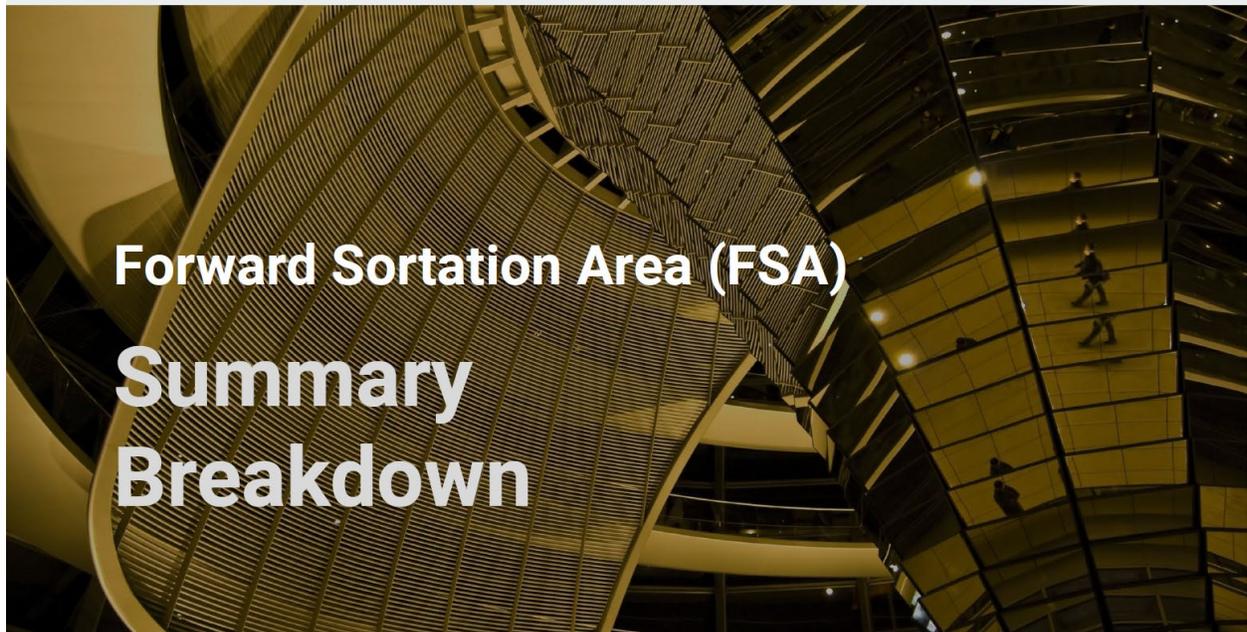
**C - 107,545 CO2-e**

**G - 54,149 CO2-e**

**F - 18,150 CO2-e**



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## L7L Breakdown

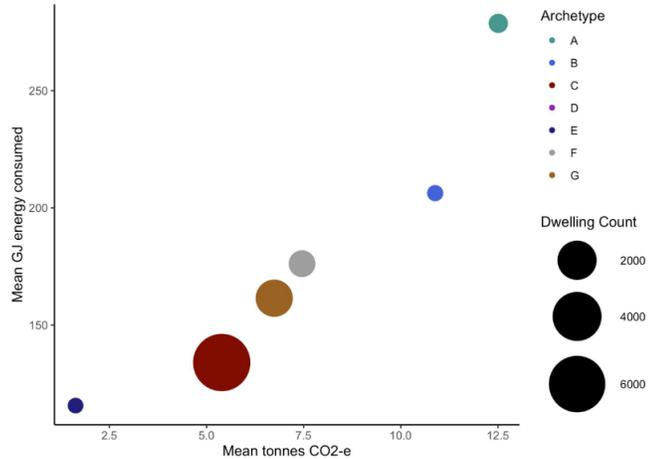
<b>Total number of single family dwellings:</b>	8,449
<b>Annual median income (\$):</b>	101,915
<b>Average occupancy per dwelling:</b>	2.7
<b>Owner to renter ratio (%):</b>	85
<b>Total Energy Use (GJ):</b>	1,204,841
<b>Total tCO2e:</b>	49,114



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## L7L - Carbon and Energy Average per Archetype

Archetype	Count	Total Energy (GJ)	Total tCO <sub>2</sub> e
A	49	13,659	613
B	6	1,238	65
C	6,259	838,774	33,741
E	5	578	8
F	450	79,295	3,357
G	1,680	271,298	11,330
<b>Total</b>	<b>8,449</b>	<b>1,204,841</b>	<b>49,114</b>



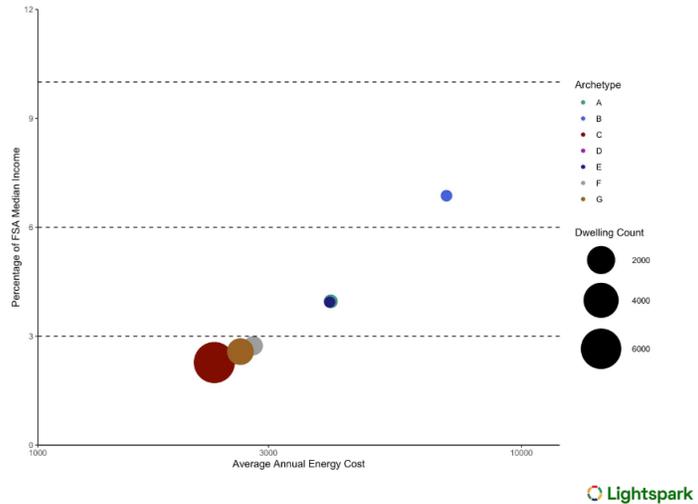
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## L7L - Energy Burden

Energy Burden: % of income spent on heating/cooling and electricity

The median Canadian household spends under 3% of its income on energy (horizontal line)

Archetype B has the burden above 3%, and accounts for 6.9% dwellings in L7L



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## L7M Breakdown

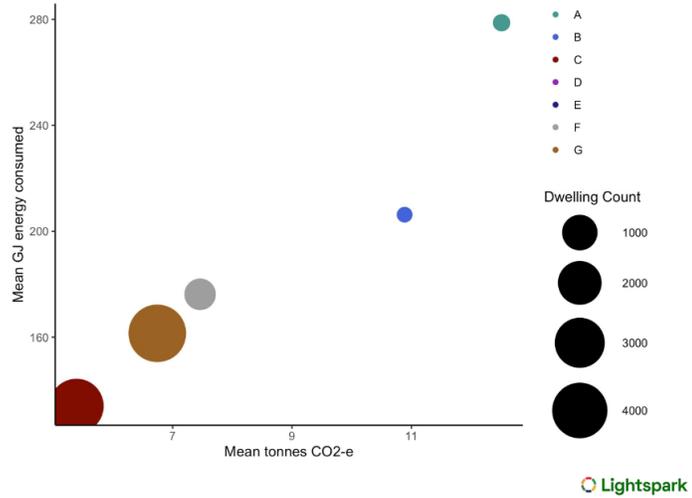
<b>Total number of single family dwellings:</b>	8,897
<b>Annual median income (\$):</b>	111,955
<b>Average occupancy per dwelling:</b>	2.8
<b>Owner to renter ratio (%):</b>	91
<b>Total Energy Use (GJ):</b>	1,342,097
<b>Total tCO2e:</b>	55,338



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## L7M - Carbon and Energy Average per Archetype

Archetype	Count	Total Energy (GJ)	Total tCO2e
A	8	2,230	100
B	2	413	22
C	3,821	512,056	20,598
F	632	111,365	4,715
G	4,434	716,034	29,904
<b>Total</b>	<b>8,897</b>	<b>1,342,097</b>	<b>55,338</b>

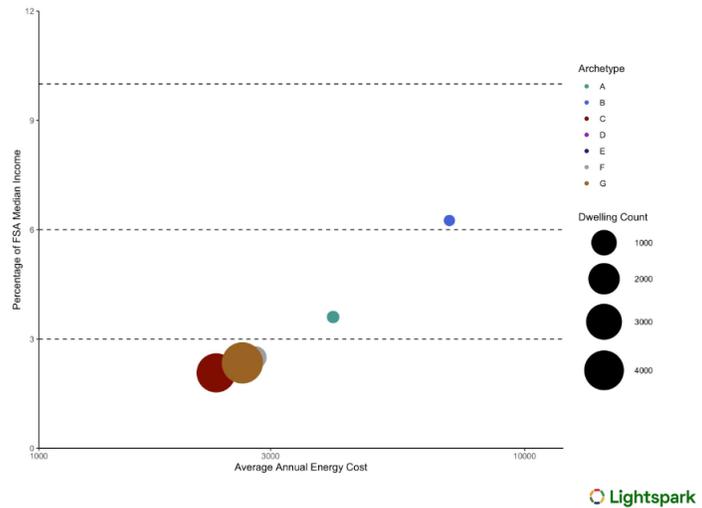


## L7M - Energy Burden

Energy Burden: % of income spent on heating/cooling and electricity

The median Canadian household spends under 3% of its income on energy (horizontal line)

Archetype B has the burden above 3%, and accounts for 6.3% dwellings in L7M



## L7N Breakdown

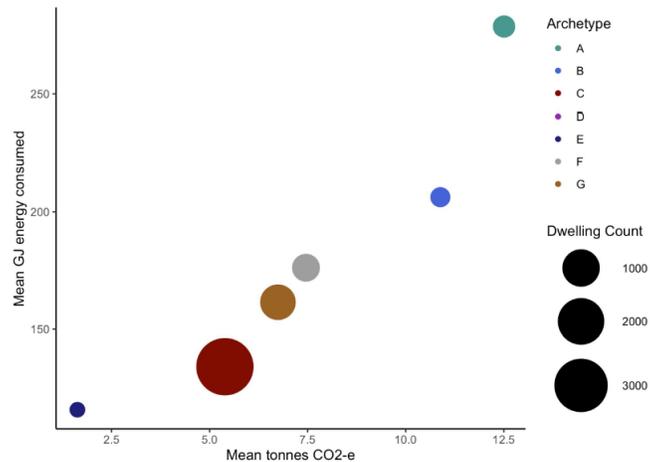
Total number of single family dwellings:	2,538
Annual median income (\$):	83,695
Average occupancy per dwelling:	2.4
Owner to renter ratio (%):	70
Total Energy Use (GJ):	384,648
Total tCO2e:	15,864



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## L7N - Carbon and Energy Average per Archetype

Archetype	Count	Total Energy (GJ)	Total tCO <sub>2</sub> e
A	103	28,711	1,289
B	6	1,238	65
C	1,600	214,417	8,625
E	6	694	10
F	454	79,999	3,387
G	369	59,589	2,489
<b>Total</b>	<b>2,538</b>	<b>384,648</b>	<b>15,864</b>



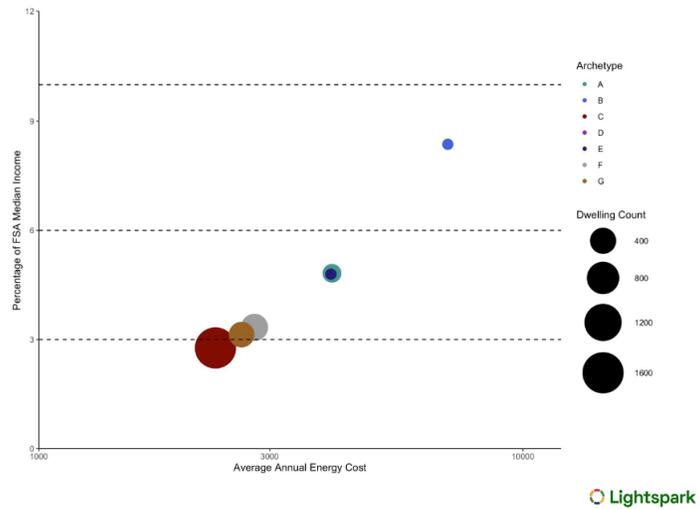
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## L7N - Energy Burden

Energy Burden: % of income spent on heating/cooling and electricity

The median Canadian household spends under 3% of its income on energy (horizontal line)

Archetype B has the burden above 3%, and accounts for 8.4% dwellings in L7N



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## L7P Breakdown

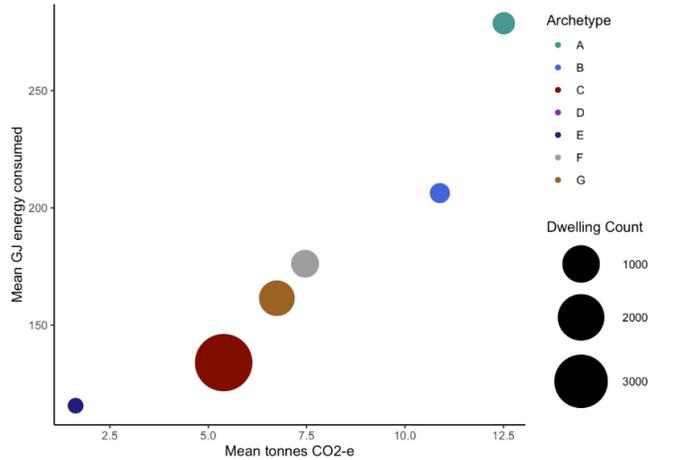
<b>Total number of single family dwellings:</b>	4,940
<b>Annual median income (\$):</b>	99,593
<b>Average occupancy per dwelling:</b>	2.7
<b>Owner to renter ratio (%):</b>	85
<b>Total Energy Use (GJ):</b>	714,407
<b>Total tCO2e:</b>	29,286



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## L7P - Carbon and Energy Average per Archetype

Archetype	Count	Total Energy (GJ)	Total tCO2e
A	91	25,366	1,138
B	42	8,664	457
C	3,656	489,944	19,709
E	1	116	2
F	313	55,154	2,335
G	837	135,165	5,645
<b>Total</b>	<b>4,940</b>	<b>714,407</b>	<b>29,286</b>



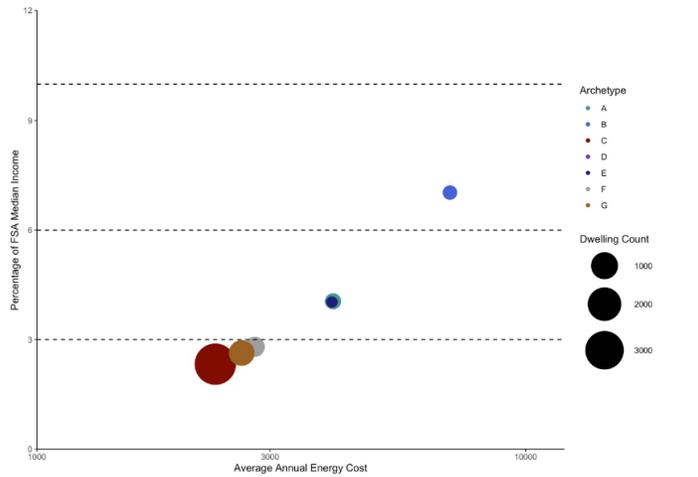
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## L7P - Energy Burden

Energy Burden: % of income spent on heating/cooling and electricity

The median Canadian household spends under 3% of its income on energy (horizontal line)

Archetype B has the burden above 3%, and accounts for 7.0% dwellings in L7P



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## L7R Breakdown

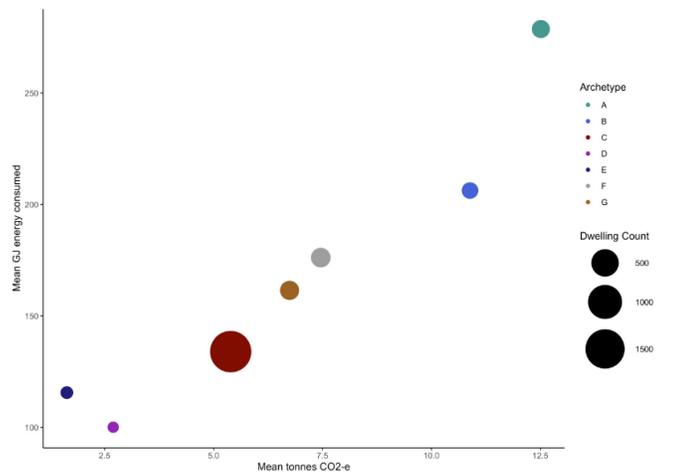
Total number of single family dwellings:	2,141
Annual median income (\$):	70,549
Average occupancy per dwelling:	2.1
Owner to renter ratio (%):	51
Total Energy Use (GJ):	312,599
Total tCO2e:	12,896



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## L7R - Carbon and Energy Average per Archetype

Archetype	Count	Total Energy (GJ)	Total tCO <sub>2</sub> e
A	89	24,809	1,113
B	55	11,345	599
C	1,737	232,777	9,364
D	1	100	3
E	5	578	8
F	134	23,612	1,000
G	120	19,378	809
<b>Total</b>	<b>2,141</b>	<b>312,599</b>	<b>12,896</b>



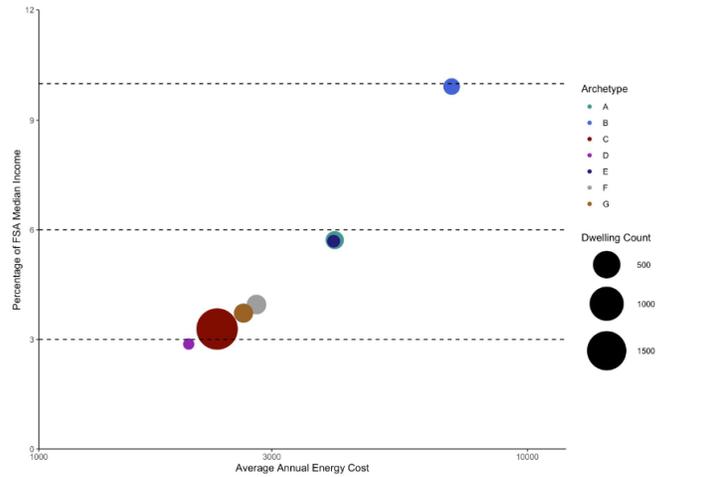
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## L7R - Energy Burden

Energy Burden: % of income spent on heating/cooling and electricity

The median Canadian household spends under 3% of its income on energy (horizontal line)

Archetype B has the burden above 3%, and accounts for 9.9% dwellings in L7R



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## L7S Breakdown

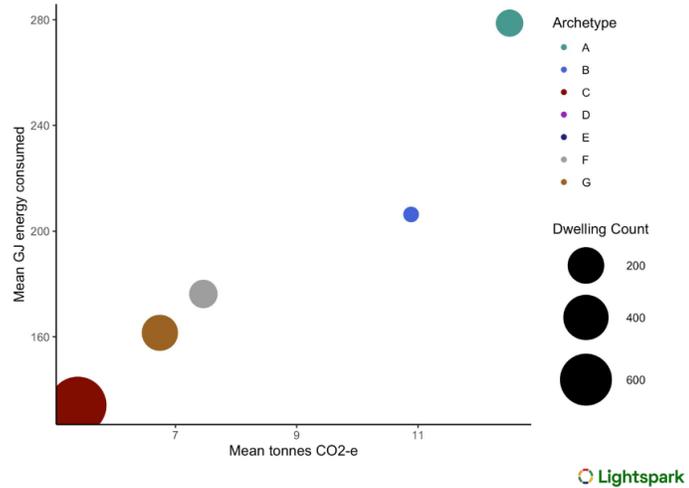
<b>Total number of single family dwellings:</b>	1,118
<b>Annual median income (\$):</b>	66,636
<b>Average occupancy per dwelling:</b>	1.9
<b>Owner to renter ratio (%):</b>	51
<b>Total Energy Use (GJ):</b>	167,256
<b>Total tCO2e:</b>	6,886



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## L7S - Carbon and Energy Average per Archetype

Archetype	Count	Total Energy (GJ)	Total tCO2e
A	62	17,282	776
B	1	206	11
C	790	105,869	4,259
F	75	13,216	560
G	190	30,683	1,281
<b>Total</b>	<b>1,118</b>	<b>167,256</b>	<b>6,886</b>

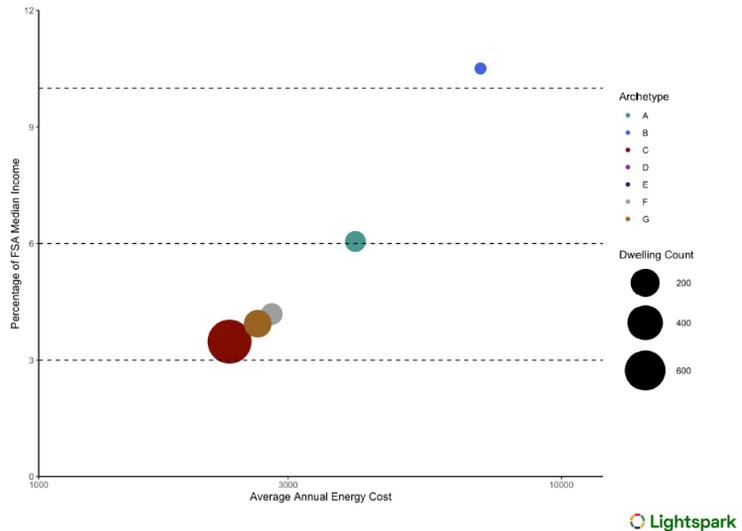


## L7S - Energy Burden

Energy Burden: % of income spent on heating/cooling and electricity

The median Canadian household spends under 3% of its income on energy (horizontal line)

Archetype B has the burden above 3%, and accounts for 10.5% dwellings in L7S



## L7T Breakdown

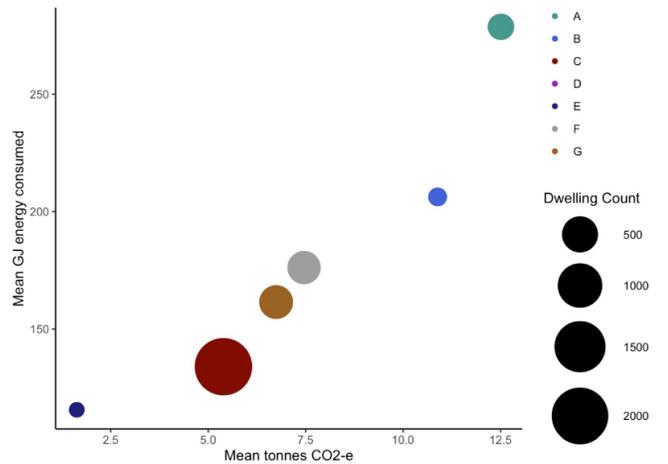
<b>Total number of single family dwellings:</b>	3,025
<b>Annual median income (\$):</b>	81,137
<b>Average occupancy per dwelling:</b>	2.3
<b>Owner to renter ratio (%):</b>	62
<b>Total Energy Use (GJ):</b>	453,860
<b>Total tCO2e:</b>	18,709



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## L7T - Carbon and Energy Average per Archetype

Archetype	Count	Total Energy (GJ)	Total tCO <sub>2</sub> e
A	142	39,582	1,776
B	17	3,507	185
C	2,087	279,681	11,250
E	5	578	8
F	375	66,079	2,798
G	399	64,433	2,691
<b>Total</b>	<b>3,025</b>	<b>453,860</b>	<b>18,709</b>



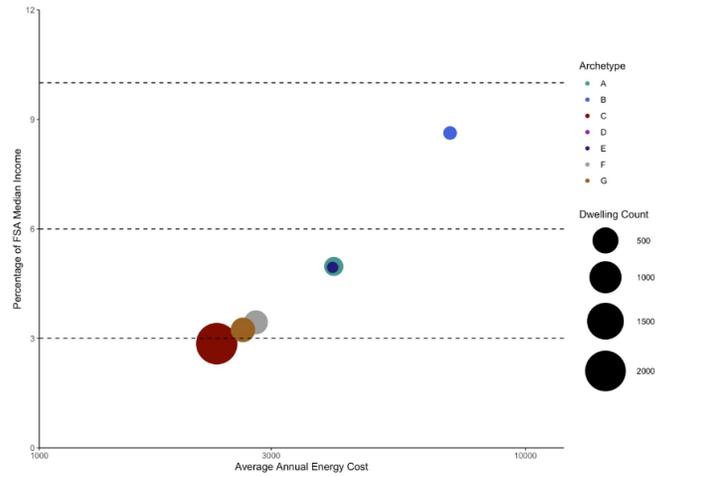
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## L7T - Energy Burden

Energy Burden: % of income spent on heating/cooling and electricity

The median Canadian household spends under 3% of its income on energy (horizontal line)

Archetype B has the burden above 3%, and accounts for 8.6% dwellings in L7T



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## APPENDIX B: BURLINGTON HOMEOWNER SURVEY

### Online Survey Results



Home Energy Retrofit Program  
Survey Findings



November 2021

DELANEY *the engagement people*

## About the Survey

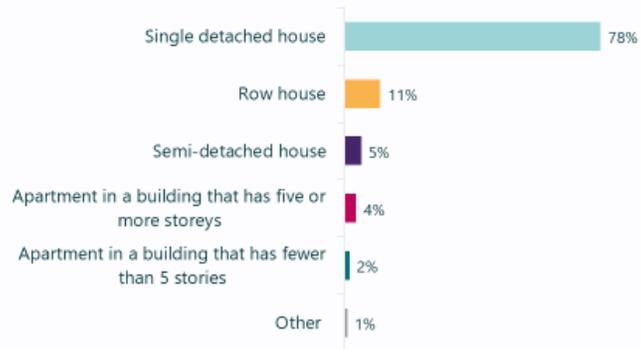
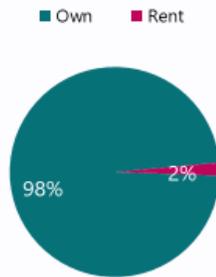
- Main focus: New proposed Home Energy Retrofit (HERO) program for City of Burlington
- Method: Online survey
- Dates: October 6 – November 8, 2021
- Number of participants: 258



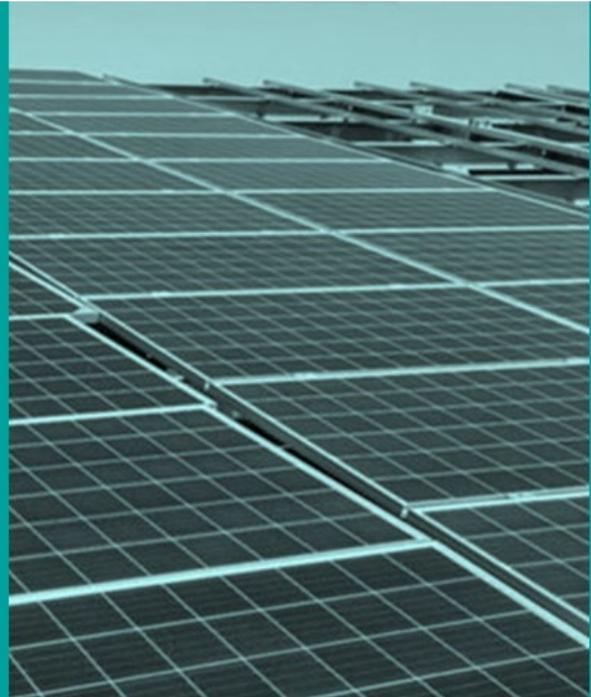


## Dwelling

- *Survey respondents were for the most part home owners who live in single detached dwellings.*

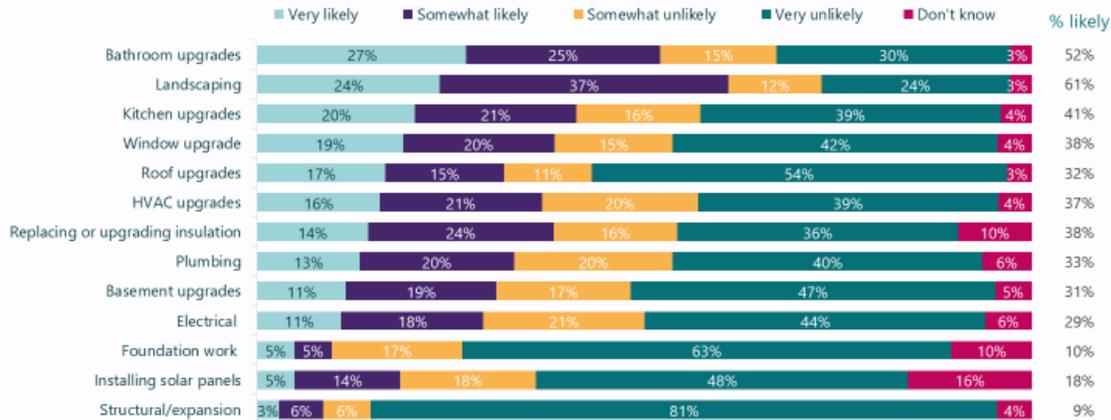


# SURVEY FINDINGS: HOME UPGRADES



## Likelihood of Undertaking Home Upgrades in Next 2 – 3 Years

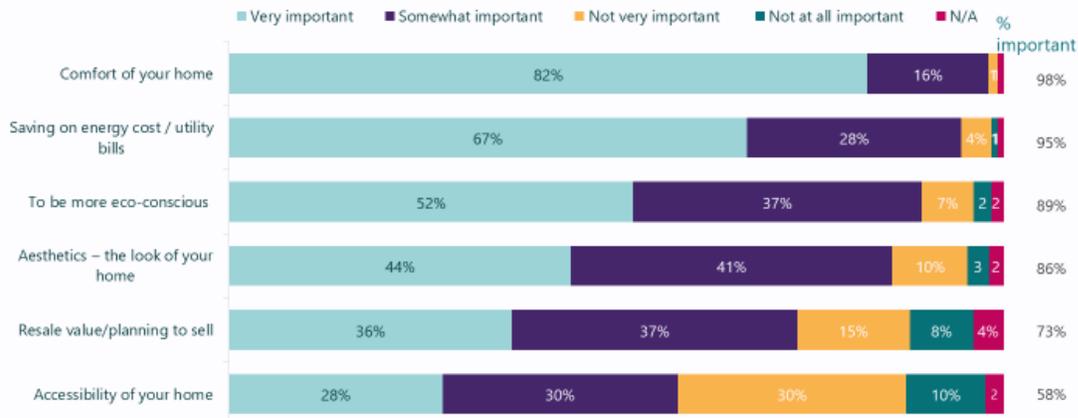
- Besides landscaping, bathroom and kitchen upgrades are the most popular.
- Four in ten are also likely to do upgrade their windows, HVAC system or insulation in the next few years.
- A third plan on upgrading their roof and one in five may be installing solar panels.



Q. Please indicate your likelihood of your undertaking these home upgrades over the next 2-3 years: (N=246-253)

## Importance of Factors in Decision to Upgrade

- Home comfort is the most important decision-making factor, followed by cost saving on energy and utility bills.
- A large majority also say that being more eco-conscious is important to them – slightly more to than the aesthetic of their home and more important than its resale value.



Q. If you were to undertake any home upgrades in the next 2-3 years, how important would each of the following factors be in your decision to conduct the upgrade(s)? (N=254-256)

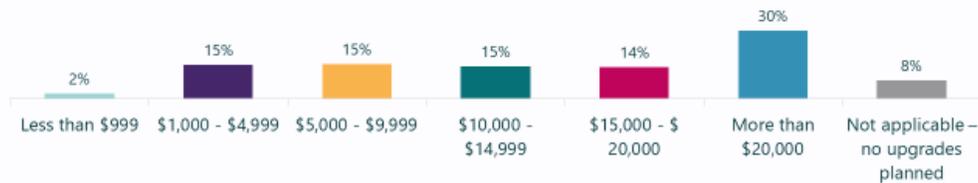
### Other Factors in Decision to Upgrade:

Main other theme:	Includes:
Cost / Affordability / Budget	Mainly general mentions, but also: <ul style="list-style-type: none"> <li>- Cost of borrowing</li> <li>- Cost of labour</li> <li>- Cost of materials</li> <li>- Cost of permits</li> </ul>
Secondary other themes:	Includes:
Environmental / energy efficiency considerations	<ul style="list-style-type: none"> <li>- Having less environmental impact</li> <li>- Saving electricity/gas</li> <li>- Using sustainable materials</li> </ul>
Return on Investment	- Short-term investment vs long-term savings
Incentives	- (Gov't) rebates, grants, subsidies
Smaller themes:	Includes:
Condo or MURB rules and options	- Limited to what is possible / allowed
Ability to stay in home longer	- Seniors who want to stay in their home
Contractors	<ul style="list-style-type: none"> <li>- Ease of dealing with contractors</li> <li>- Reliability competency</li> <li>- Unbiased advice</li> </ul>

### Spending Levels

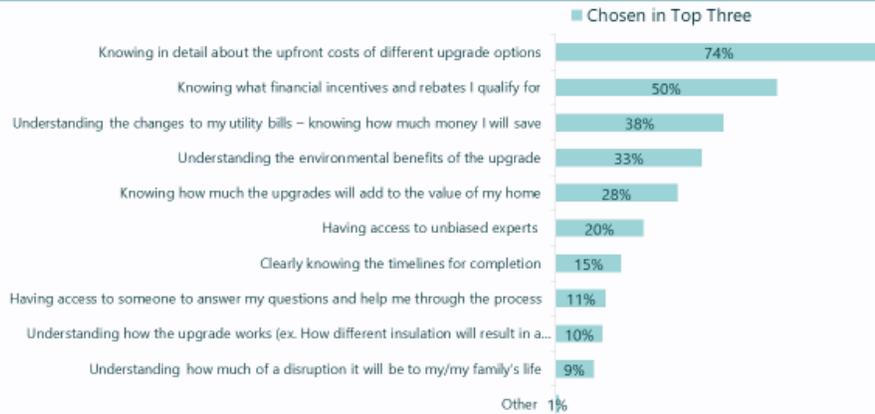
- Anticipated spending levels vary, with an even split between those comfortable spending less or more than \$15K – and three in ten anticipating spending \$20K or more.

Comfortable spending on a home upgrade



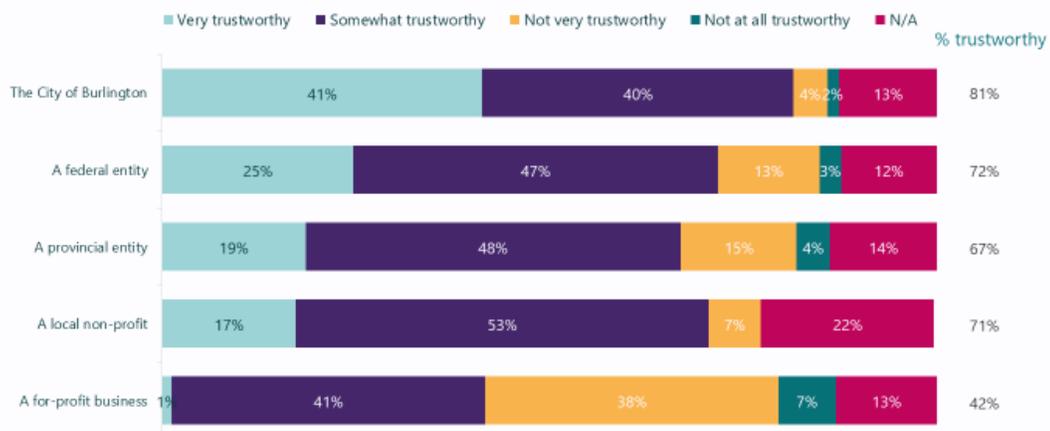
## Information Factors when Upgrading Home

- *Most importantly, respondents want to know their options and associated costs before upgrading.*
- *Understanding what incentives and rebates they may qualify for is second-most important, followed by understanding how much they will save on their utility bills.*
- *Environmental benefits are a secondary factor to cost /cost savings*



## Trust in Information Sources re: Upgrades

- *The City of Burlington is seen as the most trustworthy source for information, followed by other levels of government and non-government groups.*
- *Businesses are seen as the least trustworthy on this topic.*





### Trust in Information Sources re: Upgrades (Other)

Main other source:	Includes:
Word of mouth: Friends / family/ neighbours	Mainly general mentions, but also specifically: - Others who have done the same upgrades - Family/friends with expertise
Secondary other sources:	Includes:
Professionals / experts	- Contractors (who they've had past experience with) - Engineers, architects - Scientists
Online	- Blogs - Forums - YouTube experts
Tertiary other sources:	Includes:
Research	- Their own research - Academic research studies
Customer reviews	- HomeStars - Online reviews

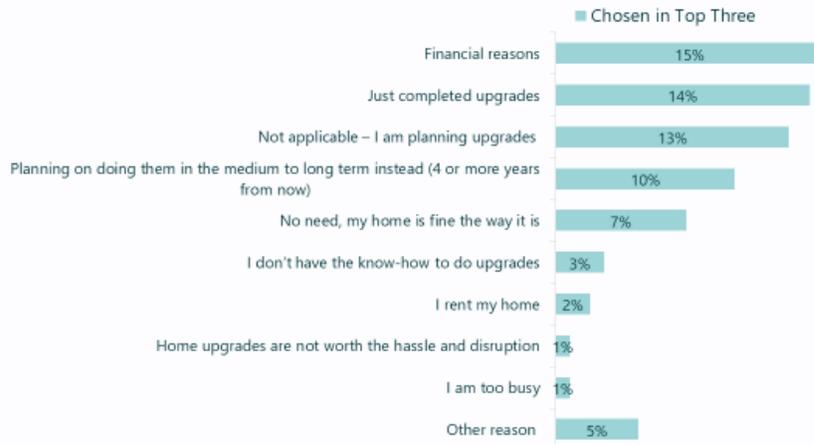


DELANEY *the engagement people*

Q. Are there any other trustworthy sources for information that you would likely consult before deciding on a home upgrade? (N=106)

### Reasons NOT to do Home Upgrades

- Among those not planning any home upgrades in the near term, many cite finances or just having completed upgrades as main reasons.



DELANEY *the engagement people*

Q. If you are not planning on doing any home upgrades in the next 2 - 3 years, why not? (Please select your top three) (N=128)

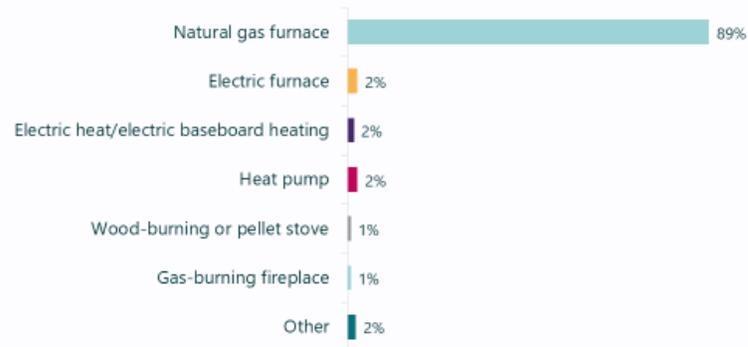


## SURVEY FINDINGS: HOME HEATING



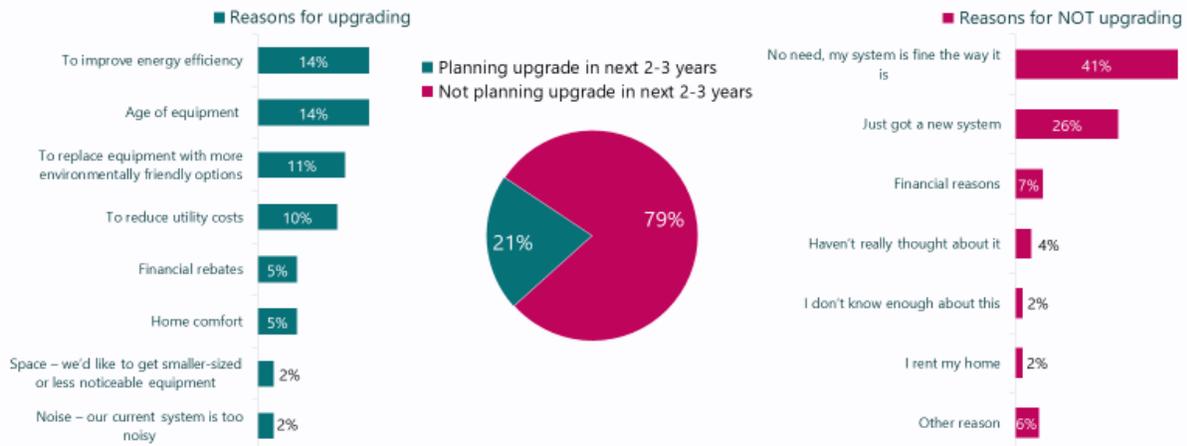
### Home Heating

- Respondents' homes were mainly heated by natural gas furnace.



## Upgrades to Home Heating

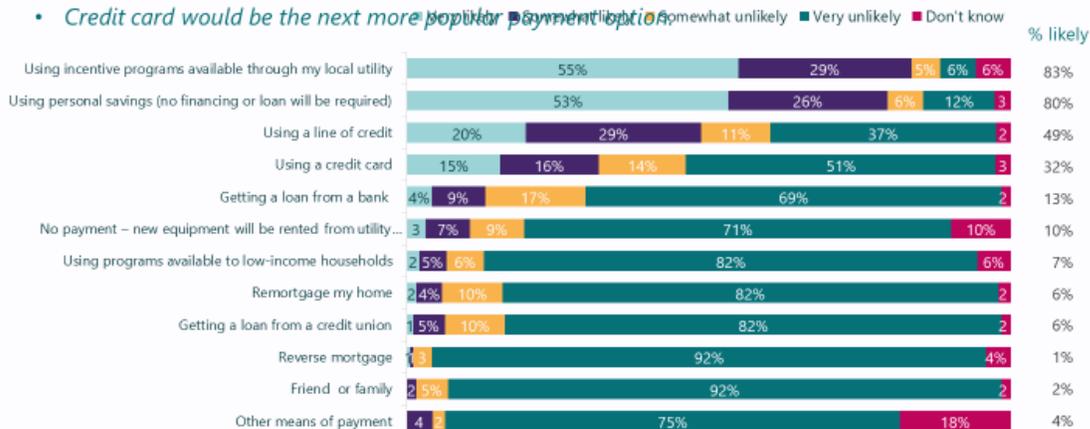
- One in five are planning to upgrade their heating system in the next few years.
- Improving energy efficiency and equipment age are the main reasons for doing so.



Q: Are you planning to upgrade or change your home heating system in the next 2-3 years? (N=257)  
 Q: Why are you not planning on upgrading your home heating system? (N=204)  
 Q: Why are you planning on upgrading your home heating system? (N=53)

## Financing for New Heating Equipment

- It is most likely that those looking to upgrade their system will use incentive programs to finance this upgrade.
- Most will not require financing or a loan to do so, while one in five say they will very likely use a line of credit.
- Credit card would be the next most popular payment option.



Q: If you were to replace your heating equipment in the next 2-3 years, how likely is it that you would use each of the following financing options as your primary source of funding? (N=203-220)

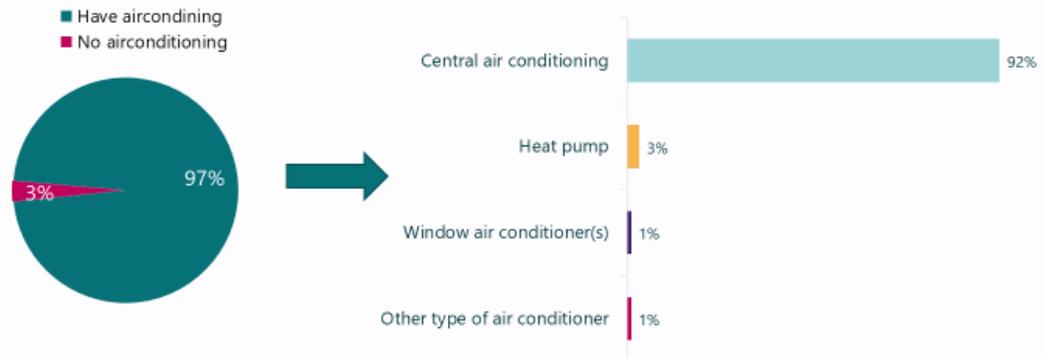


# SURVEY FINDINGS: AIR CONDITIONING



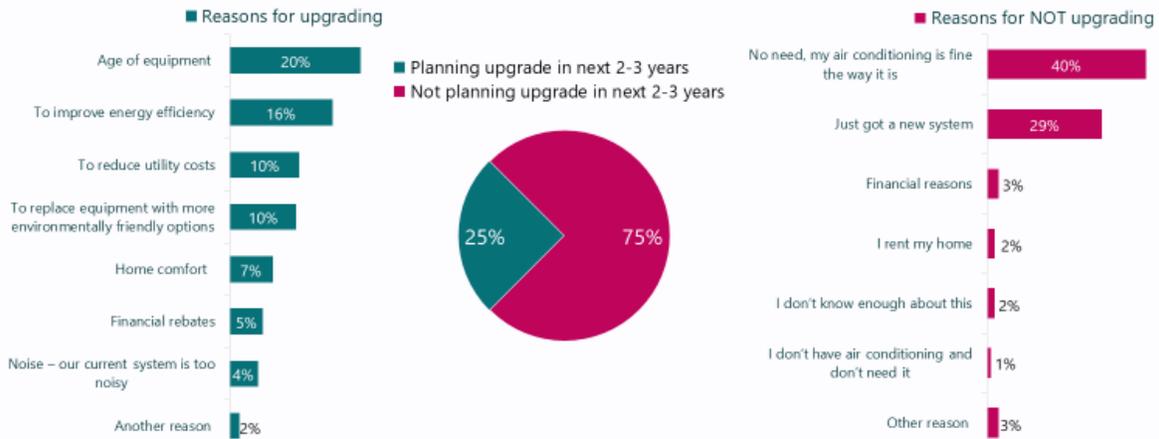
## Air Conditioning

- Almost all respondents have central air conditioning in their home.



## Upgrades to Air Conditioning

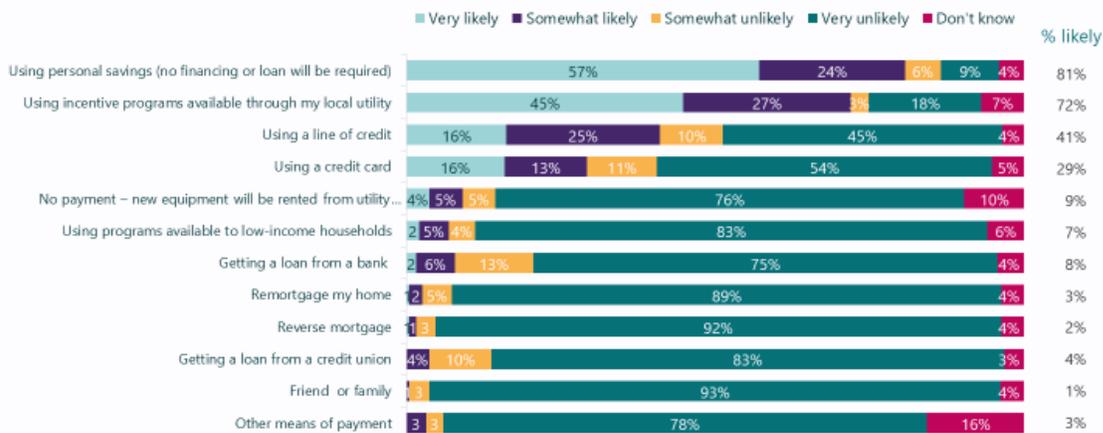
- A quarter is likely to upgrade their air conditioning system in the near future.
- Age of their equipment and improving energy efficiency are the main reasons for doing so.



Q: Are you intending on purchasing new air conditioning equipment or replacing your existing equipment in the next 2-3 years? (N=257)  
 Q: Why are you not planning on upgrading your air conditioning system? (N=192)  
 Q: Why are you planning on upgrading your air conditioning system? (N=65)

## Financing for New Air Conditioning Equipment

- For the most part, respondents anticipate not having to finance this type of upgrade.
- They are likely to use incentive programs offered by their local facility.
- If there is a need to finance, this will most likely be done with a line of credit or credit card.

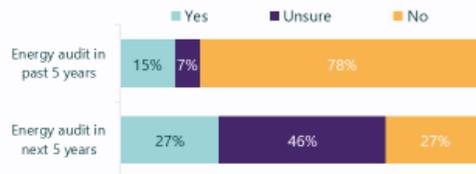
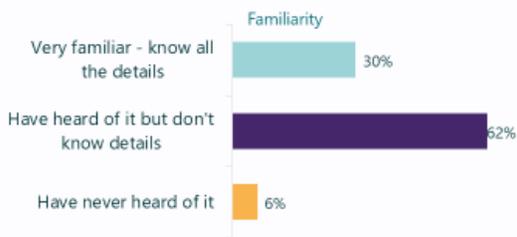


Q: If you were to purchase or upgrade air conditioning equipment in the next five years, how likely is it that you would use each of the following financing options as your primary source of funding? (N=185-224)



### Home Energy Audits (Home Owners)

- One in three respondents are very familiar with home energy audits; 15% had one done in the past five years and another quarter anticipates doing one in the next five years.
- For the most part, it is seen as either an easy/quick process, or as slightly disruptive.



Q: How familiar are you with home energy audits? (N=252)  
 Q: Have you had a home energy audit in the past five years? (N=252)  
 Q: Are you planning on having a home energy audit in the next five years? (N=251)  
 Q: What are your perceptions of having an energy audit done on your home? (N=252)

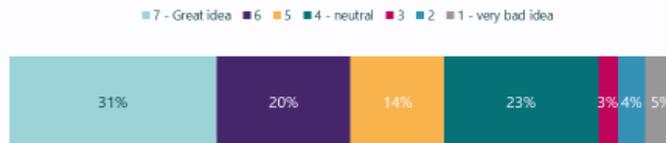


# SURVEY FINDINGS: HERO PROGRAM

## Proposed HERO Program

- The proposed program, as briefly described to participants, was well-received, with the majority saying it is a great or good idea. About a quarter is neutral (providing tacit support) and only 12% say it is a bad idea.
- There is interest among one in eight respondents, with 43% saying they are very interested.

Rating of program



Interest in program



Q. On a scale from 1 to 7, where 1 means you think this is a very bad idea, 4 means you're neutral towards this and 7 means you think this is a great idea, please tell us how you feel about a program like this. (N=255)  
 Q. How interested would you be in participating in a program like this in the next five years? (N=256)



### Making HERO Program a Success

Main mention:	Includes:
Advertise / Communicate	Generally: spread the word and inform people about the program
Secondary mentions:	Includes:
Provide detailed information / Advice	Specific questions or information they are looking for
Make it an easy process	<ul style="list-style-type: none"> <li>- Easy to understand</li> <li>- Easy application process</li> <li>- Transparent</li> </ul>
Add incentives / Rebates	<ul style="list-style-type: none"> <li>- Combine with rebates, incentives</li> <li>- Combine with other gov't programs</li> </ul>
No or low interest rates / Make it free	General mentions of this theme
Tertiary mentions:	Includes:
Don't tie loan to house	<ul style="list-style-type: none"> <li>- Tie to individual / homeowner instead</li> </ul>
Provide unbiased experts / Staff it appropriately	<ul style="list-style-type: none"> <li>- Have armslength / vetted experts</li> <li>- Have competent staff</li> </ul>
It won't work	<ul style="list-style-type: none"> <li>- Reasons why this is not a good idea</li> </ul>

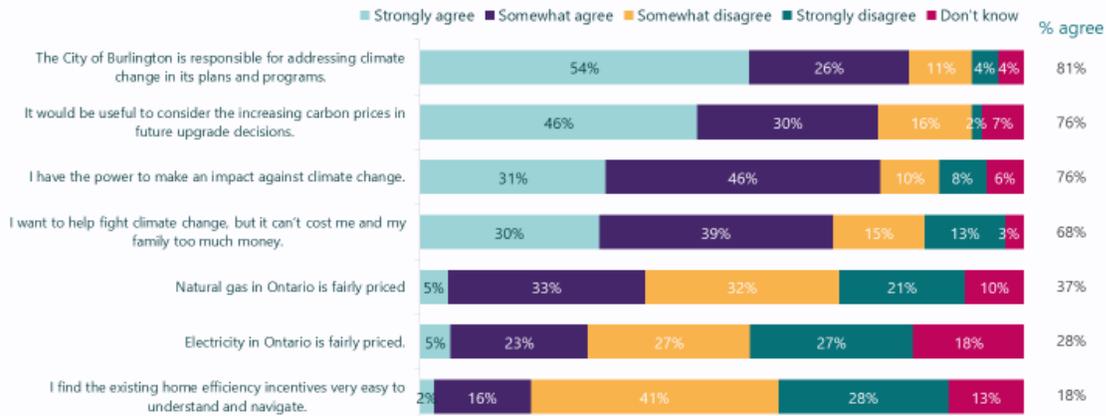


## SURVEY FINDINGS: CLIMATE CHANGE

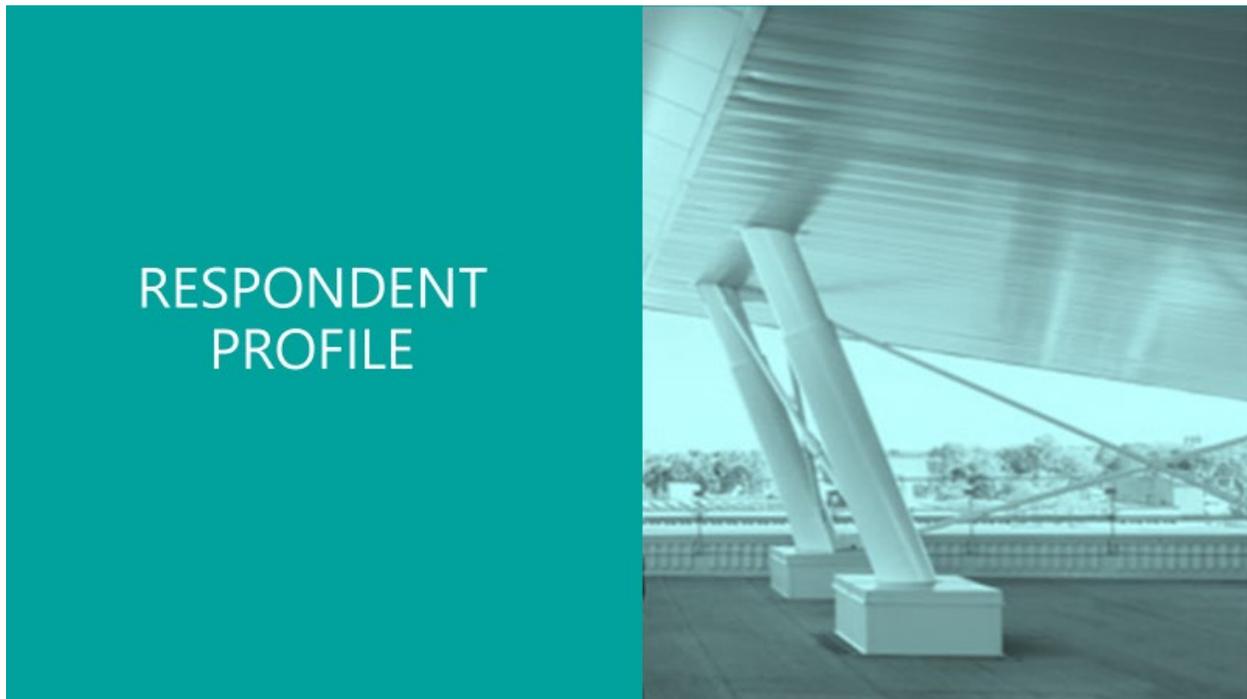


## Attitudes Towards Climate Change

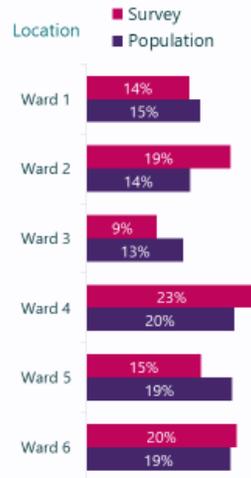
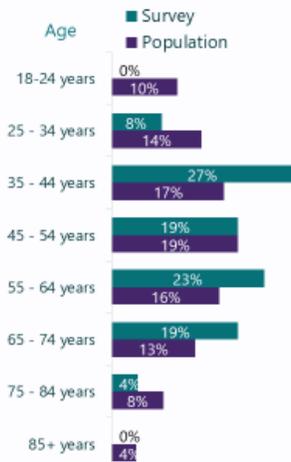
- Most respondents believe that the City should address climate change in its plans and programs; at the same time, they also feel empowered to make an impact on a personal level.
- However, a majority also agreed that it can't cost them too much money.
- Most also see the utility in considering higher carbon prices in future upgrade decisions.
- Respondents generally do not feel that gas and electricity prices in Ontario are fair; they also don't feel that incentive programs are easy to understand and navigate.



Q. Please tell us how much you agree or disagree with the following statements: (N=255-257)

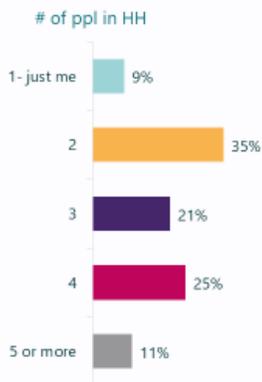


### Demographics (1)\*



\* Population figures from 2016 Canadian Census

### Demographics (2)



## Telesurvey Results



### Burlington Home Retrofit Study

Prepared for: Mohawk College

Presented by: MDB Insight

Date: November 2021



Background

### Background/ Research Methodology

- Mohawk College hired MDB Insight to conduct a survey about the plans and perceptions of residents of the City of Burlington with regards to upcoming home upgrades. The aim was to gain an understanding of interests and motivations behind energy-related upgrades, to inform the roll-out of the Home Energy Retrofit Program.
- The survey was conducted using a telephone methodology using Computer Assisted Telephone Interviewing (CATI) to randomly dial residents in the City of Burlington.
- The survey was conducted during the Fall from Sept 27<sup>th</sup> to Nov 5<sup>th</sup>, 2021 and gained 202 completed responses.
- Residents were asked about their home upgrade plans, their motivations for upgrading, and any barriers or considerations they faced.





## Survey Results

Responses to the survey questions are summarized in this section.



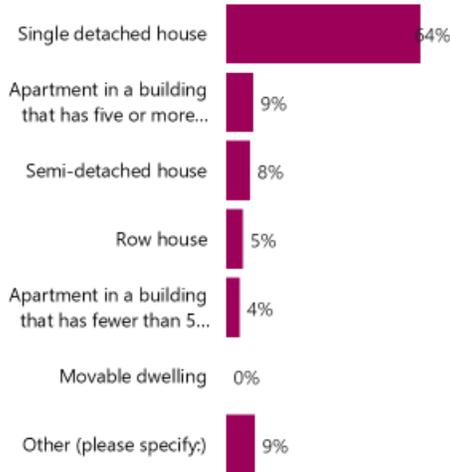
### Do you own or rent your home?



	%	Count
Own	90%	181
Rent	10%	21
Total	100%	202



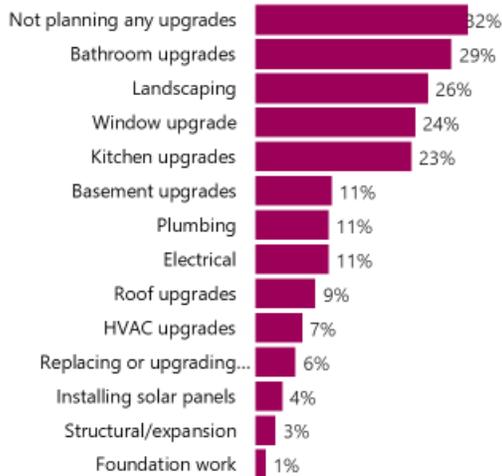
### What type of house is your home?



	%	Count
Single detached house	64%	129
Apartment in a building that has five or more storeys	9%	18
Semi-detached house	8%	16
Row house	5%	11
Apartment in a building that has fewer than 5 stories	4%	9
Movable dwelling	0%	0
Other (please specify:)	9%	19
<b>Total</b>	<b>100%</b>	<b>202</b>



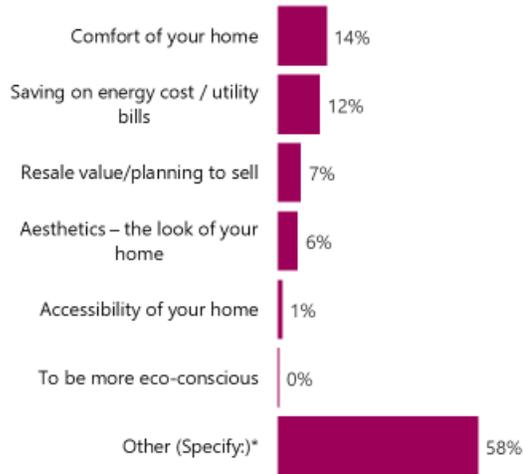
### Which of the following types of home upgrades to you plan to make over the next 2-3 years?



	%	Count
Not planning any upgrades	32%	64
Bathroom upgrades	29%	59
Landscaping	26%	52
Window upgrade	24%	48
Kitchen upgrades	23%	47
Basement upgrades	11%	23
Plumbing	11%	22
Electrical	11%	22
Roof upgrades	9%	18
HVAC upgrades	7%	14
Replacing or upgrading insulation	6%	12
Installing solar panels	4%	8
Structural/expansion	3%	6
Foundation work	1%	3
<b>Total</b>	<b>100%</b>	<b>202</b>



If you were to undertake any home upgrades in the next 2-3 years, what would be the most important factor in your decision to conduct the upgrade(s)?

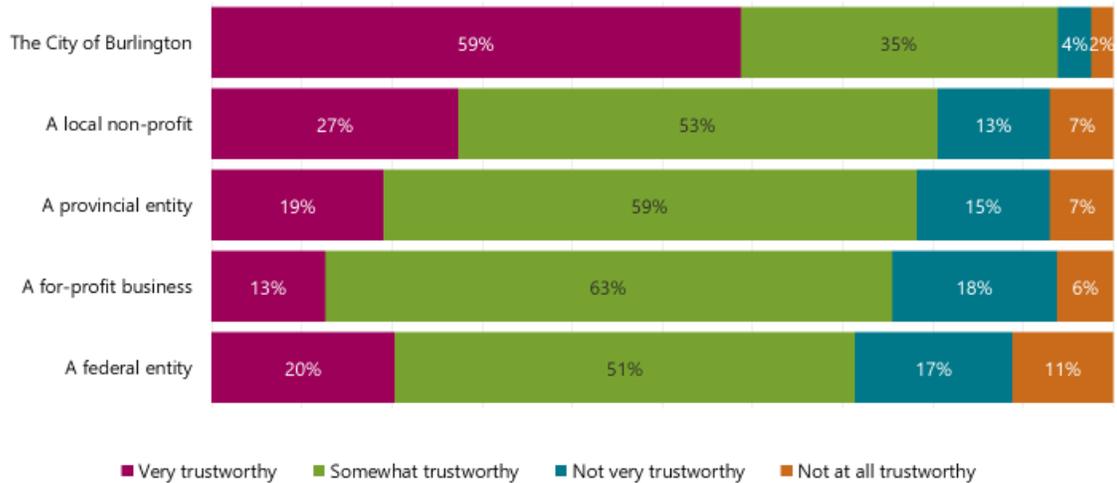


	%	Count
Comfort of your home	14%	29
Saving on energy cost / utility bills	12%	25
Resale value/planning to sell	7%	14
Aesthetics – the look of your home	6%	12
Accessibility of your home	1%	3
To be more eco-conscious	0%	1
Other (Specify:)*	58%	118
<b>Total</b>	<b>100%</b>	<b>202</b>

\*See Open-Responses Spreadsheet for responses to this option.

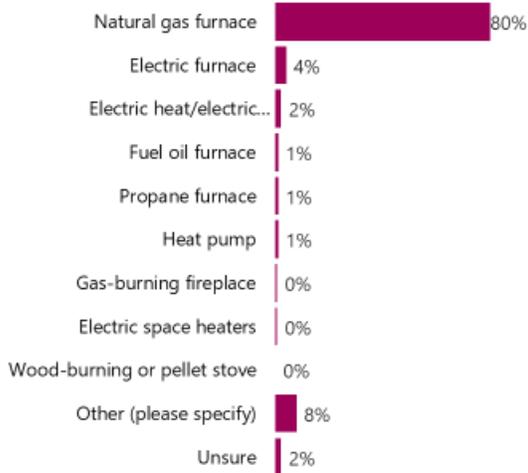


How trustworthy are the following sources of information who might provide you with help to plan and complete your home upgrades





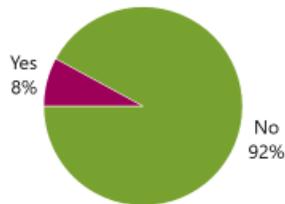
How is your home primarily heated?



	%	Count
Natural gas furnace	80%	162
Electric furnace	4%	8
Electric heat/electric baseboard heating	2%	4
Fuel oil furnace	1%	2
Propane furnace	1%	2
Heat pump	1%	2
Gas-burning fireplace	0%	1
Electric space heaters	0%	1
Wood-burning or pellet stove	0%	0
Other (please specify)	8%	16
Unsure	2%	4
<b>Total</b>	<b>100%</b>	<b>202</b>



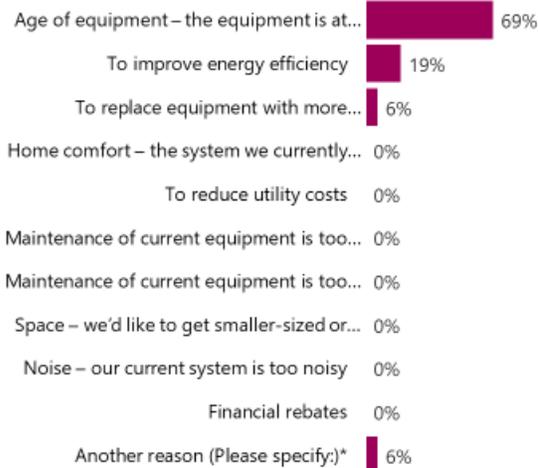
Are you planning to upgrade or change your home heating system in the next 2-3 years?



	%	Count
Yes	8%	16
No	92%	186
<b>NET</b>	<b>100%</b>	<b>202</b>



What is the primary reason you are planning on upgrading your home heating system?

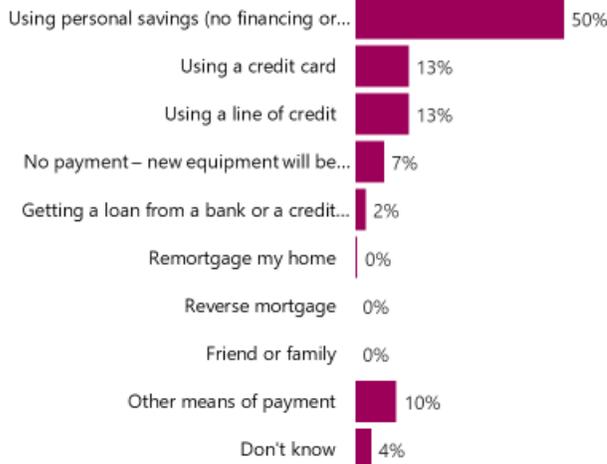


	%	Count
Age of equipment – the equipment is at the end of its useful life	69%	11
To improve energy efficiency	19%	3
To replace equipment with more environmentally friendly options	6%	1
Home comfort – the system we currently have does not provide adequate or consistent heat	0%	0
To reduce utility costs	0%	0
Maintenance of current equipment is too expensive	0%	0
Maintenance of current equipment is too time consuming	0%	0
Space – we'd like to get smaller-sized or less noticeable equipment	0%	0
Noise – our current system is too noisy	0%	0
Financial rebates	0%	0
Another reason (Please specify):	6%	1
<b>Total</b>	<b>100%</b>	<b>16</b>

\*See Open-Responses Spreadsheet for responses to this option.



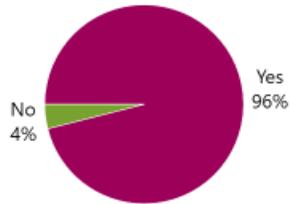
If you were to replace your heating equipment in the next 2-3 years, what would be the primary way you would pay for it?



	%	Count
Using personal savings (no financing or loan will be required)	50%	102
Using a credit card	13%	26
Using a line of credit	13%	26
No payment – new equipment will be rented from utility company	7%	14
Getting a loan from a bank or a credit union	2%	5
Remortgage my home	0%	1
Reverse mortgage	0%	0
Friend or family	0%	0
Other means of payment	10%	20
Don't know	4%	8
<b>Total</b>	<b>100%</b>	<b>202</b>



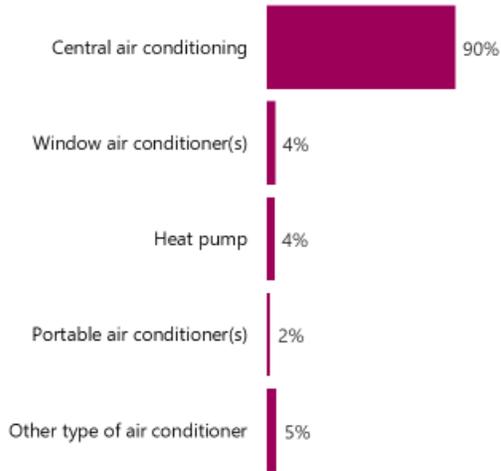
Do you have air conditioning in your home?



	%	Count
Yes	96%	194
No	4%	8
NET	100%	202



What kind(s) of air conditioning do you have?



	%	Count
Central air conditioning	90%	174
Window air conditioner(s)	4%	8
Heat pump	4%	7
Portable air conditioner(s)	2%	3
Other type of air conditioner	5%	9
Total	100%	194



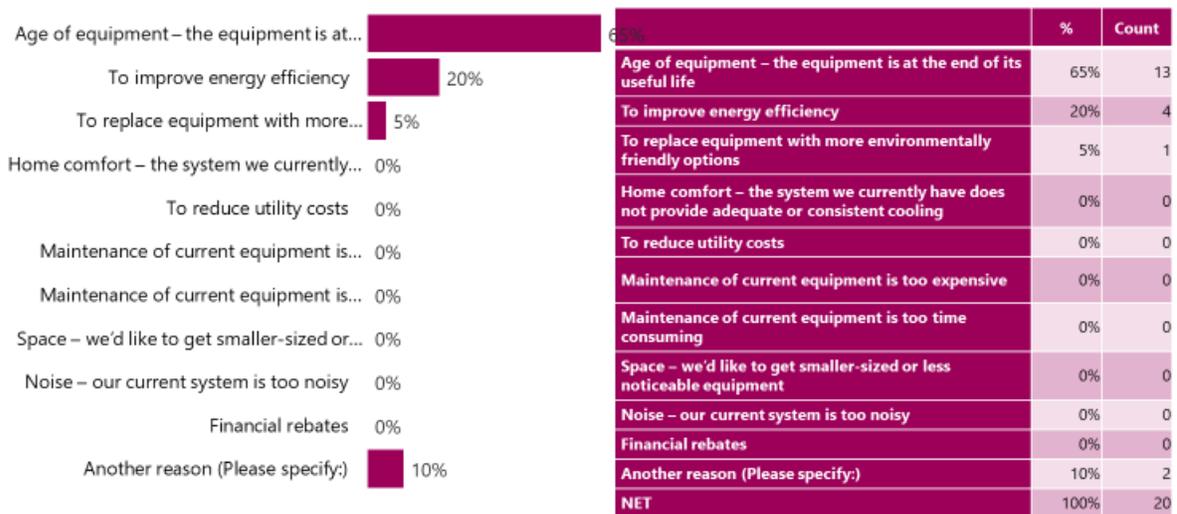
Are you intending on purchasing new air conditioning equipment or replacing your existing equipment in the next 2-3 years?



	%	Count
<b>Yes</b>	10%	20
<b>No</b>	90%	182
<b>NET</b>	100%	202

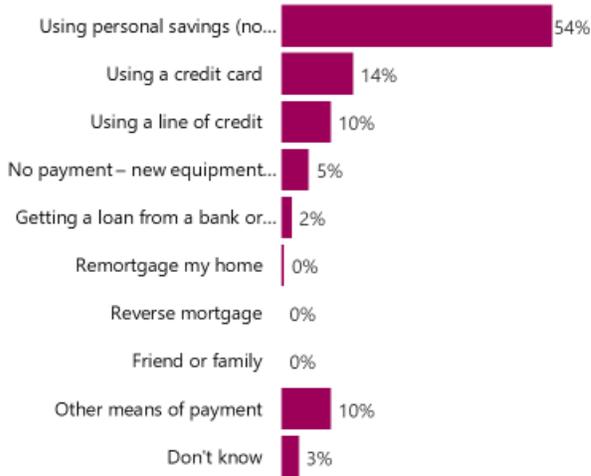


What is the primary reason you are planning on upgrading your air conditioning system?





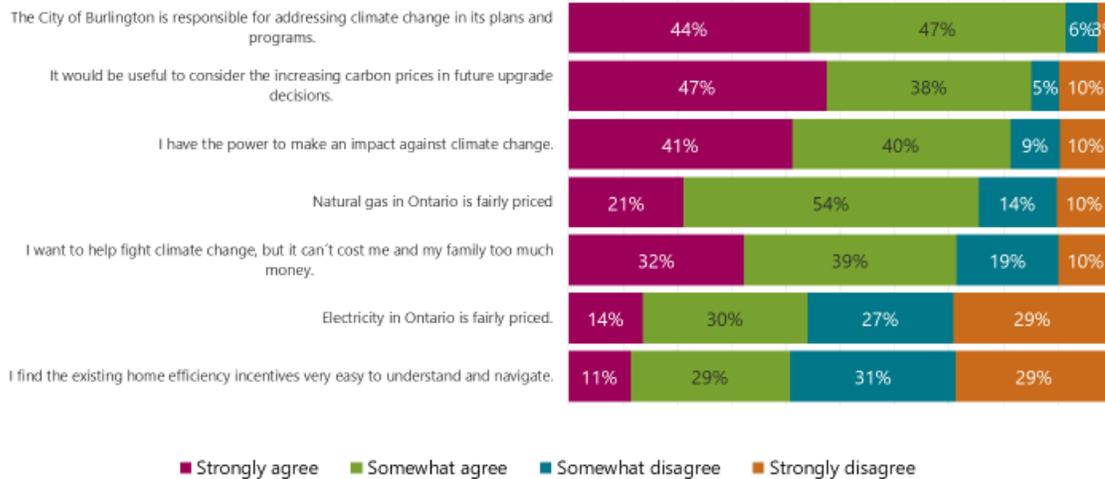
If you were to purchase or upgrade air conditioning equipment in the next 2-3 years, what would be the primary way you would pay for it?



	%	Count
Using personal savings (no financing or loan will be required)	54%	110
Using a credit card	14%	29
Using a line of credit	10%	20
No payment – new equipment will be rented from utility company	5%	11
Getting a loan from a bank or credit union	2%	4
Remortgage my home	0%	1
Reverse mortgage	0%	0
Friend or family	0%	0
Other means of payment	10%	20
Don't know	3%	7
<b>NET</b>	<b>100%</b>	<b>202</b>



Please tell us how much you agree or disagree with the following statements





What is your age?

	%	Count
18 - 24 years	0%	1
25 - 34 years	3%	6
35 - 44 years	6%	13
45 - 54 years	16%	33
55 - 64 years	22%	44
65 - 74 years	20%	41
75 - 84 years	17%	34
85 and above	3%	7
Prefer not to say	11%	23
<b>NET</b>	<b>100%</b>	<b>202</b>



How many people live in your home?

	%	Count
1 (just me)	22%	44
2	44%	89
3	10%	21
4	15%	31
5 or more	8%	17
<b>NET</b>	<b>100%</b>	<b>202</b>



What is your gender?

	%	Count	Sample Size
Female	57%	115	202
Male	39%	79	202
Non-binary	0%	0	202
Other (Please specify)*	4%	8	202
NET	100%	202	202

\*See Open-Responses Spreadsheet for responses to this option.



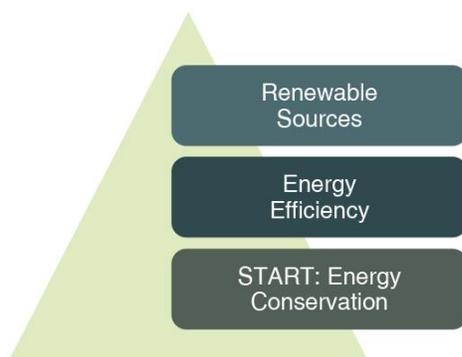
What was your total household income last year, before taxes, from all sources for all household members?

	%	Count	Sample Size
Under \$20,000	0%	1	202
\$20,000 to just under \$60,000	9%	18	202
\$60,000 to just under \$100,000	13%	26	202
\$100,000 to just under \$140,000	12%	25	202
\$140,000 and above	18%	36	202
Prefer not to say	48%	96	202
NET	100%	202	202

## APPENDIX C: PROGRAM DESIGN

### Home Upgrade Program Strategy Options

The energy hierarchy framework to guide sustainable energy decision-making outlines an initial focus on energy conservation, followed by energy efficiency, and finally incorporation of renewable energy to sustainably and responsibly transition to cleaner energy sources. The image below summarizes the hierarchy, and subsequent table outlines different strategy options, including advantages and disadvantages.



**Appendix C Figure 1:** Energy hierarchy visual summary.

**Appendix C Table 1:** Summary of advantages and disadvantages of specific energy hierarchy foci in a home upgrade program.

Approach	Advantages	Disadvantages
Energy Conservation and Efficiency Only	<ul style="list-style-type: none"> <li>• Certain upgrade options easier to implement and less costly (lightbulb change, smart thermostat etc.).</li> <li>• Greater homeowner understanding on how upgrade benefits home and occupants.</li> <li>• Homeowners may be able to complete many projects themselves.</li> <li>• Less complicated logistics.</li> <li>• Potential for financial incentives (grants, rebates etc.).</li> </ul>	<ul style="list-style-type: none"> <li>• Typically, lower GHG reductions.</li> <li>• Limited opportunity for increased home value.</li> <li>• Smaller projects may not see financial return.</li> </ul>
Renewable Energy Only	<ul style="list-style-type: none"> <li>• Typically, significantly higher GHG emission reductions.</li> <li>• Improve self-reliance for energy production (if onsite renewables installed).</li> </ul>	<ul style="list-style-type: none"> <li>• Higher costs.</li> <li>• Longer and more complex to implement.</li> <li>• May cause significant inconvenience.</li> </ul>

	<ul style="list-style-type: none"> <li>• Potential to resell back to grid, depending on programs and legislation (if onsite solar or turbine unit).</li> <li>• Potential for financial incentives (grants, rebates etc.)</li> </ul>	<ul style="list-style-type: none"> <li>• Less awareness around options and benefits.</li> <li>• Previous programming causing negative perceptions (ex. FIT program)</li> </ul>
Combination	<ul style="list-style-type: none"> <li>• Maximum GHG savings.</li> <li>• Allows for consumption reduction via energy efficiency and therefore less renewable energy installation required.</li> <li>• Large scale uptake has potential for market transformation, having a feedback effect to drive down prices, and increasing uptake.</li> </ul>	<ul style="list-style-type: none"> <li>• More work to complete.</li> <li>• Potentially more expensive than renewables only.</li> </ul>

## NRCan Energy Audit and RETScreen Comparison

**Appendix C Table 2:** Comparison of NRCan energy audit versus RETScreen software to model home energy and emissions.

	Energy Audit	RETScreen
<b>Goals and Deliverables</b>	<ul style="list-style-type: none"> <li>• Identify home energy efficiency and GHG reduction upgrades. Evaluated all aspects of home. Homeowner provided with summary report.</li> </ul>	<ul style="list-style-type: none"> <li>• Understand GHG and energy reduction savings associated with specific housing upgrades. Homeowner provided with watts per square foot baseline and GHG savings.</li> </ul>
<b>Homeowner Requirements</b>	<ul style="list-style-type: none"> <li>• One year of utility bills to determine total consumption.</li> <li>• Access to home for 2-3 hour period to conduct audit.</li> </ul>	<ul style="list-style-type: none"> <li>• One year of utility bills to determine total consumption and peak load.</li> <li>• OPTIONAL: home image and dimensions, wall: window ratio.</li> </ul>
<b>Advantages</b>	<ul style="list-style-type: none"> <li>• Completion aligns with majority of upgrade programs.</li> <li>• Focuses on many upgrades that allows for proactive homeowner planning of upgrades.</li> </ul>	<ul style="list-style-type: none"> <li>• Quick turnaround time.</li> <li>• Able to focus on upgrades of interest.</li> <li>• Able to model project stacking and impacts of multiple projects.</li> <li>• Potential to limit home visits.</li> </ul>
<b>Disadvantages</b>	<ul style="list-style-type: none"> <li>• Potential for long wait times before completion.</li> <li>• Standard process may not include upgrades of interest to homeowner.</li> <li>• Does not speak to potential financial savings.</li> </ul>	<ul style="list-style-type: none"> <li>• Would not allow for proactive planning, but would be able to model other upgrades if homeowner was interested.</li> </ul>



<b>Timing</b>	<ul style="list-style-type: none"><li>• Baseline data gathering dependent on homeowner.</li><li>• Wait time: variable, estimated 2-6 weeks.</li><li>• Audit: 2-3 hours.</li><li>• Report to homeowner: 2-4 weeks.</li></ul>	<ul style="list-style-type: none"><li>• Baseline data gathering dependent on homeowner.</li><li>• Data input and modelling time: 3 hours.</li><li>• Recommendation presentation to homeowner: 1 week.</li></ul>
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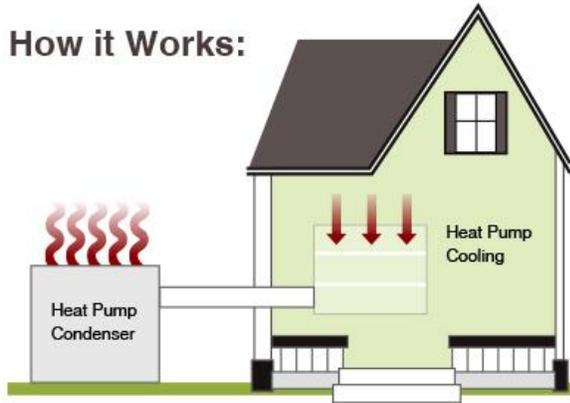
## BACCC Analyses Summary

Home Upgrade Project	Current use at home			Post Upgrade Estimate			Information on Retrofit		Change in Consumption for Year 1			Emissions Change in Year 1 in kg CO <sub>2</sub> e				\$ per kg CO <sub>2</sub> e	Impact on Consumer Hydro Bill	Impact on Consumer Gas Bill	Impact on Consumer Fuel Oil Bill
	gas	fuel oil	kWh	gas	fuel oil	kWh	useful years	project cost	net gas m <sup>3</sup>	net fuel oil	net kWh	gas	fuel oil	kWh	total reduction	Marginal abatement cost (MAC)			
gas furnace to heat pump full switch	1,600	0	800	0	0	6,300	12	\$9,000	-1,600	0	5,500+	-4,000	0	825 +	-3,175	\$2.83	\$86.55 more per month	\$45.38 less per month	N/A
gas furnace hybrid heat pump	1,600	0	800	160	0	5,750	12	\$9,000	-1,440	0	4,950+	-3,600	0	743+	-2,857	\$3.10	\$80.75 more per month	\$40.84 less per month	N/A
upgrade furnace	1,600	0	800	1,347	0	674	15	\$6,000	-253	0	-126	-632	0	-19	-651	\$9.22	\$29.82 less per month	\$7.18 less per month	N/A
upgrade window	1,600	0	800	1,592	0	796	30	\$600	-8	0	-4	-20	0	-1	-21	\$28.57	\$28.53 less per month	\$0.23 less per month	N/A
replace door	1,600	0	800	1,592	0	796	30	\$1,000	-8	0	-4	-20	0	-1	-21	\$47.62	\$28.53 less per month	\$0.23 less per month	N/A
air sealing	1,600	0	800	1,520	0	760	30	\$1,000	-80	0	-40	-200	0	-6	-206	\$4.85	\$28.91 less per month	\$2.27 less per month	N/A
fuel oil to heat pump full switch*	0	4,237	800	0	0	6,300	12	\$9,000	0	-1,600	4,700 +	0	-5,600	825+	-4775	\$1.88	\$78.11 more per month	N/A	\$118.48 less per month

Home Upgrade Project	Current use at home			Post Upgrade Estimate			Information on Retrofit		Change in Consumption for Year 1			Emissions Change in Year 1 in kg CO <sub>2</sub> e				\$ per kg CO <sub>2</sub> e	Impact on Consumer Hydro Bill	Impact on Consumer Gas Bill	Impact on Consumer Fuel Oil Bill
	gas	fuel oil	kWh	gas	fuel oil	kWh	useful years	project cost	net gas m <sup>3</sup>	net fuel oil	net kWh	gas	fuel oil	kWh	total reduction	Marginal abatement cost (MAC)			
Fuel oil hybrid heat pump*	0	4,237	800	0	160	5,750	12	\$9,000	0	-1,440	4,950+	0	-5,040	743+	-4,306	\$2.09	\$80.75 more per month	N/A	\$106.80 less per month
electric water heater	700	0	350	0	0	5,145	12	\$1,000	-700	0	4,795+	-1,750	0	719	-1,031	\$0.96	\$79.11 more per month	\$19.85 less per month	N/A
tankless gas water heater	700	0	350	490	0	245	20	\$2,000	-210	0	-105	-525	0	-16	-541	\$3.70	\$31.43 less per month	\$5.96 less per month	N/A
heat pump water heater	700	0	350	0	0	2,573	10	\$2,500	-700	0	2,223+	-1,750	0	333	-1,417	\$1.76	\$51.96 more per month	\$19.85 less per month	N/A
insulate existing gas heater	700	0	350	665	0	333	30	\$100	-35	0	-18	-88	0	-3	-90	\$1.11	\$28.68 less per month	\$0.99 less per month	N/A
insulate attic	1,600	0	800	1,586	0	784	30	\$2,000	-14	0	-16	-35	0	-2	-37	\$54.05	\$28.71 less per month	\$0.49 less per month	N/A
insulate exterior walls	1,600	0	800	960	0	480	30	\$8,000	-640	0	-320	-1,600	0	-48	-1,648	\$4.85	\$31.81 less per month	\$18.15 less per month	N/A

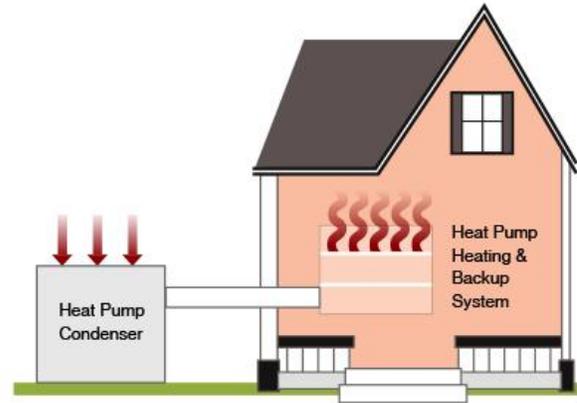
## Additional Heat Pump Information

### How it Works:



#### During the summer:

A heat pump pulls heat from inside your home and moves it outside to provide air conditioning.



#### During the fall and spring:

A heat pump pulls heat from outside your home and moves it into your home. You will need a backup heat source when temperatures are below 30 degrees F, typically mid-December through to mid-February.

**Appendix C Figure 2:** Overview of how heat pump work to move energy between indoors and outdoors, which results in heating and cooling.

## Home Upgrade Considerations

The following section was prepared in collaboration with BACCC and summarizes further considerations for home upgrade selection in the program design phase.

### Stacking

It is important to keep in mind that completing more than one retrofit project does not mean GHG savings are additive. Table 3 below outlines how, at first glance, simply adding GHG savings together makes intuitive sense for calculating GHG savings, though this would be incorrect.

**Appendix C Table 3:** Example of two home upgrades and associated GHG reductions if those reductions were additive.

Home Upgrade Project	GHG reduction (kg CO <sub>2</sub> e)
Heat pump for space heating	-3,175
Insulate exterior walls	-1,648
<b>TOTAL</b>	<b>-4,823</b>

Identified savings listed for each individual project are predicated on consumption patterns of the home. The model home used in this example uses natural gas for space heating, if a homeowner insulates their walls, with no other measures, they would reduce their consumption of natural gas and thereby their emissions by about 1,648 kgs. However, if that same

homeowner decides to go a step further and switch their space heating from natural gas to a heat pump, which uses electricity, the GHG savings from insulation drop substantially, since the insulation is no longer reducing natural gas consumption. As a result, the total emission reduction of these two measures would be less than 4,823 kg of CO<sub>2</sub>e.

The concept of stacking means it must be taken with caution to recommended measures and calculations for total GHGs reduced.

### *Quality Assurance*

Stakeholder outreach identified quality of the work and individuals completing home retrofits is important for three main stakeholders: homeowners, equipment manufacturers, and program staff. Concerns are summarized in Table 4.

**Appendix C Table 4:** Concerns and recommendations regarding upgrade quality.

Stakeholder	Quality Concern
Homeowners	<ul style="list-style-type: none"> <li>Require trust of knowledgeable and trained professionals</li> <li>Difficult to gauge capabilities of contractors if unfamiliar with home retrofits.</li> </ul>
Program staff	<ul style="list-style-type: none"> <li>Poor quality may lead to poor program reputation.</li> </ul>
Equipment manufacturers	<ul style="list-style-type: none"> <li>Poor installation compromise quality of the equipment, efficiency, and potentially homeowner satisfaction.</li> </ul>

These concerns may be compounded by the decentralized nature of the home construction industry, as it can be difficult to identify relevant certification and certified contractors. Additionally, those able to do the work properly and with a focus on energy and/or GHG reductions are limited.

A formal contractor registration process would help minimize concerns by providing already completed due diligence and a narrowed list of trusted sources for retrofit completion, which would also reduce overchoice.

### *Discounting*

Discounting refers to the valuation of an item at different points in time. Applied to home upgrades, discounting refers to how much value we place on GHG reductions that are expected to be realized in the years after the project has been completed. For example, an upgrade that reduces emissions by 1,000 kgs of CO<sub>2</sub>e per year, with technology that will last 8 years will not reduce 8,000 kgs of CO<sub>2</sub>e. This is because:

- There are no guarantees the technology will live out its full useful life.
- Energy inputs are not static. The carbon intensity of our electricity grid may change (and in fact, is likely to get dirtier with the decommissioning of Ontario nuclear plants) in the years to come, thereby changing the emission reductions of each project.
- Should there be a switch to green fuels (like natural gas to hydrogen), the projected emissions savings may never materialize.

In practice, discounting could be applied to devalue the projected emission reductions by 10% (as an arbitrary example) each year after the project is complete to account for the uncertainty.

### *Product Conformity*

Some incentive programs provide a specific list of products that are available for funding. As an example, Enbridge provides suppliers with monthly lists of specific water heaters that would qualify for funding in their retrofit incentive program. This approach can be time intensive and does not adjust easily to new product offerings. On the other hand, knowing which products are eligible for incentives can help guide suppliers in their stock and purchasing decisions.

An alternative approach to program design that would help guide suppliers, while also allowing for innovation and variety, would be to provide minimum product standards. In particular, a program could outline minimum SEER scores, minimum warranties, minimum HSPF ratings, and minimum capacity ratings at certain temperatures. Suggestions for each are provided below.

**AHRI Number** - It is recommended that eligible heat pumps should have a certified reference number from the Air-Conditioning, Heating, and Refrigeration Institute (AHRI). The AHRI Directory is a trusted source for performance certified HVAC equipment.

**Minimum SEER Scores** - Seasonal Energy Efficiency Ratio (SEER) can range from 13 to 21 and indicates seasonal cooling efficiency of a heat pump. The higher the score, the higher the efficiency. It is recommended that 15 SEER is the minimum score for heat pumps eligible for incentive funding.

**Minimum HSPF Ratings** - Heating seasonal performance factor (HSPF) indicates seasonal heating efficiency of a heat pump. The higher the score, the higher the efficiency. It is recommended that 10 HSPF is the minimum rating for heat pumps eligible for incentive funding. The HSPF ratings ought to be for AHRI Climate Region Zone IV.

**Minimum Warranties** - Warranties function as a written guarantee to assure buyers that their product will be replaced or repaired, if necessary, within a specified period of time after the purchase. It is recommended that 5 years is the minimum warranty for heat pumps eligible for incentive funding.

**Minimum Capacity Ratings** - The rated outdoor temperature of a heat pump reflects the lowest temperature that the unit can provide adequate heating. As outdoor temperatures drop, an air source heat pump must work harder to extract heat. Given the climate of the Bay Area, eligible heat pump products should have a minimum rated outdoor temperature of -15C and 100% capacity at -8C, allowing back up heat to kick in, when needed. For context, the Bay Area sees historical average temperatures of about -9C during the coldest months of winter (National Oceanic and Atmospheric Administration).

These suggested minimum standards are based on BACCC consultation with local wholesalers, suppliers, and manufacturers. The minimum standards proposed herein also reflect many of the performance requirements set by the Northeast Energy Efficiency Partnerships (NEEP) for cold

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climate air-source heat pumps. NEEP [hosts a list](#) of air source heat pumps that are suited for cold climates, with an IECC climate zone of 4 and higher. NEEP is one of six Regional Energy Efficiency Organizations funded by the US Department of Energy, tasked with accelerating energy efficiency in the Northeast and Mid-Atlantic states.

Aligning the product eligibility with NRCan's Greener Homes heat pump list would also suffice, particularly if the municipality wishes to make the incentive program stackable.

### *Embodied Carbon*

Embodied carbon accounts for GHG emissions associated with materials, technology, manufacturing, transportation, disposal, contractor travel and facilities etc. (i.e. the emissions generated above and beyond those within the home when the retrofits are in use). These may also be called up and downstream emissions.

Up and downstream emissions may contribute significantly to the overall impact of a products GHG footprint, though it is not recommended to include these emissions in the overall impact of the program. The rationale for this includes:

- **Difficulty in accurately quantifying emissions** due to a lack of tracking, numerous options for technology, geography etc.
- **Time and resources** required to complete calculations
- **Limited municipality control** over emissions that contribute to embodied carbon.



## APPENDIX D: FINANCIAL INCENTIVES

**Appendix D Table 1:** Home upgrade financing mechanism summary

Financing Mechanism: Municipal Options	
<b>Description</b>	Temporary charges added to property taxes to pay for upgrades.
<b>Pros</b>	<ul style="list-style-type: none"> <li>• Potential for significant GHG reductions.</li> <li>• Makes upgrades more affordable to a larger population of homeowners.</li> <li>• Access to favorable loan terms.</li> <li>• Low income households, with few collateral assets or limited access to credit, will be able to qualify for financing</li> <li>• Loan is tied to the property, not to its owner, which can incentivize homeowners to complete measures that are otherwise not cost effective over the time they anticipate owning the home</li> <li>• LIC loans are low risk for the municipality: if loan repayments go in arrears, the overdue amount can be recovered from the property using a special priority lien. This lien takes precedence over other liens on the property, including mortgage lines</li> <li>• Administrative and set-up costs may be covered by an additional administrative charge on LIC loans. Meaning, an LIC home upgrade program can operate with no net cost to the municipality and does not have to use taxpayer funds.</li> <li>• LIC loans are recoverable and therefore do not count toward a municipality's debt, as far as provincial legislation is concerned.</li> <li>• Approval may be easier.</li> <li>• No down payment necessary.</li> <li>• Interest payments may be tax-deductible.</li> <li>• Real estate concerns for resale with lien on the home</li> </ul>
<b>Cons</b>	<ul style="list-style-type: none"> <li>• Potential for high startup costs upfront for municipalities.</li> <li>• Time and personnel capacity in the city are required.</li> <li>• Mortgage lenders and insurers express concern over the senior lien position of LIC relative to the mortgage and because the Canadian Mortgage and Housing Corporation (CMHC) has not historically extended mortgage insurance to cover LIC loans.</li> <li>• Real estate concerns for resale with lien on the home.</li> </ul>

LIC Charges

<b>Grant/Rebate</b>	<b>Description</b>
	Non-repayable grants offered to homeowners to cover some or all of the costs of upgrades, thereby incentivizing them.
	<b>Pros</b>
	<ul style="list-style-type: none"> <li>• No payback required for homeowners.</li> <li>• High interest level from public can drive participation.</li> </ul>
<b>Tax Incentive</b>	<b>Description</b>
	Reductions in taxes to incentivize building retrofits and efficiency measures
	<b>Pros</b>
	<ul style="list-style-type: none"> <li>• Potential for high GHG savings.</li> <li>• Potential high interest from public.</li> </ul>
<b>Cons</b>	
<ul style="list-style-type: none"> <li>• Reduces municipal tax revenue</li> <li>• Time and personnel capacity in the city are required</li> <li>• Does not provide upfront capital, thereby excluding low income individuals</li> </ul>	

**Appendix D Table 2: Examples of Complementary Programs (Non-Exhaustive).**

Group	Relevant Program(s) and Funding
Save on Energy	Energy Affordability Program
Enbridge Union	Smart Thermostat savings, free upgrades based on income, energy efficiency upgrades
Federal Government	Canada Greener Homes Grant
Green Brain	Energy Savings Kit

Service Organizations for delivery of Canada Greener Homes Grant, Energy Affordability Program, and Home Winterproofing Program are found throughout Ontario to support delivery. The RDC is recommended to support these organizations.

## Home Upgrade Financing Examples

Non-exhaustive list of home upgrade financing examples completed by BACCC.

### *LIC Mechanism*

#### Toronto

- In 2014, the City of Toronto launched the Home Energy Loan Program (HELP) for houses and the High-rise Retrofit Improvement Support Program (Hi-RIS) for multi-unit residential buildings.
- As of June 2019, almost \$14.9 million in financing has been committed to projects with over 187 homes and 15 buildings (2,200 units) participating in the program
- How it works:
  - All property owners on title must consent to participate, and the property tax and utility payments to the city must be in good standing. The program also requires written consent from a mortgage lender.
- An average project achieved a 30% reduction in energy use and 28% reduction in greenhouse gas emissions.
- After 5 years of program operation, the HELP and Hi-RIS programs have not achieved the level of uptake needed for the City of Toronto to achieve its GHG reduction targets
- Problems:
- Limited marketing of the program meant that many homeowners were not aware of the program or its benefits.
- Mortgage lender consent has been a key barrier to program participation.
- Note: Mortgage lender consent is not a requirement under Ontario Regulation 322/12. However, CHEERIO's 2013 Local Improvement Charge (LIC) Financing Program Design for Residential Buildings in Ontario report recommended requiring written consent from all lenders holding liens on the property to prevent disputes. Roughly half of the City of Toronto's HELP applicants failed to qualify due to challenges in receiving consent from mortgage lenders.

## **Nova Scotia**

- Nova Scotia is currently the most active province in terms of the number of LIC programs with approximately 10 municipalities have either launched or are currently creating programs.
- In Nova Scotia, the Clean Foundation has acted as the administrator of several LIC programs.
- The Halifax Solar City Program offers property owners in the municipality financing for various solar technologies, including electric, hot water, and hot air.

## **Singapore**

- Building Retrofit Energy Efficiency Financing (BREEF) Scheme offers financing to pay the upfront costs of energy retrofits of existing buildings, through an energy performance contract arrangement.
- BREEF can cover the cost of equipment, installation and professional fees.
- Up to \$4 million or 90% of costs, whichever is lower.
- Maximum loan tenure - 5 years.
- Loan through financial institutions.

## **Germany**

- Energy Efficient Renovation Program of the KfW Bank Group.
- Provides preferential loans and grants for single energy efficient components and for comprehensive upgrades.
- The Federal Government makes budget funds available to KfW under the CO<sub>2</sub> Building Rehabilitation Program through the Federal Ministry of Transport, Building and Urban Development.
- This program provides builders with reduced-interest loans or investment bonuses with which they can build or convert their houses or flats into energy-efficient homes.
- KfW created a digital application process to make it more customer-friendly, with direct confirmation regarding the eligibility of their application from their financing partners in just a few minutes.
- Positive impact on the climate by reduction of CO<sub>2</sub>: during the period between 2006 to 2012, the program's led to a reduction in total of 5.9 mtCO<sub>2</sub>e/yr.
- High uptake: In 2012 alone, 240,000 housing units were refurbished to more energy efficient levels, 116,000 energy efficient housing units were newly built with support of the program (roughly every second newly built housing unit in Germany).

## **Melbourne, Australia**

- The City of Melbourne's 1200 Buildings Program aims to encourage the environmental retrofit of around two thirds of the municipality's commercial stock.
- Since 2010, the savvy owners of over 540 commercial office buildings in Melbourne have retrofitted to improve energy and water efficiency.

- By improving energy efficiency by around 38 per cent, the commercial building sector alone could eliminate 383,000 tonnes of greenhouse gas emissions every year
- Eligibility: Owners and managers of commercial buildings within the City of Melbourne's municipal boundaries.
- An environmental upgrade agreement is a tripartite contract between a building owner, a bank and the City of Melbourne. When the agreement is established, the lending body (bank) forwards the retrofit loan to the owner. The City of Melbourne then collects the loan repayment through a rate charge (the amount funded is declared by the Melbourne City Council as an environmental upgrade charge), and finally passes it back to the bank. Council rates and charges take precedence over mortgages as charges against property. This means any debt owing to Council will take priority, thereby greatly reducing the risk for banks.

### **San Francisco**

- San Francisco's commercial Property Assessed Clean Energy program (PACE), property owners can secure 100% financing from an investor of their choice, and repay the cost of the upgrade over time through a special line item on their property tax bill.
- Financing through two third party partners with the City.
- No down-payment and no minimum credit score.
- Easy payments through your property tax bill.
- Lower utility bills.
- Verified contractors and consumer protection.
- Supported by the City and County of San Francisco.

### **Seoul, South Korea**

- Building Retrofit Program (BRP) Loan Support Scheme meant to spur retrofitting in government, commercial and residential buildings.
- This initiative promotes energy efficiency refurbishments by facilitating access to highly attractive, low interest rate loans with generous repayment and grace periods.
- In 2013, approximately 14,000 different types of buildings were participating in the BRP.
- The Seoul Metropolitan Government provides low-interest loans to buildings and energy service companies to help ease the burden of installation costs. Specifically, Seoul offers 8-year loans at 1.75% interest rate per year for up to \$1.87 million for each project (current market interest rate is hovering over 3.8%).
- After assessment, the city makes a recommendation to financial institutions and the applicant submits a loan application to a bank. The bank confirms the possibility of financing.
- Applicants repay the loan directly to the financial institution concerned.
- Applicants have the option of a long-term repayment plan up to eight years. In the case of non-residential buildings, applicants are also eligible for a three-year grace period where repayments are subject only to interest.

## *Grant/Rebate*

### **Vancouver - Heritage Energy Retrofit Grant**

- Designed to encourage and enable deep energy retrofits and GHG emissions reductions while respecting the heritage fabric and character-defining elements of participating homes in Vancouver.
- The Heritage Energy Retrofit Grant is available to qualifying pre-1940 or homes on the City of Vancouver Heritage Register that meet eligibility requirements and successfully complete the application package.
- Participants in the Heritage Energy Retrofit Grant program may access a grant of up to \$10,000 to contribute to the costs of recommended retrofits.
- Heritage Energy Retrofit Grants for retrofits are variable and based on a program calculation of \$150 per tonne of GHG emission reduction per year for the estimated lifetime of the retrofit.
- Rebates a homeowner is eligible for through other provincial programs are subtracted from the calculated Heritage Energy Retrofit Grant.

### **Chicago - Retrofit Chicago Residential Partnership**

- Provides free energy efficient fixtures, such as programmable thermostats and showerheads, as well as rebates on larger appliances, like qualifying air conditioners, to homeowners while helping them identify trusted energy efficiency assessment contractors.

### **Edmonton - Building Energy Retrofit Accelerator**

- Rebate program that provides financial incentives for energy efficiency upgrades to commercial and institutional buildings.
- The program offers financial rebates on the purchase and installation of select energy-efficient equipment.
- Rebates are determined in a prescriptive manner, meaning that the rebate amount is per unit (fixture, sensor, ton, hp) and the rebate is determined by the number of units installed.
- For projects that do not include installation of a heat pump, a rebate cap of \$75,000 applies to the project.
- For projects that include installation of a heat pump, a rebate cap of \$125,000 applies to the project.

### **British Columbia**

- CleanBC Better Homes Program offers rebates and easy access to professionals.
- BC's online hub for homeowners and businesses to access information, rebates and support to reduce energy use and greenhouse gas emissions in new and existing homes and buildings.

- Easy to use rebate search tool for when you are renovating a home or building a new home.
- Single application for CleanBC Better Homes, BC Hydro, FortisBC and local government rebates.
- Information and answers to frequently asked questions on energy efficiency upgrades and accessing rebates.
- Search tool to find registered EnerGuide Rating System energy advisors for residential renovations.
- Contractor directories to find registered contractors in your area.

## *Tax Incentive*

### **Mexico City**

- Sustainable Buildings Certification Program offers the owners or tenants of commercial, residential and industrial buildings an opportunity to reduce GHGs.
- By requiring multiple actions covering energy, water, waste, transport and social and environmental responsibility, SBCP promotes a holistic view of sustainability in the building industry.
- Participation from owners and tenants is incentivized through tax reductions, reduced energy and water bills, access to project financing, expedited permitting procedures, and finally, prospects of increased rental yields from green premiums.
- For existing buildings, enrolling in the program firstly requires performing an audit. SBCP participants are responsible for costs associated with this step.
- Agents will identify for building owners or tenants' opportunities to invest in building upgrades to gain a higher certification level. If adopted, building improvements are then carried out. Once a building has obtained its final evaluation from auditors, an appropriate level of certification is determined and awarded by the Ministry of the Environment.
- Points are assigned to the retrofits; property tax discounts correlate to points achieved
- Compared to the base year 2009, for the 40 buildings certified as of 2015, the program has achieved a total reduction of 20.1 million kWh of electricity and 66,120 tCO<sub>2e</sub>

## APPENDIX E: PROGRAM DELIVERY

**Appendix E Table 1:** Program delivery options

<b>Delivery Type</b>	<b>Description</b>	<b>Additional Information</b>
<b>Public Sector</b>	Public-sector organizes and coordinates the program and secures/ supports funding.	<ul style="list-style-type: none"> <li>• Straightforward to implement regarding procurement and delivery.</li> <li>• often implemented with social housing.</li> </ul>
<b>Community-Led</b>	Community-owned program focusing on impacts and member needs.	<ul style="list-style-type: none"> <li>• Decisions tend to balance between profits and needs of members.</li> <li>• Typically look into renewable energy versus energy efficiency.</li> </ul>
<b>Market-Based</b>	Minimal government control, free-market approach.	<ul style="list-style-type: none"> <li>• Typically seen for large scale uptake.</li> <li>• increased potential for profit, but also predatory sales tactics.</li> </ul>

**Appendix E Table 2:** Advantages and disadvantages of various PDA’s who could implement the program.

	Description	Advantages	Disadvantages
<b>Public Sector Led</b>	<ul style="list-style-type: none"> <li>All program aspects administered by the municipality.</li> </ul>	<ul style="list-style-type: none"> <li>One entity handles the program from start to finish.</li> <li>No perverse incentives from profits.</li> </ul>	<ul style="list-style-type: none"> <li>Limited resources and/or expertise.</li> <li><b>Less flexible</b> due to legislative and bureaucratic requirements that may slow down program delivery.</li> <li>May be subject to perverse <b>incentives of politics.</b></li> <li><b>Limited to working within municipal boundaries</b> and unlikely to enter into beneficial partnerships with other municipalities.</li> <li>May take <b>more time to set up</b> and establish.</li> <li>Not optimally positioned to enter into partnerships with the private sector.</li> </ul>
<b>Not-for-Profit</b>	<ul style="list-style-type: none"> <li><b>Program set up and operations</b> administered by <b>Not-for-profit.</b></li> <li>LIC administration completed by municipality.</li> </ul>	<ul style="list-style-type: none"> <li>May be <b>more flexible</b> in their legislative and bureaucratic requirements than a municipality, <b>speeding up program delivery.</b></li> <li>No perverse incentives from profits.</li> <li>No perverse incentives to recommend products and services offered by the agent (conflict of interest).</li> <li>Avoids perverse incentives of politics.</li> <li>May be <b>more trusted</b> by consumers &amp; business.</li> </ul>	<ul style="list-style-type: none"> <li>Potential for limited expertise.</li> </ul>

		<ul style="list-style-type: none"> <li>• <b>Not limited to working within municipal boundaries</b> and can enter into beneficial partnerships with other municipalities.</li> <li>• May take relatively <b>less time to set up</b> and establish.</li> <li>• <b>Better positioned to enter into partnerships</b> with the private sector than the municipality.</li> </ul>	
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>For Profit Entity (aka Market-led)</b></p>	<ul style="list-style-type: none"> <li>• Program set up and operations administered by for profit.</li> <li>• LIC administration completed by municipality.</li> </ul>	<ul style="list-style-type: none"> <li>• May be <b>more flexible</b> in their legislative and bureaucratic requirements than a municipality, speeding up program delivery.</li> <li>• Avoids perverse incentives of politics.</li> <li>• <b>Not limited to working within municipal boundaries</b> and can enter into beneficial partnerships with other municipalities.</li> <li>• May take relatively less time to set up and establish.</li> <li>• <b>Better positioned to enter into partnerships</b> with the private sector than the municipality.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>May have perverse incentives from profits.</b></li> <li>• May be less trusted by consumers.</li> </ul>



<p><b>Municipal Services Corporation</b> (owned by the City as a subsidiary, yet separate)</p>	<ul style="list-style-type: none"> <li>• Program set up and operations administered by MSC.</li> <li>• LIC administration completed by municipality.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Not limited to working within municipal boundaries</b> and can enter into beneficial partnerships with other municipalities.</li> <li>• <b>Better positioned to enter into partnerships</b> with the private sector than the municipality.</li> </ul>	<ul style="list-style-type: none"> <li>• May be subject to some legislative and bureaucratic requirements, making program delivery less flexible.</li> <li>• May take relatively more time to set up and establish.</li> <li>• May be subject to perverse <b>incentives of politics</b>.</li> </ul>
<p><b>Utility Provider</b></p>	<ul style="list-style-type: none"> <li>• Program set up and operations administered by utility.</li> <li>• LIC administration completed by municipality.</li> </ul>	<ul style="list-style-type: none"> <li>• May be <b>more flexible</b> in their legislative and bureaucratic requirements than a municipality, <b>speeding up program delivery</b>.</li> <li>• Greater chance to avoid perverse incentives of politics.</li> <li>• <b>Not limited to working within municipal boundaries</b> and can enter into beneficial partnerships with other municipalities.</li> <li>• May take relatively <b>less time to set up</b> and establish.</li> </ul>	<ul style="list-style-type: none"> <li>• No perverse incentives from profits.</li> <li>• No perverse incentives to recommend products and services offered by the agent (conflict of interest).</li> <li>• Potentially better positioned to enter into partnerships with the private sector than the municipality.</li> <li>• Potential for limited trust with business and customers.</li> </ul>

**Appendix E Table 3: Examples of Complementary Programs (Non-Exhaustive)**

Group	Relevant Program(s) and Funding
<b>Save on Energy</b>	Energy Affordability Program
<b>Enbridge Union</b>	Smart Thermostat savings, free upgrades based on income, energy efficiency upgrades
<b>Federal Government</b>	Canada Greener Homes Grant
<b>Green Brain</b>	Energy Savings Kit

Service Organizations for delivery of Canada Greener Homes Grant, Energy Affordability Program, and Home Winterproofing Program are found throughout Ontario to support delivery. The RDC is recommended to support these organizations.

The following is a non-exhaustive list of GTHA-related climate adaptation programming (as of December, 2021) that may be offered through the RDC. These include home-related and non-related programs that citizens can access or learn more. Examples include programs in Burlington and Hamilton.

**Appendix E Table 4: Examples of Climate Resilience-Related Programming within Hamilton and Burlington.**

Program	Description
<b>Hamilton backwater valve program</b>	More intense rainfalls can lead to contaminants entering drinking water as infrastructure becomes overwhelmed with water and lead to water flowing in the wrong direction. This program ensures that the City of Hamilton drinking water quality and distribution system is protected by regulating this backflow when it does occur.
<b>Halton Region's Basement Flooding Mitigation Program</b>	Upgraded wastewater service lines and maintenance holes to ensure wastewater infrastructure is in a state of good repair and help prevent sewer back-ups that can lead to basement flooding.
<b>Halton Region Enhanced Basement Flooding Prevention Subsidy</b>	This program offers financial support for residents who make the necessary improvements on their homes to prevent storm water from entering the wastewater system and to reduce the risk of flooding from sewer backup. Programs include: <ul style="list-style-type: none"> <li>• Downspout disconnection.</li> <li>• Weeping tile disconnection and sump pump installation.</li> <li>• Backwater valve insulation.</li> <li>• Sewer lateral (pipe) lining and repair.</li> </ul>

<p><b>Home Flood Protection Program</b></p>	<p>Previous offerings included a 60-90-minute inspection of residents' homes and recommendation report informing residents on how to reduce their risk of flooding and in turn reduce damage if flooding occurred. Program initially offered at a subsidized price of \$125. Grant options to support financial needs approved but rollout paused due to COVID.</p>
<p><b>Trees Please</b></p>	<p>Environment Hamilton offers free tree giveaway. Fully mature trees not only provide ecosystem support, but can also improve home temperature stabilization. Currently available for Hamilton homeowners only.</p>

## APPENDIX F: GOALS AND METRICS

**Appendix F Table 1:** Summary of recommended program goals and metrics.

Goals	Priority	Metric(s)
<b>Community</b>		
3 partnerships/ collaborations developed by end of first year post-launch.	Medium	Depending on skills and specific goals, may include business, non-profits, utilities, home upgrade businesses etc.
20 referrals to complementary programs.	Medium	Number of homeowners that inquire about program supports, who are referred to complementary programs.
<b>Stakeholder Experience and Value</b>		
Minimum 80% of homeowners have positive program experience and identify program value.	High	Post-home upgrade survey results that capture information.
80% of contractors identify program as valuable.	High	Annual survey results or follow-up discussions for program feedback.
15 qualified contractors by end of first year (post-launch).	Low	Number of approved contractors on websites qualified contractor list.
<b>Environmental</b>		
98% pre-2017 dwellings retrofitted by 2050	High	Homes upgraded annually through program. The City's Climate Action Plan outlines (pg. 63 and 64) total home upgrades required in 5-year increments to achieve home upgrade and heat pump goals.
Electrical savings of 50%	Low	kWh use per home (pre and post installation) for each home and cumulatively for all upgrades.
Thermal savings of 50%	High	m <sup>3</sup> or L of fuel per home (pre and post installation) for each home and cumulatively for all upgrades.

50% Reduction in GHG per home	High	tCO <sub>2</sub> e reduced per home (pre and post installation) as well as cumulative annual and total cumulative (all years).
<b>Financing</b>		
50% of participants utilize LIC financing in first year.	Low	Total loans provided/ total participants.
Average loan amount of less than \$10,000.	Medium	Average annual loan amount and cumulative loan averages.
Average payback period of 15 years	Low	Average annual and cumulative loan payback period, total amount paid back annually.
Loan default rate of 1% or less.	Medium	Total annual and cumulative default rates.
<b>Participation and Uptake</b>		
Reach of 1,000 in first year.	Medium	Total number of Burlington citizens engaged on program through all outreach, education, business development, and marketing strategies.
Conversion rate of 15% in first year.	High	Total program participants/ total reach
20 homes upgraded in first year.	High	Total homeowners that successfully completed program in a calendar or fiscal year
20% of homes with air source heat pumps by 2050.	Medium	Annual and cumulative installed.
40% of homes have ground source heat pumps by 2050.	Medium	Annual and cumulative installed.
\$40,000 external support by end of first program year.	High	Total funding brought in by non-municipal sources.
Market penetration rate of 0.25%	Medium	Total homes upgraded/ total eligible Burlington homes.
Total homeowners assisted in program.	High	Sum of total homeowners that participated in the program, were referred to other programs, completed inquiries, gathered climate adaptation information etc.
<b>Energy Poverty</b>		
Support citizens with increased likelihood of energy poverty.	Medium	Total program participants identified to be in energy poverty.



Understand contribution of homeowners accessing the program that are low/moderate income.	Medium	Total program participants identified to be low/moderate income.
<b>Marketing and Communication</b>		
Homeowners and contractors are engaged through a minimum of 3 different options.	High	Annual and cumulative website visits, social media followers, inquiries from email/phone/website, events etc.
500 visits to website in first year.	Medium	Total website visits.
150 inquiries in first year.	Medium	Phone, email, and website inquiries.

## APPENDIX G: EDUCATION AND OUTREACH CAMPAIGN

### Market Education Campaign Summary & Results

**All work completed on the *Education and Outreach Campaign* was completed by the Bay Area Climate Change Council**

#### **BACKGROUND**

As a component of BACCC's work to advocate for deep energy retrofits for existing buildings in the Bay Area, BACCC developed a communications and education campaign to educate homeowners and other market actors on home retrofits.

#### **CAMPAIGN OVERVIEW**

BACCC staff produced four mediums of educational materials for this campaign: Infographics, graphic ads, long form videos, and short form videos.

##### **Infographics**

BACCC staff created two infographics for each of the five market segments: contractors/suppliers, realty, price conscious consumers, low income homeowners/seniors, environmentally conscious consumers. In total, BACCC staff produced ten 'poster-style' infographics. These infographics have been made publicly available on the BACCC website.

The infographics were distributed via email to thirty-one local stakeholders, covering the five market segments. Stakeholders included: Enbridge, Burlington Hydro, Alectra, non-profits like Immigrants Working Centre Hamilton and Neighbour to Neighbour, Canadian Home Builders, West End Home Builders Association, various neighbourhood associations, realtors, and the Heating, Refrigeration and Air Conditioning Institute of Canada. Approximately one third of the contacted stakeholders committed to further disseminating the infographics among their networks: internally among staff, in upcoming member newsletters, with clients, at training sessions etc. Many stakeholders scheduled meetings to discuss this and future collaborations with BACCC that will continue into 2022.

##### **Graphic Ads**

Along with the ten 'poster-style' infographics, BACCC staff created two social media ad versions of the price conscious consumers, low income homeowners/seniors, environmentally conscious consumers market segment infographics. The ads were optimized for audience reach, and were targeted to specific audiences that matched the corresponding market segment. These six social media graphic ads ran on Facebook and Instagram in November and December 2021. The results of these ads can be found below.

##### **Long Form Videos**

BACCC staff created six ‘long-form’ educational videos. On social media, ‘long form’ content is considered to be any video over fifteen to thirty seconds in length. These six videos covered the following topics: the connection between home choices and utility bills, support programs for home retrofits, air tightness & air sealing, what to expect from an energy audit, how to understand an energy audit, and heat pumps. The videos are [publicly available on BACCC’s YouTube channel](#) and on BACCC’s website.

The Facebook versions of the long form videos were converted into paid advertisements. The ads were optimized for video views, and were targeted to residents within the Bay Area. These six long form video ads ran on Facebook in November and December 2021. The results of these ads can be found below.

### Short Form Videos

BACCC staff created twelve ‘short form’ educational video clips for social media: two clips corresponding to each of the six long form videos. These videos covered much of the key concepts of the long form videos, but in a brief and more casual format.

The videos were shared on BACCC’s Instagram page as Reels, and BACCC’s TikTok account. The Instagram Reels versions of the short form videos were converted into paid advertisements. The ads were optimized for video views, and were targeted to residents within the Bay Area. These twelve short form video ads ran on Instagram between November and December 2021. The results of these ads can be found below. The organic versions of these videos will continue to be shared on Reels and TikTok beyond the end of the campaign.

## AD RESULTS

	Reach <sup>1</sup>	Impressions <sup>2</sup>
Graphic Ads	62,092	175,008
Long Form Videos	38,276	46,767
Short Form Videos	43,900	74,990
<b>TOTAL</b>	<b>121,314</b>	<b>296,765</b>

## SAMPLE INFOGRAPHICS

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<sup>1</sup> Reach is the number of people who saw the ad (unique view)

<sup>2</sup> Impressions are the number of total times that any ad content entered a person’s screen (total views)

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## What programs exist for seniors to reduce utility bills?

There are several incentives available for homeowners to improve their home efficiency, reduce their utility bills, and improve home comfort

### REDUCE ENERGY COSTS BY UP TO 30%



Enbridge Home Winterproofing Program

# FREE

upgrades for low-income homeowners

More than 22,000 homes have already participated



Learn more

#### WHAT'S INCLUDED

- A free home energy assessment by a trusted delivery agent
- Free energy-efficient upgrades
- Quick, professional installation by Enbridge's qualified contractors

#### YOU'LL GET

- Free insulation
- Free draft proofing
- A free smart thermostat



# ODSP recipients qualify for free home energy upgrades

There are several incentives available for homeowners to improve their home efficiency, reduce their utility bills, and improve home comfort

## REDUCE ENERGY COSTS BY UP TO 30%



Enbridge Home  
Winterproofing Program

# FREE

upgrades for low-income homeowners

More than 22,000 homes  
have already participated

[Learn more](#)

### WHAT'S INCLUDED

- A free home energy assessment by a trusted delivery agent
- Free energy-efficient upgrades
- Quick, professional installation by Enbridge's qualified contractors

### YOU'LL GET

- Free insulation
- Free draft proofing
- A free smart thermostat

## APPENDIX H: BUSINESS PLAN

**Appendix H Table 1:** Financial summary of first four years of program through **100%** municipal financial support.

Municipal Support Only					
REVENUE					
		Year 1	Year 2	Year 3	Year 4
<b># Homes upgraded</b>		<b>20</b>	<b>40</b>	<b>100</b>	<b>150</b>
<b>Payment Type</b>	<b>Frequency</b>	<b>Amount (\$)</b>	<b>Amount (\$)</b>	<b>Amount (\$)</b>	<b>Amount (\$)</b>
<b>Admin and Service Fees</b>					
Customer Admin	One-time	2,000	4,000	10,000	15,000
<b>Grants</b>					
<u>FCM</u>	One-time	-	-	-	-
<b>Municipality</b>					
<b>Municipality 1 (Burlington)</b>	Multi-year	<b>603,000</b>	<b>807,000</b>	<b>823,500</b>	<b>1,086,000</b>
Municipality 2	Multi-year	-	-	823,500	1,086,000
<b>External</b>					
Municipal in-kind, partnerships, sponsorships, utilities, youth hiring etc.	Annual	125,000	125,000	170,000	170,000
<b>TOTAL PROGRAM REVENUE (\$) without City Funding</b>		<b>127,000</b>	<b>129,000</b>	<b>180,000</b>	<b>185,000</b>

**EXPENSES**

		Year 1	Year 2	Year 3	Year 4
<b>Staff</b>	<b>Frequency</b>	<b>Amount (base salary) (\$)</b>			
Program manager	Annual	90,000	90,000	90,000	90,000
Marketing and Comms		65,000	65,000	130,000	130,000
Business Development		65,000	65,000	130,000	130,000
Technical Expertise		65,000	65,000	65,000	65,000
Customer Service		50,000	50,000	100,000	100,000
<b>TOTAL PAYROLL</b>		<b>335,000</b>	<b>335,000</b>	<b>515,000</b>	<b>515,000</b>
<b>Other</b>	<b>Frequency</b>	<b>Amount</b>			
Marketing and Promo	Annual	30,000	30,000	60,000	60,000
IT	Annual	12,000	12,000	12,000	12,000
RETSscreen templates	Startup	2,000	0	0	0
Supplies	Annual	7,000	5,000	5,000	5,000
Communication	Annual	7,000	5,000	5,000	5,000
<b>TOTAL OTHER (\$)</b>		<b>58,000</b>	<b>52,000</b>	<b>82,000</b>	<b>82,000</b>
<b>LIC Loan</b>					
Loan Loss Reserve (5%)	Annual	10,000	20,000	50,000	75,000
Loan Capital	Annual	200,000	400,000	1,000,000	1,500,000
<b>TOTAL LIC LOAN</b>		<b>210,000</b>	<b>420,000</b>	<b>1,050,000</b>	<b>1,575,000</b>
<b>TOTAL (\$)</b>		<b>603,000</b>	<b>807,000</b>	<b>1,647,000</b>	<b>2,172,000</b>
<b>4 year total (\$)</b>	<b>5,229,000</b>				
<b>Burlington pays (\$)</b>	<b>5,229,000</b>				

**Appendix H Table 2: Financial summary of first four years of program leveraging FCM Capital Program as main funding source.**

<b>FCM + Municipal Support</b>					
<b>REVENUE</b>					
		<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>
<b># Homes upgraded</b>		<b>20</b>	<b>40</b>	<b>100</b>	<b>150</b>
<b>Payment Type</b>	<b>Frequency</b>	<b>Amount (\$)</b>	<b>Amount (\$)</b>	<b>Amount (\$)</b>	<b>Amount (\$)</b>
<b>Admin and Service Fees</b>					
Customer Admin	One-time	2,000	4,000	10,000	15,000
<b>Grants</b>					
<u>FCM</u>	One-time	465,000	465,000	465,000	465,000
<b>Government</b>					
<b>Municipality 1 (Burlington)</b>	Multi-year	(72,000)	(78,000)	66,000	66,000
Municipality 2	Multi-year			66,000	66,000
<b>External</b>					
Municipal in-kind, partnerships, sponsorships, utilities, youth hring etc.	Annual	125,000	125,000	170,000	170,000
<b>TOTAL PROGRAM REVENUE (\$) without City Funding</b>		<b>592,000</b>	<b>594,000</b>	<b>645,000</b>	<b>650,000</b>

**EXPENSES**

		Year 1	Year 2	Year 3	Year 4
<b>Staff</b>	<b>Frequency</b>	<b>Amount (base salary) (\$)</b>			
Program manager	Annual	90,000	90,000	90,000	90,000
Marketing and Comms		65,000	65,000	130,000	130,000
Business Development		65,000	65,000	130,000	130,000
Technical Expertise		65,000	65,000	65,000	65,000
Customer Service		50,000	50,000	100,000	100,000
<b>TOTAL PAYROLL</b>		<b>335,000</b>	<b>335,000</b>	<b>515,000</b>	<b>515,000</b>
<b>Other</b>	<b>Frequency</b>	<b>Amount</b>			
Marketing and Promo	Annual	30,000	30,000	60,000	60,000
IT	Annual	12,000	12,000	12,000	12,000
RETScreen templates	Startup	2,000	0	0	0
Supplies	Annual	7,000	5,000	5,000	5,000
Communication	Annual	7,000	5,000	5,000	5,000
<b>TOTAL OTHER (\$)</b>		<b>58,000</b>	<b>52,000</b>	<b>82,000</b>	<b>82,000</b>
<b>LIC Loan</b>					
Loan Loss Reserve (5% of loan amount provided by FCM as backstop)	Annual	10,000	20,000	50,000	75,000
Loan Capital	Annual	200,000	400,000	1,000,000	1,500,000
<b>TOTAL LIC LOAN</b>		<b>210,000</b>	<b>420,000</b>	<b>1,050,000</b>	<b>1,575,000</b>
<b>TOTAL (\$)</b> (Does not include "TOTAL LIC LOAN" as FCM covers this)		<b>393,000</b>	<b>387,000</b>	<b>597,000</b>	<b>597,000</b>
<b>Per Year Burlington \$</b>		(72,000)	(78,000)	132,000	132,000
<b>Total Burlington Financing (\$)</b>	<b>264,000</b>				
<b>Loan Amount (max of \$10 mil)</b>	<b>3,100,000</b>				



<b>Max Grant Amount (50% of loan)</b>	<b>1,550,000</b>
<b>Max 4 Year Spending (so grant amount is 80% of costs)</b>	<b>1,860,000.0</b>

## APPENDIX I: IMPLEMENTATION PLAN

**Appendix I Table 1:** Implementation plan and launch timeline with approximate program launch indicated at months 9 and 10 (red). Grey blocks indicate set up/launch tasks only.

Task	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
<b>Project Management</b>																									
Hire Program Manager																									
Identify PDA capacity to support program areas (comms, marketing, outreach, etc.)																									
Hire additional staff																									
Coordinate with City items to be completed before program launch																									
Fundraising																									
Recruit board/advisory and plan meeting schedule etc.																									
Relationship development with other Municipalities and local businesses/ not-for-profits (ongoing)																									
Finalize evaluation and measurement tools																									
Reporting and strategic planning																									
Community representation																									
Lead Advisory Group meetings																									
Support council updates																									
Volunteer recruitment																									
<b>Business Development</b>																									
Generate CRM																									
Develop sales strategy and tactics																									
Implement sales strategy																									

Task	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Evaluate and report on uptake, modify strategy and tactics																									
<b>Operations</b>																									
Finalize application process																									
Create application forms																									
Establish data collection processes (title search, Property liens info, building info)																									
Set up databases																									
Develop reporting tools																									
Create contractor process																									
Manage template development from RETScreen																									
Manage incoming contractor and generate online list																									
Coordinate RETScreen evaluations																									
Respond to incoming requests and questions from homeowners and contractors																									
Support gathering contractor quotes for homeowners																									
Support funding applications																									
Provide homeowners with information regarding program options, funding, stacking and complementary programs																									
Data gathering support for metrics, as needed																									
<b>Marketing and Communications</b>																									
Finalize marketing and communications strategy																									
Identify marketing material needs																									

Task	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Implement marketing and communications strategy																									
Create marketing materials																									
Work alongside business development to optimize marketing and communications																									
Track relevant data for reporting																									
Update website																									
<b>Other</b>																									
Design training needs contractors, if applicable																									
Identify legal management needs																									
Develop launch plan and timelines																									
<b>Financing and Legal</b>																									
Set up tax record system for LIC financing																									
<b>Municipality</b>																									
Record tax lien on property																									
Adjust financing terms if necessary																									
Collect LIC payments																									

## APPENDIX J: ADDITIONAL RECOMMENDATION

### Baseline Data

- **FSA, energy poverty, and Lightspark data** should be used to inform marketing and targeted demographics and/or neighbourhoods.
- An **initial emphasis on rural areas** that have a higher proportion of **heating oil, propane, or electric radiant heating** should be targeted due to **high GHG reductions and increased financial ROI**.
- **Financial return on investment** calculations for home upgrades should **include carbon tax savings**.

### Program Design

#### *Baseline Creation*

- **Baselining** should be **completed quickly** with as **minimal information and time required from homeowner as possible**. A balance of required homeowner time/effort, turnaround time, and baseline accuracy will support a positive customer experience while providing useful quantitative information on each home.
- It is recommended to use **RETScreen Clean Energy Management Software** as the **primary analysis tool for energy, emissions, and (if feasible) utility cost baselining**. If participants prefer NRCan's energy audit for baselining the program will allow it to increase flexibility. An energy audit can be completed through a local service organization, and the RDC may help in navigating the audit to support the homeowner further.
- **Stacking with other available programs is recommended**, but requirements of the complementary program must be fulfilled. This would most likely include completion of an energy audit. In these instances, a *RETScreen* analysis is not required.
- **RETScreen templates** for typical Burlington home archetypes identified by Lightspark should be developed by a third party to streamline home modelling. Ideally, the homeowner would provide 1 year of utility bills, home square footage and age, and potentially window installation years, heating source, and age of equipment. The RDC can acquire a home image to identify home facing. All **requirements for optimal RETScreen modelling should be confirmed with the template developer** to reduce homeowner effort.
- It's recommended to **proactively work and plan towards adopting Green Button** to significantly reduce customer time in gathering utility data, as increased effort by homeowners can lead to program uptake reduction. The Green Button program aggregates customer utility data in one online location that can be accessed and downloaded by customers or accessed by a third party, if consent is given. The use of Green Button is currently voluntary, with participation decided by decided by municipal

utilities. **Ontario has outlined its intention to move forward of mandating the use of Green Button over a two-year period starting in late 2021.**

- If identified as useful and requiring limited time a **baseline comparison** with and without **heat and cooling degree** days.
- **Inform participating homeowners of projected impacts to utility bills** to avoid any surprises and ensure informed consent.
- **Baseline results should be discussed in real-time** with the homeowner in simple terms to help communicate energy use, GHG emissions, utility costs (if applicable/desirable), and options for going forward to reduce GHGs and align with any other home upgrade goals of interest. Having this summarized in a simple one-page summary template would improve communication through visualization.

### *Identify Upgrades and Financial Incentive Options*

- It's recommended that homeowners have an open discussion with a program employee regarding their own home goals, baseline results, and associated upgrades of interest. This background knowledge may then inform the appropriate program(s) that match homeowner goals to provide a more customized experience that provides homeowners with their own decision-making power.
- **Homeowners do not have to complete both heat pump installation and air sealing**, but at a minimum the former must be completed.
- Heat pump offering should be flexible and include both ducted and ductless types, air source and ground source, as well as hybrid and full heat pump installation.
- RDC staff are recommended to help homeowners move through the process by assessing contractor quotes, identifying funding options, following up with customers as needed, and referring to other programs (if applicable).

### *Work Completed by Qualified Contractor*

- An online **qualified contractors (QC) list is created and accessible through the program's website**. Information to display in the list includes business name, location, link to website, phone number etc.
  - Qualified contractors should **be approved and added to the website** in a **timely manner**, and informed when they are added.
  - **No minimum or maximum** number of contractors should be required.
  - **Limit the amount of time and information contractors must provide** when going through the process of becoming a QC. Mandatory information program staff should verify and require to be on the list includes:
    - **Registered (HST #)** to improve business legitimacy and reduce underground options.
    - Proof of a **313A or 313D** license.
    - Purchased **liability insurance** that covers all employees.
  - A simple search should be completed to review the business before being accepted as a QC to identify any unprofessional conduct etc.
  - QC's should be **located in Burlington**. If low contractor uptake is seen expansion to other neighbouring municipalities may be useful.
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- If the program **joins with another municipality eligible QC's would extend to those areas.**
- Work with relevant certification groups to **ensure relevant QC certification/licenses are up to date.** Other local programs are able to do this monthly through requests to the certification body, though COVID has caused leniency in this. Quarterly or semi-annual checks may be ideal initially and altered as needed.
- **Contractor fees** can be applied annually to help generate information and reduce number of contractors and therefore upkeep, but is **not recommended** as it may significantly limit contractor interest and retention and therefore require marketing and communications staff and time to recruit contractors. Of note, **the vast majority of programs do not charge QC fees.**
- **QC sign-off on a code of conduct review and marketing guidelines** may be a useful due diligence activity.
- QCs should obtain any relevant permits required to complete work covered by the program.
- If homeowners have a contractor of choice that is not on the list they should be able to go through the same process to become a QC.
- **Individual installers should not be eligible** to become a QC; companies or independent contractors only.
- **Provide minimum product standards instead of specific product lists** for eligible funding.
- Work with local electricity providers to formulate a plan for increased electrical servicing for heat pump technology.
- Annual feedback through email will help inform any required changes. Methods such as surveys, virtual meetings, and phone calls may be difficult due to hours spent on site and away from computers.
- **QC and Program Launch**
  - Engage and inform contractors early to address any design or process flaws before program launch. This may be done through informational webinars, proactive conversations etc.
  - Program feedback based on already implemented programs recommends developing a QC list before program launch. Of note, uptake may be slower than anticipated due to significant increases in upgrade demand plus availability of other incentive programs.
  - Avoid creating buzz long before program launch to avoid too much or too little demand.
- Require applicants to submit proof of ASHP sizing and proof of work completion to the municipality, with the chance that City staff may visit the property within 6 months post-completion to confirm changes visible from the exterior of the home.

### *Post-upgrade Monitoring*

- **1-3 months post-upgrade installation a satisfaction survey** should be completed through either email or phone. The survey is recommended to be short and quick to complete, and focus on overall experience and areas for improvement, knowledge

gained during the process, and home comfort improvements. This may also be an opportunity to gather any other metric data.

- One year after upgrade completion the RDC may wish to reach out to program participants and gather the previous year’s home data as an update to energy use, GHG emissions, utility costing changes, and carbon taxes avoided. If done, a comparison with and without heating and cooling degree days may be useful, and impact summarized in a short visual one-pager. This can be done annually to show previous year impacts and cumulative impacts. The use of Green Button would significantly streamline this process.

## *Program Delivery*

- Municipalities should opt for a **not-for-profit (NFP) organization to act as the program delivery agent**.
- The NFP can be newly created or existing, so long as they can meet the criteria listed herein. To ensure accountability, transparency, and a comprehensive evaluation the delivery agent should be chosen through an RFP process, and consider the following criteria:
- **Qualifications and Experience**
  - **Delivery agent**
    - Considered credible and trustworthy by citizens.
    - Ideally an already established NFP or social enterprise.
    - Not be subject to a real or perceived conflict of interest.
    - Prohibited from benefiting from commissions or kick-backs from vendors or contractors.
    - **Local to the Bay area.**
    - Have demonstrated or values program flexibility, adaptiveness to market needs, barrier reduction, and collaboration.
    - Ideally, **have participated in similar programs**, whether municipal program delivery or home-energy related programs etc.
  - **Staff**
    - Staffed with **individuals well versed in various local program offerings** and processes.
    - Staffed with individuals who have “on the ground” expertise in the mechanics of the retrofits being offered by the agent.
    - Staffed with those who understand the local context.
- Focus on **education and coordination** as key support services, primarily communicating to homeowners their options for upgrades and associated GHG and utility impacts, timelines and inputs, financing options, and other complementary programs available to them; these programs may be related to mitigation or adaptation.
- The **value of the program is identified as being homeowner support through the upgrade process**, not solely the financing options.
- An RDC should consider the promotion and participation of other related programs beyond those offered by the City.
- To reduce program start-up costs **housing the RDC in a virtual environment is recommended**. This also allows for greater customer flexibility while reducing transportation and timing barriers. If a physical location is of interest in the future an

easily accessible location for public transit should be considered. Furthermore, the location can be strategically placed to be near the Hamilton and Burlington border that will allow for the potential of a regional approach for home upgrade programming within the bay area.

- **The RDC should have the knowledge on available climate resilience programs**, both within Burlington and the GTHA that homeowners are able to access. Programs should not be coordinated through the RDC, but guide citizens on what is available, the benefits, and next steps.
- Future Burlington resilience programs may be offered through the RDC to streamline offerings and a one-stop-shop for citizens. Of note, not all resiliency programs will fit within the scope of housing. It will be up to the RDC's discretion on what to include and exclude, though focusing on housing-related programs is the logical option that will limit scope creep.
- As identified in the survey, bathroom upgrades, landscaping, and kitchen upgrades are the most likely upgrades homeowners anticipate undertaking in the coming years. Collaborating with local businesses on these items to provide additional program value is recommended.
- The homeowner survey indicated details of **upfront costs, availability of financial incentives, and changes in energy bills** as key information required in decision-making. The RDC should focus on supporting identifying these details to provide an overall financial picture for homeowner upgrades, including how carbon tax payments impact long-term costs.

### *Goals and Metrics*

- **Goals should go beyond GHG and environmental impacts** to demonstrate program impacts extend beyond environmental benefits.
- **Limit goals key to strategically informing program decisions and those important to key stakeholders**, such as Council, Sustainability staff, typical metrics required by funders etc. Linking to City aspirations, priorities, as well as how the program supports the work of other City efforts is recommended.
- If partnering or collaborating on communications, outreach, or engagement activities discussions on who claims those numbers should established. For instance, if the RDC receives a call regarding a utility program a homeowner received in the mail, does the utility claim that engagement or the RDC who supported the homeowner with additional information and guidance?

### *Monitoring and Evaluation*

- Where needed use **total and intensity metrics**, for example total GHGs saved through the program and GHGs reduced per home. Additionally, annual and cumulative reporting will show total program impacts and a more comprehensive picture.
- **Data gathering should be built in to program steps** to reduce staff collection time requirements and organization.
- The RDC should be required to present the above stated results annually to relevant municipal councils and answer questions

## *Program Financing*

- Utilize the **local improvement charge (LIC) incentive model** as a financial incentive, as opposed to non-repayable grants, rebates, or municipal tax incentives.
- Offer up to **\$10,000** to cover air sealing services, the **purchase and installation of heat pumps and any electrical service upgrades required** to install the technology. This amount should be reviewed and compared to the average and modal upgrade costs periodically to ensure 100% coverage for homeowners, as this is a significant driver.
- Make the **incentive available to those wishing to leverage more than one upgrade incentive program** (i.e. NRCan's Greener Homes program).
- **Low- and moderate-income homeowners require the use of grants that cover 100% of all upgrade costs.** Rebates require upfront payment, which may not be realistic for all interested homeowners.
- **Diverse financial supports** such as a mix of LIC with grants or rebates offer more flexibility depending on homeowner needs. It is recommended in the long-term to consider complementary incentives or, as noted above, leverage other programs that offer these incentives.
- A **loan loss reserve** with coverage of minimum 5% of total loan base is recommended. Of note, one of Canada's longest running programs (Halifax's Solar City), does not have an LLR.
- A **project financing minimum** should be set. For larger whole-home upgrade programs this may be \$4,000- \$5,000. As the recommended program focuses on only two upgrades that are typically more affordable, consideration may be given to lowering this amount initially.
- **Linking financing to items such as energy or GHG performance is not recommended** as this tight restriction may reduce homeowner interest if targets are not met. Additionally, the impact of more extreme and unpredictable weather would make this difficult to determine, for example a particularly cold year results in higher natural gas use compared to an average year that would cause increased energy use and emissions.
- Leverage and adapt existing LIC resources from other municipalities and organizations to hasten the rollout process and minimize personnel capacity burden.
- The homeowner survey indicated overwhelming interest in using incentive programs or personal savings to finance home upgrades. This should help to solidify that program delivery and value be placed on homeowners understand their financial incentive options above and beyond the LIC.
- The program should leverage the large increase in home-related updates due to COVID. This may include **collaborating with local businesses** to identify and offer additional aesthetic-related upgrades that have seen added interest over the past two years. The homeowner survey identified high interest in landscaping, kitchen, and bathroom upgrades as high-value, non-GHG related items.

## *Financial Incentives*

- **Funding to run the program should come from diverse sources to reduce long-term risk.**

- The overall percentage the municipality is responsible for funding should be reduced over time.
- Identifying how other municipalities may want to work together to reduce RDC costs should be a proactive priority.
- **Volunteer** time and expertise should be utilized to increase capacity while also providing added value through experiential learning.
- **Youth funding** opportunities should be used to support staffing.
- **Options for third party funding should be considered** to increase program uptake over the medium and long-term.

## Business Plan

### *Governance*

- The PDA should be required to form a volunteer advisory group that supports program rollout and administration. The advisory group is recommended to be comprised of individuals with a large range of expertise for comprehensive program advice. The group should:
  - Meet every other month.
  - Have the power to request PDA staff removal from the program administration, for performance accountability.
  - Include a citizen representative from each municipality where the program is offered.
  - Include a relevant municipal staff person from each municipality where the program is offered
  - Include representatives from diverse populations, including but not limited to: communities of colour, Indigenous peoples, social service organizations with experience with immigrants and/or low-income populations.
  - Include a representative with technical understanding of upgrades and retrofits.
  - Include representatives from local environmental organizations
  - Governance should align with municipal best practices.
- Relevant municipalities should complete a FIVE (5) year agreement with the delivery agent to provide program stability, with clauses for cancellation limited to specific, objective, and clearly stated failures.
- Municipalities should provide stable, base funding that is sufficient for the PDA to successfully deliver the program.
  - Delivery agents should continue to seek additional funding through other grant sources.
  - While *some* program administration costs can be recuperated through contractor registration fees and/or administration fees on local improvement charges, this should be capped at a low rate to avoid low program uptake.

## *Marketing and Communications*

- **Initial heavy focus on marketing and communications** should be considered for educational and participation uptake.
- **Marketing should be tailored to both homeowners and contractors**, with relevant value for each group established.
- Tactics that include the use of QCs for marketing and promotion purposes is highly recommended, and may take the form of informing these groups of the program and providing them with items such as brochures etc. This is supported by homeowner survey results, which indicated trusted sources of information include those with home upgrade expertise. Marketing materials for QC's should be provided by the RDC, and may include one-pagers, brochures, etc.
- **Marketing efforts may want to link home upgrades and increased time spent working from home** to drive added value, as more time is spent in the home. Program marketing should focus on home upgrades for comfort, aesthetics, and enjoyment, not energy efficiency and environmental improvements.
- The homeowner survey indicated **costs** (borrowing, labour, materials, permits), **home comfort, quantifying changes in utility bills, and being more eco-conscious** as the main decision-making criteria for upgrade selection. Marketing and communication items should reflect how the program and RDC can support these items.

## *Implementation Plan*

- **A high priority on funding and partnership strategy creation and implementation** should be applied to help sustainably finance the program. It is recommended to do this through working alongside local businesses and other groups with similar interests i.e. GHG mitigation, home upgrades etc.
- **Program scaling decisions** should be **based on feedback from homeowners and contractors/suppliers** as well as changes to other complementary programs to ensure all home upgrade gaps are identified.
- **A phased approach to program delivery** that eventually transitions some or all of the RDC from a public-sector led to another model will support program scaling.
- **Provide 3-6 months notice of program details** to suppliers, contractors, wholesalers, realtors, HVAC associations and the like prior to the launch of a retrofit program.

## **General Program Success**

- **Limit number of program steps** to increase homeowner and contractor appeal. Fewer steps typically allows programs to more easily adapt to market trends, allow for program changes, and eases expansion.
- Information (technology, software etc.) that allow consumers to better quantify their energy usage, GHG emissions, and expected savings can assist homeowners in confident decision making while also increasing transparency.
- **Numerous touchpoints between contractors and RDC staff** are recommended.

- Proactive planning and discussions with other municipalities regarding aggregating delivery and/or programs is recommended to reduce costs and streamline delivery.
- Municipal LIC offerings as a financial incentive are usually seen as an interim solution, as program expansion cannot happen through this manner. Program scaling typically requires private funding.
- The homeowner survey indicated the following areas as important to program success, and should be reflected within the program:
  - Ensure the program is advertised and communicated effectively so citizens are aware of it.
  - Provide detailed information to help homeowners, and do so in a simple manner they can understand.
  - Make process easy to understand, applications simple, and in general have program transparency.
  - Combine with other rebates or programs.
  - Make it free or low interest rates.
  - Provide unbiased experts and staff appropriately.
- As indicated in the survey, homeowners are interested and want to act on climate change, but it cannot cost them significantly more than the business as usual option. This is highly recommended to be a primary driver regarding upgrade eligibility i.e. **the cost of climate action is not significantly more than current options.**
- The **program must adapt based on homeowner wants.** This may include altering eligible upgrades, financial incentives, program sequence, staffing, marketing, non-energy related upgrades etc.

The Centre for Climate Change Management is an applied research centre at Mohawk College.

The Centre is a regional hub for collaboration on climate action. The Centre brings together partners to collaborate and design climate change and sustainability solutions that improve our neighbourhoods, businesses, and public institutions.