THE CITY OF PRINCE RUPERT

Home Energy Upgrade Program

ecotrust canada

FEASIBILITY STUDY FINAL REPORT

SEPTEMBER 2023

Contents

Acknowledgements

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The study focused on the community of Prince Rupert, located on the traditional, unceded territory of the Coast Ts'msyen Peoples, whom we acknowledge and thank for their stewardship of the land since time immemorial.

This project was carried out with assistance from the Green Municipal Fund, a Fund financed by the Government of Canada and administered by the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them.

Executive summary

There is an urgent need for climate mitigation to reach Canada's climate targets, as well as adaptation required in the face of increasingly challenging climate impacts being felt across British Columbia. In addition, the Province is grappling with serious affordability and housing challenges. Home energy efficiency upgrades represent a strong opportunity to address these interconnected issues by lowering energy consumption and greenhouse gas emissions, improving resilience to extreme weather, increasing quality of life, and reducing inequities (see Housing and energy profile section). The BC Provincial and Canadian Federal governments are both offering financial incentives that can significantly reduce the cost of retrofits for individual households (see Program landscape section).

This feasibility study was prepared by Ecotrust Canada for the City of Prince Rupert, BC, to consider the local opportunities for scaling up retrofits, meaning renovations such as improving insulation and air-sealing, installing more efficient space and water heating systems, or replacing windows and doors. The study assessed the local barriers to home energy efficiency upgrades, researched the feasibility, benefits, and risks of solutions to address these barriers, and examined specific program design considerations and financing options that could be implemented in Prince Rupert.

Our analysis of energy assessments done on common home types in the City of Prince Rupert shows significant cost and energy savings opportunities (see Benefits section). The residential rate for natural gas in Prince Rupert is far above other parts of BC, which, in combination with the higher rebates available, results in uniquely high-cost savings and short payback times on the renovation investment. Replacing a gas furnace with an electric heat pump represents the single greatest opportunity, both for energy savings and for emissions reductions, in Prince Rupert homes.

The key barriers identified via research and community engagement involve (see Barriers section):

- Low awareness of the retrofit opportunities and available supports,
- Multiple information gaps hampering engagement with and completion of the upgrade process,
- Contractor availability, capacity, and related challenges, and
- Affordability issues.

The financing options considered in this study include property-assessed clean energy (PACE)/local improvement charge (LIC) financing, and third-party financing. Our assessment finds third-party lending to be the more feasible of these options (see Financing assessment section). While some households will require financing to reduce up-front costs of upgrades, accessing financing was not found to be one of the top barriers facing households in Prince Rupert. It will therefore not sufficiently address the key identified barriers on its own, and while worth including as a support, is not a key priority.

In addition to financing options, the key administrative considerations evaluated with the City focused on program elements and delivery, scope, and potential target audiences (see Program design considerations section). We recommend implementing a comprehensive and sustained local awareness and education campaign, simultaneous engagement of contractors, in combination with a concierge-type point of contact for households in Prince Rupert delivered by an external delivery agent (see Key findings and recommendations section). We estimate that at a medium uptake of 75 homes per year, a program could reduce GHGs by 224 tCO2e, conserve 6,559 GJ of energy, and save $192,231 in energy costs per year.

Context

Retrofits

Home energy upgrades, or retrofits, in this report are defined as any renovations that can improve the energy efficiency, health, and comfort of homes, while reducing carbon emissions and significantly lowering utility bills. Examples include:

- Adding or improving insulation.
- Installing a more efficient space heating system like a heat pump.*
- Installing a more efficient water heating system.
- Replacing windows and doors.
- Improving ventilation.
- Sealing air leaks to reduce drafts.

*A heat pump is an energy efficient system that can both heat and cool a building. It usually replaces, for instance, a natural gas furnace/boiler or electric baseboard heating, and works by moving warmth from the outside air indoors to heat your home in winter (and vice versa in summer).[1]

[1] To learn more about heat pumps, see BC Hydro's overview at: https://www.bchydro.com/powersmart/residential/tips-technologies/heat-pumps.html?utm_source=direct&utm_medium=redirect&utm_content=heatpumps

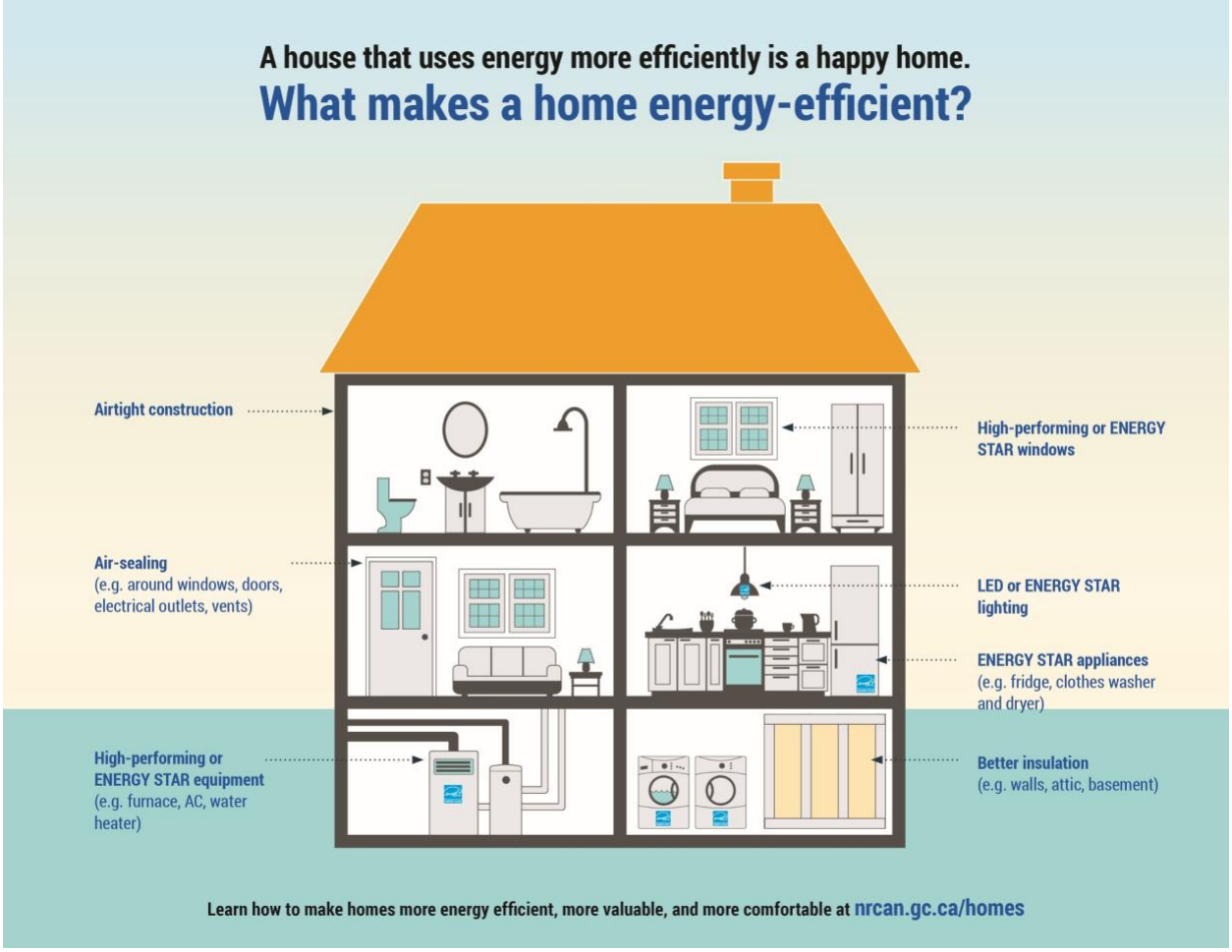

FIGURE 1: WHAT MAKES A HOME ENERGY-EFFICIENT?[2]

There are numerous other environmental, economic, and social benefits at the individual household and community level to be gained from home energy efficiency upgrades. At the household level, successful upgrades can result in multiple benefits, such as:

- More comfortable, healthier homes and improved individual health due to factors such as:
    - Improved ventilation, reducing moisture build-up and mould issues
    - Eliminating drafts
    - Improved air quality due to filtration or removal of particulate emitting heating
    - Reduced cold/hot spots from improved insulation/fenestration
- Energy cost savings, providing relief from increasing costs of living and rising energy prices

[2] Natural Resources Canada. (2020). *What is an energy-efficient home?* Retrieved July 6, 2023 from https://natural-resources.canada.ca/energy-efficiency/homes/what-energy-efficient-home/20548

- Resilience to extreme weather, incl. heat, cold, power outages
- Increased property value & building lifespan
- Household emissions reductions from lower energy use and/or electrification

As progress on home energy retrofits accelerates in a municipality or region, there can be several potential benefits at the community level as well. These include:

- Better housing affordability due to lower utility costs
- Cleaner air
- Better public health
- Increased employment/business activity from retrofits
- Reduced GHGs, progress on climate goals
- Improved building stock and property tax base
- Higher energy efficiency reducing growing electricity loads and need for new power generation

BC has a sectoral target to reduce greenhouse gas emissions by 59-64% below 2007 levels by 2030. Energy efficiency renovations and electrification of existing residential buildings are critical to making progress on these goals. Progress on emissions reductions has been made, but BC is not on track for these targets so far.[3]

The City of Prince Rupert's Official Community Plan also targets an ambitious GHG emission reduction target of 80% of 2007 levels by 2050, in line with the Paris Accord. Much of the work needed on the City side involves retrofitting existing facilities, supporting low-GHG development, and fleet management changes; however, this policy also includes support for initiatives such as this one that support emissions reduction at the community level.

In addition to the need to significantly reduce greenhouse gas emissions from existing buildings, climate adaptation work in the residential building sector is simultaneously required to ensure people are safe, healthy and comfortable in their homes. With increasing weather extremes, and wildfires impacting air quality, people's health is likely to be increasingly impacted by the quality of homes, including adequate heating, active and passive cooling, air filtration, and ventilation. Finally, affordability of housing and the overall cost of living has been rising, exacerbating struggles with home energy costs. Many retrofits have the potential to significantly reduce ongoing home energy costs faced by households.

[3] BC GHG emissions from residential buildings: 4.5 MTCO2e in 2019, estimated 4.5 MtCO2e in 2020, no overall change from 2007. Province of British Columbia. (2020). *Provincial Inventory of Greenhouse Gas Emissions*. Retrieved Feb. 28, 2023, from https://www2.gov.bc.ca/gov/content/environment/climate-change/data/provincial-inventory

Study Objectives

The objective of this Community Efficiency Financing feasibility study was to review and assess the identified financing options and program design considerations, with an aim to address the following identified barriers:

- High up-front costs of improvements and limited access to capital to meet need
- Lack of access to EnerGuide Assessments and Greener Homes rebates
- Limited local contractor availability and capacity for efficiency upgrades
- Limited opportunity awareness and other gaps in information
- Residential infrastructure needs, e.g., electrical upgrades required for electrification

The study assessed the extent of these as well as additional barriers identified by participants, and the feasibility, benefits, and risks of various programming and financing solutions to address these barriers.

Method

To address the study objectives, we reviewed the local socio-economic context, local housing stock and energy use, the provincial and national policy context, rebate programs, other available supports, successful programs in other jurisdictions, and available financing options. We used desktop research, analysis of publicly available data, energy and impact modeling, and community engagement to identify key barriers, and potential solutions and benefits of upgrades. We presented administrative considerations for the City to evaluate the feasibility of different program options, and engaged third-party financing providers to assess financing opportunities.

Integrating this information and analysis, we developed recommendations for the most feasible actions the City of Prince Rupert could pursue to support home energy upgrades. Study findings and recommendations were presented for input and feedback, which was incorporated into this final report. Summaries of the key findings were shared publicly in various formats and forums for community and peer learning purposes.

Community engagement

The community was engaged to inform this feasibility study using public communications, individual outreach, and a household survey with 125 responses. Over 40 organizations were contacted in our outreach, resulting in 24 interviews.

City of Prince Rupert staff provided input throughout the study. Discussions with staff explored the City's goals and capacity for implementing different program and financing options, including design and administrative considerations, and the potential for creating a local Property Assessed Clean Energy (PACE) or 3rd party financing program.

Local households were engaged via public communications to share feasibility study activities and results. A public household survey was used to gather data from 125 households on local housing stock, energy use & costs, and interest in or previous experience with retrofits; and to receive household input on barriers and potential solutions for home retrofits.

Representatives from community organizations, financial institutions, and other governments were interviewed individually to further inform on barriers, needs, and potential solutions. These included staff from First Nations, nonprofits, the local credit union, and administrators of efficiency programs in other locations.

Contractors, construction businesses, and Energy Advisors were also engaged in individual interviews to share their own current capacity and state of the local retrofit market; their perceptions of retrofit technologies; barriers to their retrofit work and possible solutions; their experience with homeowner's barriers, preferences, and motivations to retrofit; and current use of retrofit financing in their work.

About Prince Rupert

Prince Rupert is a municipality incorporated in 1910, currently with about 12,000 residents (5,000 households), located in the temperate rain forest of B.C.'s northwest coast, on the traditional territories of the Coast Ts'msyen People (name meaning "inside the Skeena River"), who have lived in this area for over 10,000 years.

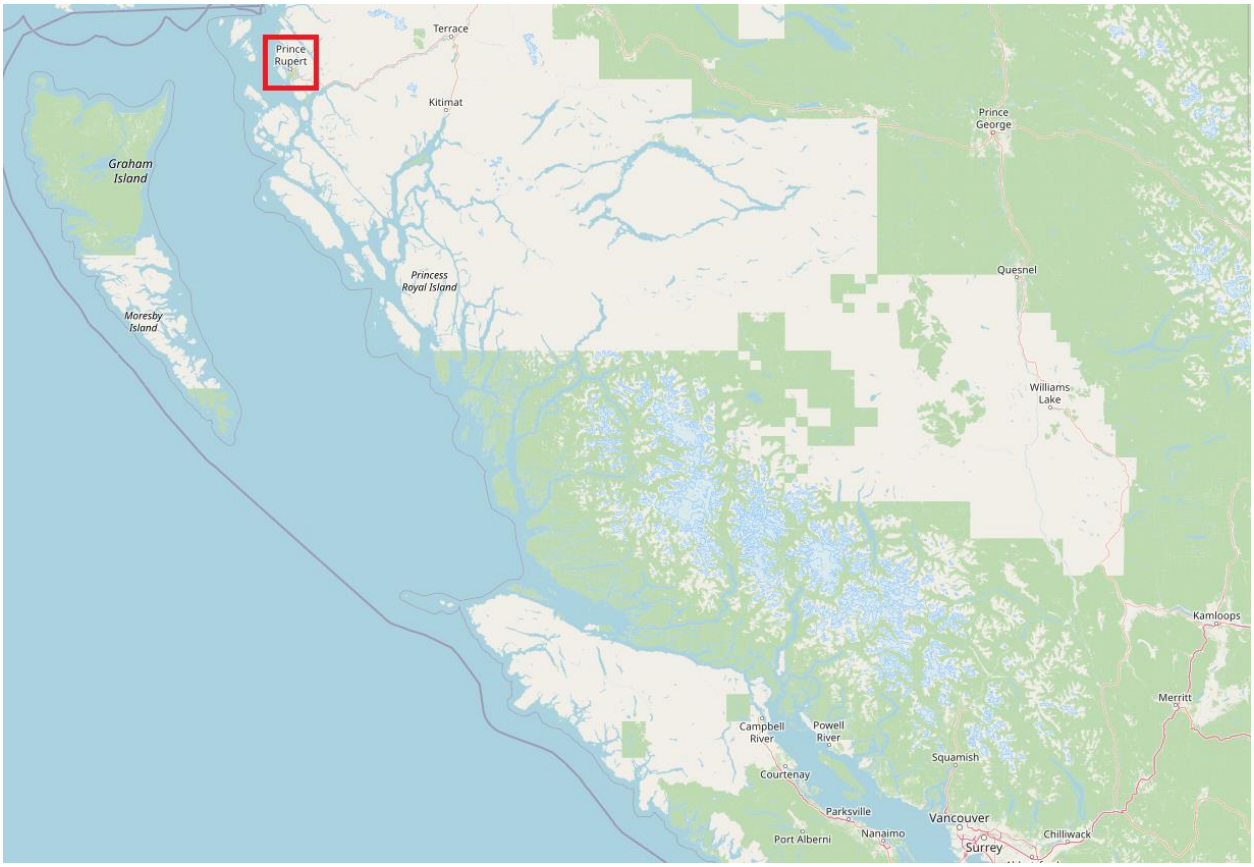

FIGURE 2: THE CITY OF PRINCE RUPERT IS LOCATED ON THE NORTHERNMOST END OF THE BC COAST, A NEARLY 1,500 KM (17-HOUR) DRIVE TO BOTH VANCOUVER AND EDMONTON.

Prince Rupert has the third largest port in Canada (by trade value), with six terminals (including one for cruise ships) and a direct connection to the CN rail network.4 Its location at the very end of northern BC's mainland infrastructure means transportation costs, and the cost of goods and services generally, tends to be higher than southern BC and access to some services can be limited.

[4] Prince Rupert Port Authority. (2021). *2021 Economic Impact Assessment.* Retrieved from https://www.rupertport.com/economic-impact/

The oceanic climate (zone 6/7) is mild and wet, and the city has been ranked the rainiest in Canada.[5]

Climate normals[6]	Avg. temperature	Rainfall days	Annual rainfall mm	Annual sunshine hrs	Avg. humidity
Prince Rupert	2 - 14°C	236	2,530	1,240	75%
Ottawa	-10 - 21°C	118	755	2,084	n/a

FIGURE 3: CITY OF PRINCE RUPERT MUNICIPAL BOUNDARIES ENCOMPASS ALL OF KAIEN ISLAND.

[5] Budget Direct. (n.d.). The Wettest City in Every Country. Retrieved July 27, 2023, from https://www.budgetdirect.com.au/home-contents-insurance/home-safety/storm-season/wettest-cities.html

[6] Prince Rupert A. Ottawa CDA Canadian Climate Normals 1981-2010 Station Data:. https://climate.weather.gc.ca/climate_normals/index_e.html

Demographics

The City of Prince Rupert has a population of 12,300, which increases to 13,442 when nearby communities are included.[7] There are 5,085 occupied private dwellings in the city and 5,500 with nearby communities. The senior population is increasing, creating a demand for senior housing. There is also a higher than BC average proportion of Indigenous residents of 37% in the city and 43% in North Coast Regional District. There are several languages other than English that residents speak most often at home, with Vietnamese being the most common at 250 speakers, followed by Punjabi at 220, and Tagalog at 65.

FIGURE 4: THE CITY IS LOCATED ON THE NORTHERN END OF KAIEN ISLAND.

Prince Rupert's 2030 Sustainable City Policy established a goal to "support local property owners in improving the efficiency of their homes and businesses," which this project seeks

[7] All demographic statistics, unless otherwise referenced, are sourced from: Statistics Canada. (Dec. 15, 2022). Census Profile, 2021 Census of Population. Statistics Canada Catalogue no. 98-316-X2021001. Ottawa. Retrieved Jan. 12, 2023, from https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E

to pursue.[8] In addition to its 2030 Sustainable City Policy objectives, Prince Rupert is a signatory to the BC Climate Action Charter and has identified community GHG emission targets in its 2017 Community Energy and Emission Plan (CEEP).[9] Reducing demand as much as possible first creates a great base for community energy action (followed by heat recovery or power generation projects), so exploring residential energy efficiency programs, including a comprehensive energy efficiency retrofit campaign, realtor education, energy labeling, an efficient wood stoves program, identifying green economy opportunities, and community engagement were recommended in the CEEP.[10]

As previously noted, the City's Official Community Plan states the City's aspiration to "meet or exceed an 80% GHG reduction of 2007 levels by 2050."[11] It includes several climate change and GHG emissions policies focused specifically on energy efficiency in buildings.[12] Policies 13 and 19 set out the City's aim to work with stakeholders to develop a program encouraging building retrofits, including consideration of Property Assessed Clean Energy (PACE), which is included in this feasibility study.[13]

A pressing current issue for the City involves its infrastructure deficit. With multiple water main and water service breaks resulting in the City declaring a State of Local Emergency in December 2022, it became clear that municipal water and sewer infrastructure are urgently requiring replacement. This issue has significantly impacted staff capacity to engage with other projects, and also limits the City in carrying additional debt.

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[8] City of Prince Rupert. (n.d.). *2030 Sustainable City Policy Objectives*, 1.3 Energy Efficiency and Conservation, p. 6. Retrieved Jan. 12, 2023, from https://www.princerupert.ca/sites/default/files/hays2/2030%20Sustainable%20City%20Policy%20Objectives%20-%20FINAL.pdf

[9] City of Prince Rupert. (2017). *Prince Rupert Community Energy and Emission Plan – 2017,* p. 10. Retrieved from https://www.princerupert.ca/sites/default/files/development/carip/Prince%20Rupert%20Community%20Energy%20and%20Emissions%20Plan%20-%202017%20-%20FINAL.pdf

[10] Ibid. See p. 6, and recommended CEEP actions 3.3 – 3.6 on pages 46-49, 8.4 & 8.6 on p. 65-66.

[11] City of Prince Rupert (2021). *Official Community Plan: Bylaw #3460*, p. 64. Retrieved from: https://www.princerupert.ca/sites/default/files/bylaws/2021-01-26%20OCP%20-%20%20final.pdf

[12] Ibid, pp. 67-69.

[13] Ibid, p. 68.
Policy 13: "The City will assess opportunities to work with senior levels of government, local energy assessment professionals, local trades people, and local suppliers to develop a program to encourage cost-effective retrofits of existing commercial, residential, and institutional buildings."
Policy 19: "Supporting building retrofitting programs including Property Assessed Clean Energy and neutralization of GHG emissions from demolitions."

Income & Labour

Various industries are providing job opportunities in Prince Rupert, and seasonal employment is common. The transportation and warehousing sector is the largest, with 1,130 workers in 2016. Retail comes in at a close second with 750 workers, followed by health care and social assistance with 685 workers. Public administration employs 580 individuals, while accommodation and food services provide jobs for 550 workers. The median after-tax income in the city was $83,000 in 2020, which is higher than both the regional average of $74,000 and the provincial average of $76,000.

The Prince Rupert Port Authority has experienced substantial growth, employing 3,700 people in 2021, more than doubling its workforce in the past decade.[14] Employment in the port industry offers high-paying roles, with average annual wages reaching $95,000 in 2020, in some cases, double the salary of similar positions in the town.[15] The Port has also projected the creation of 1,900 new positions by 2030 based on the growth horizon at in 2019 when the study was completed.[16] Though that may now have been impacted by global market changes, many projects continue to move forward, and growth of the labour market is likely to continue or exceed its historic trajectory.

[14] Prince Rupert Port Authority, *2021 Economic Impact Assessment.*
[15] Ibid.
[16] Redesign Rupert. (2019). *2019 labour market study*. Retrieved from: https://www.redesignrupert.ca/labour-market-study

Housing and energy profile

This section examines housing stock and energy use in Prince Rupert to provide a basis for estimating potential benefits and impacts of making upgrades, and to clarify possible target audiences and programming priorities.

Community housing profile

Prince Rupert has a very old housing stock, another reason the need for and potential impact of retrofits on GHG emissions, cost savings, home comfort, and personal wellbeing is high. Nearly all (96%) of Prince Rupert's residential buildings are more than 22 years old, with three quarters constructed before 1981, and one third prior to 1960.

Occupied private dwellings by period of construction				
	City of Prince Rupert		**Region***	
	Count (5,085 total)	Percent	Count (5,500 total)	Percent
1960 or before	1,830	36	1,880	34.2
1961 to 1980	2,000	39.3	2,125	38.6
1981 to 1990	720	14.2	815	14.8
1991 to 2000	355	7	460	8.4
2001 to 2005	40	0.8	50	0.9
2006 to 2010	25	0.5	30	0.5
2011 to 2015	40	0.8	40	0.7
2016 to 2021	85	1.7	105	1.9

*Defined by Statistics Canada as a Census Agglomeration, this includes the City of Prince Rupert and surrounding communities, including Lax Kw'alaams 1 reserve, Tsimpsean 2 reserve, North Coast A Electoral Area, and the District Municipality of Port Edward.

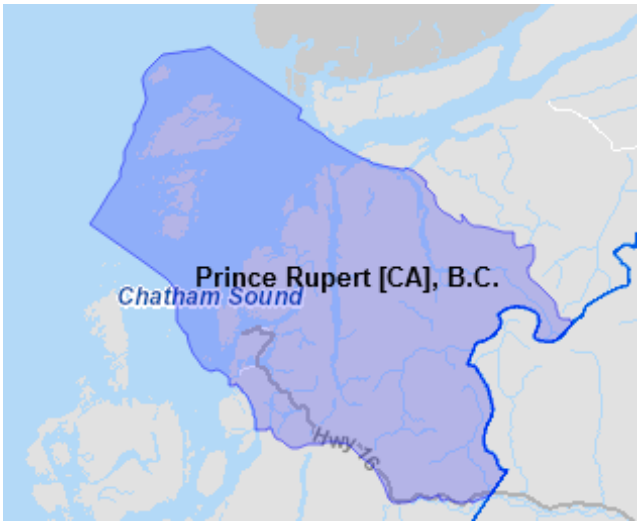

FIGURE 5: PRINCE RUPERT CENSUS AGGLOMERATION

Occupied private dwellings by structural type of dwelling				
	City of Prince Rupert		**Region**	
	Count	%	Count	%
Single-detached house	2,875	56.7	3,245	59.1
Semi-detached house	200	3.9	230	4.2
Row house	285	5.6	310	5.6
Apartment or flat in a duplex	635	12.5	635	11.6
Apartment in a building that has fewer than five storeys	910	17.9	905	16.5
Apartment in a building that has five or more storeys	55	1.1	60	1.1
Other single-attached house	10	0.2	15	0.3
Movable dwelling	95	1.9	100	1.8
*Total non-apartment building dwellings**	*4,100*	*80.9*	*4,535*	*82.5*
Total	**5,070**	**100**	**5,495**	**100**

*This category was created for this study, to reflect the number of dwellings in building types that are generally eligible for individual household retrofit incentives

Eighty percent of the City's 5,085 occupied homes are single- or semi-detached (incl. row homes, duplexes, mobile homes), while 20% are apartments. Homes in Prince Rupert are larger than the average homes in British Columbia. In fact, approximately 65% of the housing units in the city have three or more bedrooms. On average, these homes have 6.3 rooms. With an aging population and a need to accommodate seniors and individuals with physical disabilities, there is a growing demand for homes that are designed accessibly. The proportion of renters in Prince Rupert (38%) is slightly higher as compared to the rest of BC (33%). Short-term jobs likely play a role in this.[17]

Private households by tenure				
	City of Prince Rupert		**Region**	
Owner	3,170	62.3%	3,495	63.5%
Renter	1,920	37.8%	1,960	35.6%
Dwelling provided by the local government, First Nation or Indian band	0	0%	40	0.7%
Total	**5,085**	**100%**	**5,500**	**100%**

Housing Issues

The affordability of housing (paying <30% of income) is better in Prince Rupert as compared to the provincial average, but housing costs in have increased dramatically over recent years.[18] Additionally, the adequacy (adequacy meaning a home does not require major repairs) and suitability (meaning a home has enough bedrooms for the number of individuals living in the home) is lower than the British Columbia average.[19] Additionally, the local geotechnical conditions limit City expansion and make new development very expensive.

The lack of affordable housing is affecting the recruitment of workers, and has led to additional pressure on First Nations' on-reserve housing, as well as an increased rate of homelessness.[20] As of 2021, there were 118 homeless individuals in Prince Rupert, a majority of whom were Indigenous. The need for various levels of care and support in housing is

[17] City of Prince Rupert. (2022). *Housing Needs Report,* p. 20. Retrieved from https://princerupert.ca/sites/default/files/reports/221128_Final_PR_HNR.pdf
[18] Statistics Canada, *2021 Census of Population*.
[19] Ibid.
[20] City of Prince Rupert, *Housing Needs Report,* p. 28.

apparent in Prince Rupert, especially for those who have experienced brain injuries, mental health issues, and seniors.[21]

The affordability and availability of rental housing is an issue, especially for low-income families, but even for those earning median wages. Unfortunately, there is currently no data available on the secondary rental market. Renters in Prince Rupert are more likely to experience inadequate, unsuitable, and unaffordable housing than homeowners in the city.[22]

Community energy & emissions profile

The use, cost, and sources of energy in Prince Rupert homes is similar to much of the province but has a few unique attributes that point to specific upgrade opportunities. Most significantly, the residential rate of natural gas in Prince Rupert is far higher than the FortisBC Mainland rate.[23] This means the potential cost savings of energy retrofits are uniquely high compared to other parts of the province. Investments in retrofits therefore have an extraordinary cost-benefit ratio and are more impactful in terms of reducing household energy spending and emissions.

According to the BC Community Energy and Emissions Inventory, in 2020, electricity (supplied by BC Hydro) accounted for 57% of total residential building energy consumption and 23% of total residential building energy greenhouse gas emissions within the City of Prince Rupert.[24] Fossil gas (supplied by Pacific Northern Gas) made up 38% of consumption and 70% of emissions, while wood, oil, and propane made up only an estimated 5.2% of consumption and 7.5% of emissions combined.[25]

Greenhouse gas emissions in Prince Rupert have been summarized in three main categories: Transportation made up 51%, solid waste 14%, and buildings 35% in 2010, the most recent community-specific dataset available.[26] Residential energy use made up 46% of total building

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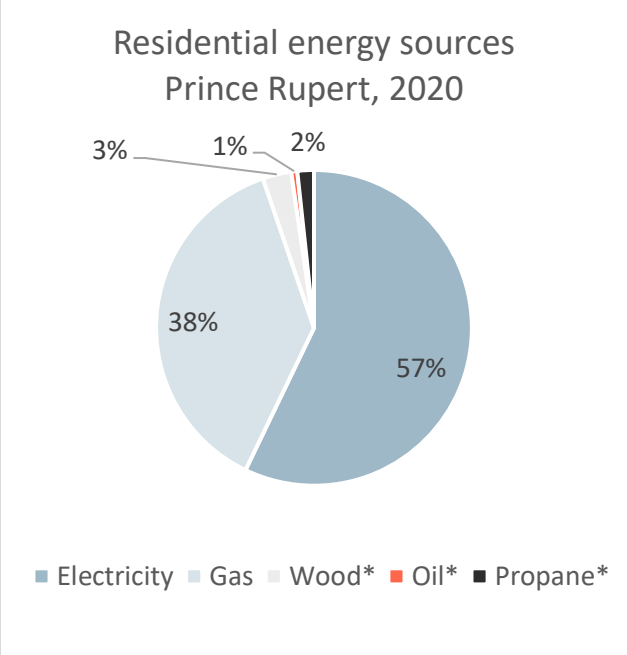
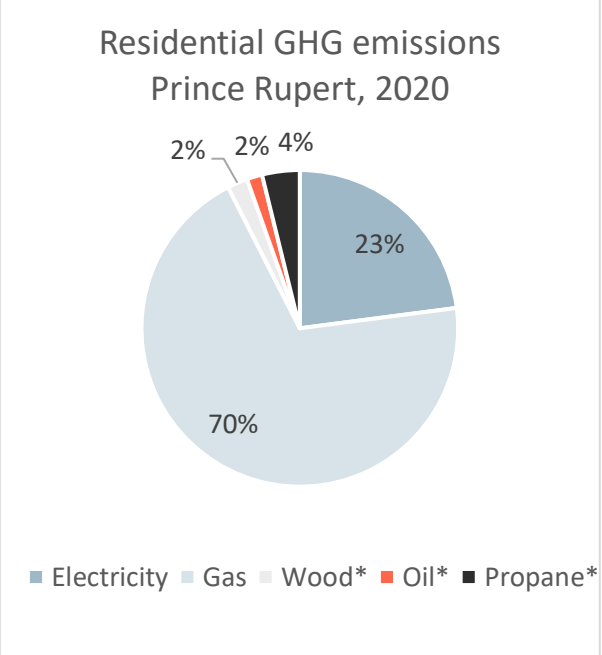
[21] Ibid., pp. 45-46.
[22] Statistics Canada, *2021 Census of Population*.
[23] At the time of writing, FortisBC Mainland rate is $10.65, PNG Prince Rupert rate is $16.21.
FortisBC. (2023, Jul. 1). *Residential natural gas rates.* Retrieved from https://www.fortisbc.com/accounts-billing/billing-rates/natural-gas-rates/residential-rates#mainland
Pacific Northern Gas. (2023, Jul. 1). *Residential Rates: 4. Vanderhoof to Prince Rupert/Kitimat/Terrace.* Retrieved from https://png.ca/residential/residential-rates/
[24] Province of British Columbia. (2020). *CEEI Buildings Data*. Retrieved Jan. 11, 2023, from https://www2.gov.bc.ca/gov/content/environment/climate-change/data/ceei
[25] Ibid.
[26] City of Prince Rupert, *Community Energy and Emission Plan,* p. 38.

energy use, and 39% of building GHG emissions (the other 61% of emissions stemmed from commercial and small-medium industrial use).[27] Overall in Prince Rupert, energy consumption in residential buildings is estimated to be approximately 16% of community emissions.





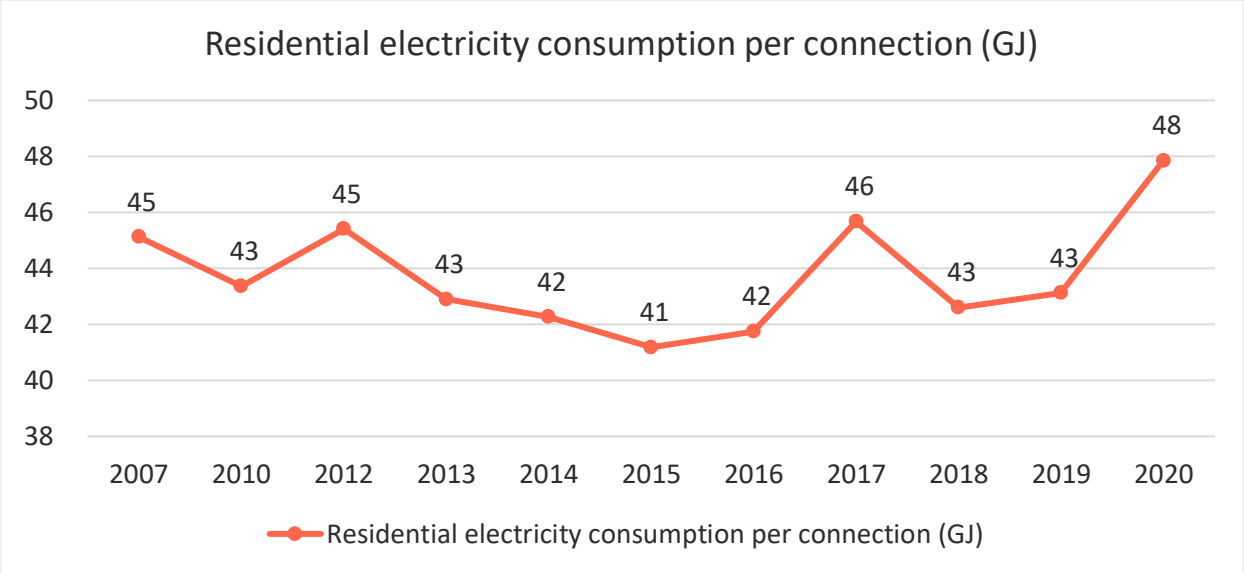
Energy type	Total consumption (GJ)	% of total consumption	Total connections	Emissions (TCO2e)	Emissions with imports (TCO2e)	% of total emissions
Electricity (BC Hydro)	286,423	57.1%	5,985	849	3,100	22.9%
Gas (Pacific Northern Gas)	188,508	37.6%	2,471	9,401	9,401	69.9%
Wood*	14,689	2.9%		280	280	2.1%
Oil*	3,106	0.6%		212	212	1.6%
Propane*	8,490	1.7%		519	519	3.8%
Total	**501,216**	**100%**	**8,456**	**11,262**	**13,514**	**100%**

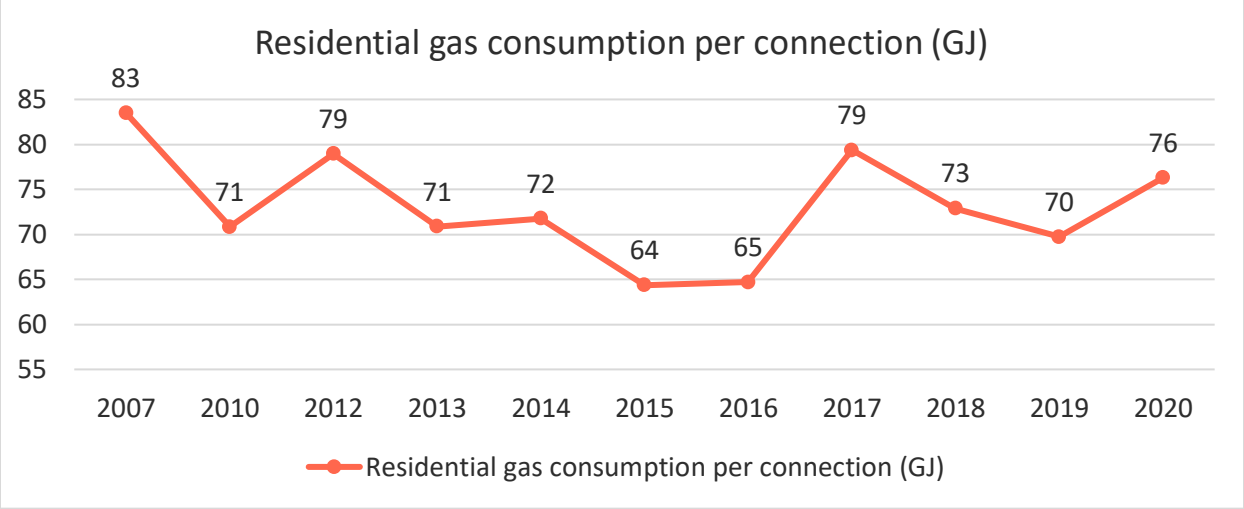
*Wood/Oil/Propane data is based on 2007 calculations and adjusted for weather. It may not represent an accurate estimate and should be treated with caution.

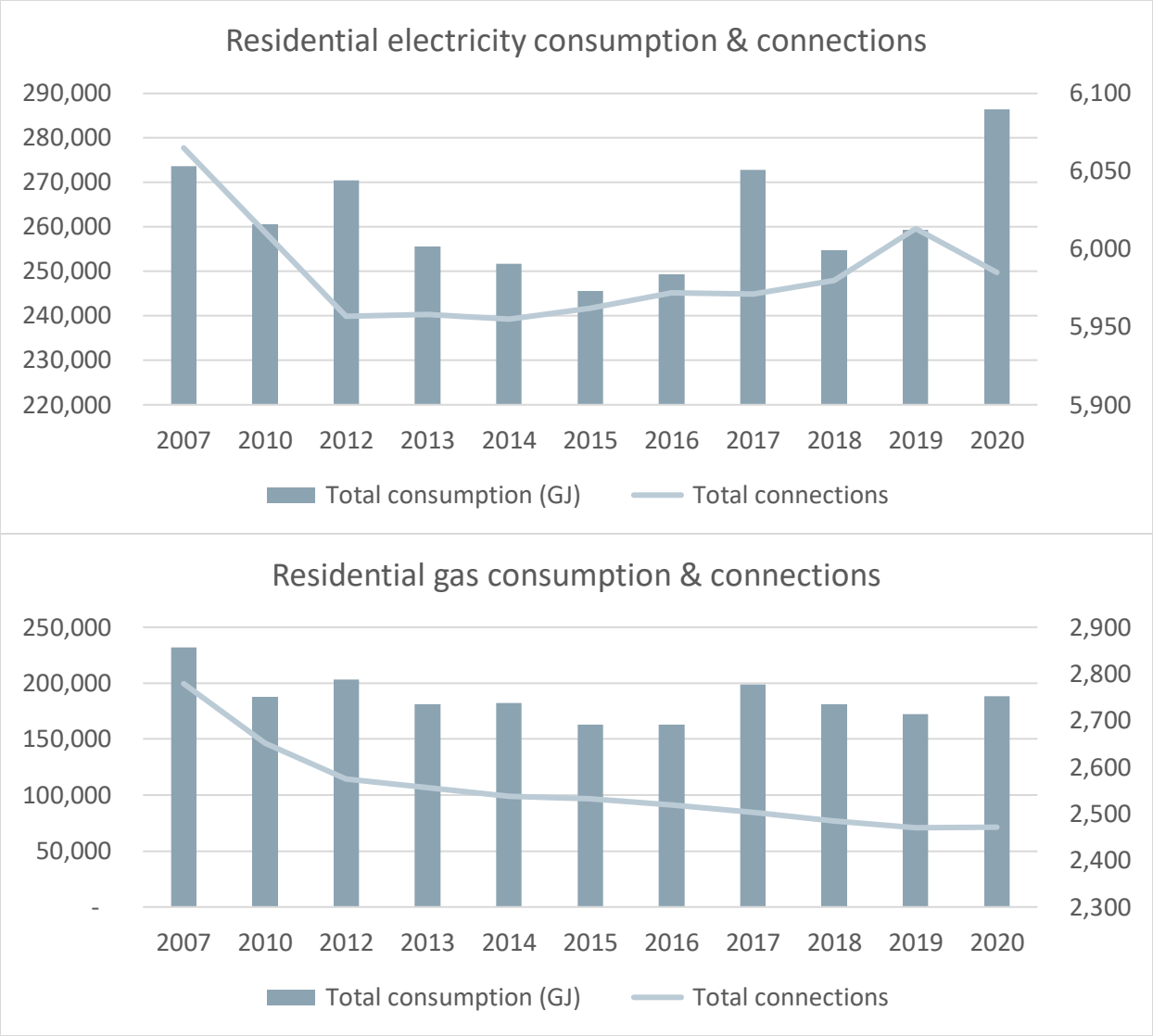
[27] Ibid.

The following trends in residential energy consumption within the City of Rupert were identified, based on available data from 2007 to 2020:

- Electricity consumption per connection trended downward until 2015, but has since increased again.
- Gas consumption per connection also trended downward until 2015, and has since trended upward, but still remains below the 2007 baseline.
- Total electricity connections and consumption have trended slightly upwards since 2012.
- Total gas connections and consumption have trended downwards since 2007.







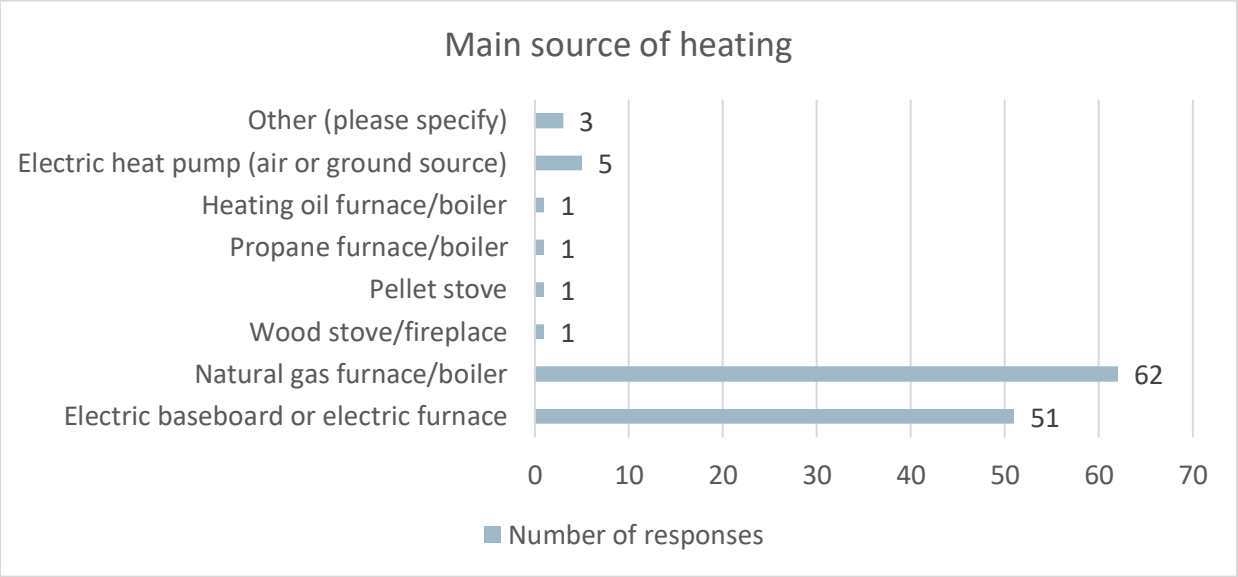
Heating

According to Natural Resources Canada, about two-thirds of home energy use stems from space heating, making heating system upgrades highly impactful in reducing energy costs, and representing the strongest opportunity for GHG reductions if switching from fossil fuel to cleaner energy.[28] In coastal BC, this can generally be most effectively accomplished by switching to electric heat pumps. Another 18% of residential energy consumption comes from water heating, and the remainder from appliances (13%), lighting (3%), and space

[28] Natural Resources Canada. (2021). *Energy fact book 2021-2022*, p. 45. Retrieved from https://natural-resources.canada.ca/sites/nrcan/files/energy/energy_fact/2021-2022/PDF/2021_Energy-factbook_december23_EN_accessible.pdf

cooling (2%). Community-level data on the use of heat pumps is not available, but heat pump adoption in Canada was at six percent overall in 2021.[29]

Four percent of our 125 household survey respondents in Prince Rupert already had a heat pump, all of whom were satisfied or very satisfied with their heating. 50% of respondents used natural gas heating, while 40% used electric heating.



According to PNG's residential end-use survey, natural gas is the main space heating fuel for 92% of PNG's residential customers."[30] 2.6% of PNG customer households already use an electric air-source heat pump as the main space heating method.[31] The survey also found that 50% use a secondary fuel to heat their home – most often electricity (25% of respondents), followed by wood (12%) and natural gas (5%).[32] Portable electric heaters (22%) and fireplaces or heater stoves (25%) are the most common secondary sources of space heating.[33]

[29] Statistics Canada. (2022, Dec. 12*). Table 38-10-0286-01: Primary heating systems and type of energy*. Retrieved from https://doi.org/10.25318/3810028601-eng

[30] Pacific Northern Gas. (2022, Dec. 22). *Pacific Northern Gas Ltd. and Pacific Northern Gas (N.E.) Ltd. Application for Energy Conservation and Innovation (ECI) Portfolio Funding 2023-2024. Response to BCUC Information Request No. 1*, p. 37. Retrieved from https://docs.bcuc.com/Documents/Proceedings/2022/DOC_69321_B-2-PNG-response-BCUC-IR-No1.pdf

[31] Ibid.

[32] Ibid.

[33] Ibid.

Home energy affordability

Energy poverty or energy insecurity is experienced by households that struggle to pay for or have to restrict their use of basic energy services like cooking, lighting and heat. Consequences can include inadequate heating and cooling; inadequate ventilation; and drafts, mould, moisture, and poor indoor air quality. This can result in heat-related, cardiovascular, and respiratory illnesses, as well as stress, and adverse emotional and social impacts. There is great potential to address the social and health-related impacts of energy poverty with energy efficiency retrofits.

The need is strong: Nearly a quarter of households in the City of Prince Rupert are experiencing energy poverty, including over one third of seniors and Indigenous households in the city.[34] Half of survey respondents found their energy costs unaffordable. The proportions of renter (36%) and owner (64%) households with high energy cost burdens is about equal to their overall proportion of all households. The same is true of Indigenous households (39%). However, while senior households make up about one quarter of all households in the City, they are overrepresented as 38% of the energy poor. Lone parent households and those spending over 30% of their income on housing are also overrepresented.

The HealthyPlan.City online mapping tool can be used to identify areas of the City where potentially vulnerable populations, including seniors, children, individuals living alone, visible minority individuals, and those below the low-income cut-off are more concentrated. It also identifies potential urban heat islands and tree canopy cover, which can affect people's home energy use and health during extreme heat events. For instance, the map shows an overlapping concentration of individuals living alone and/or on low incomes in potential heat islands and/or with little tree canopy cover in one area of Prince Rupert:

[34] Canadian Urban Sustainability Practitioners. (n.d.). *Energy poverty and equity explorer*. Retrieved Mar. 1, 2023, from https://energypoverty.ca/mappingtool/

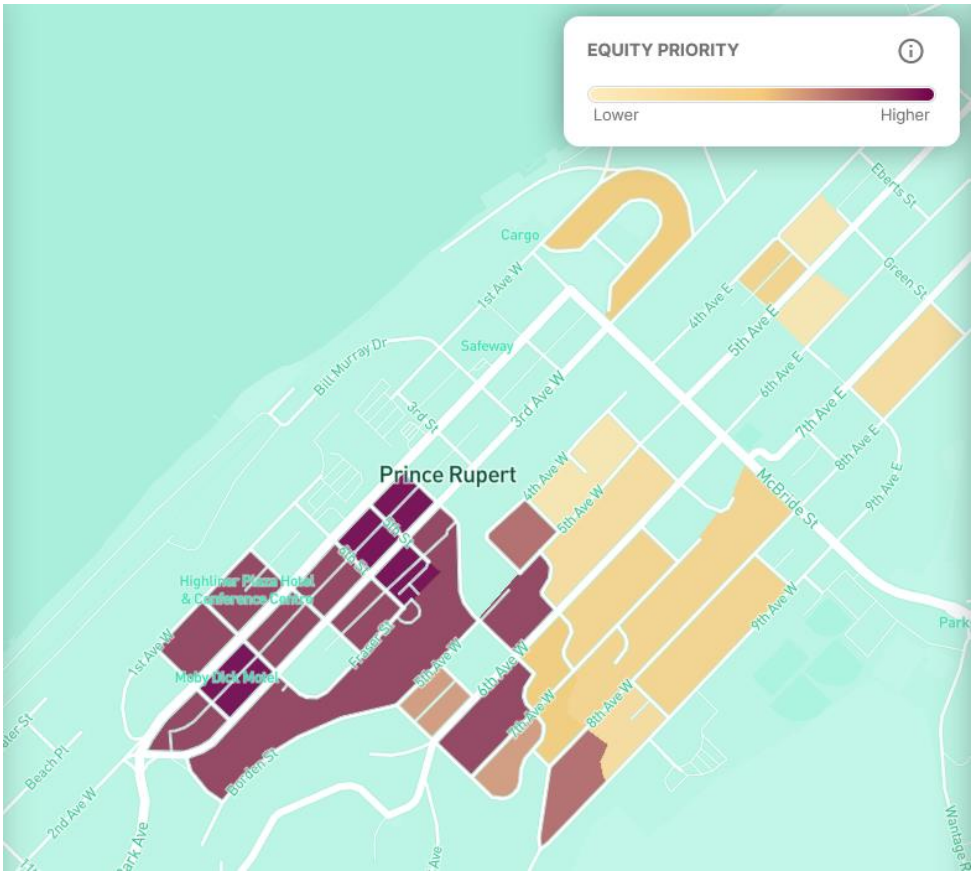


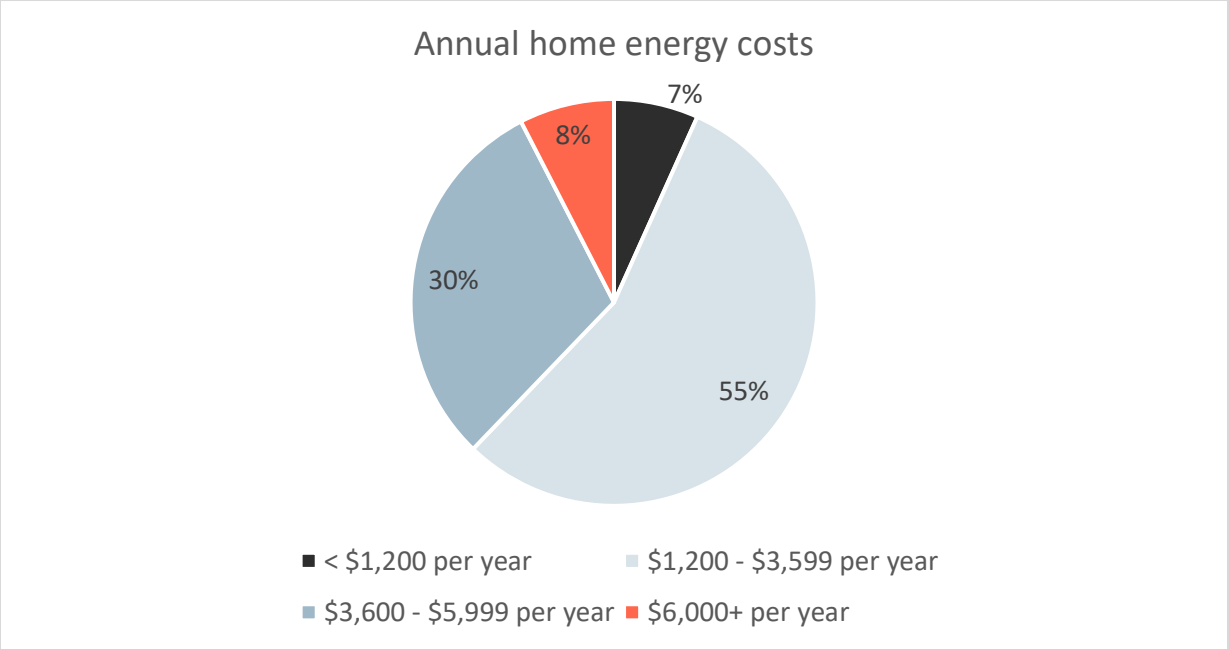
FIGURE 6: EQUITY PRIORITY MAP, PRINCE RUPERT[35]

Survey results

The public household survey conducted as part of this study gives some additional insight into home energy use and issues in Prince Rupert. All but one respondent lived in the City of Prince Rupert, and most (86%) lived in single-detached homes that they own (90%). Ten per cent were renters, and only 23% of those identifying as renters lived in single-detached homes. Fifty per cent of respondents used gas heating, 41% electric baseboards or furnace, and 4% used electric heat pumps.

Just over half of respondents found their household energy costs to be unaffordable (42%) or very unaffordable (10%) in the past year. For the majority of respondents, the average monthly home energy costs were in the range of $200-$1,000 every two months.

[35] HealthyDesign.City. (n.d.). *HealthyPlan.City*. Retrieved Mar. 1, 2023, from https://healthyplan.city/en

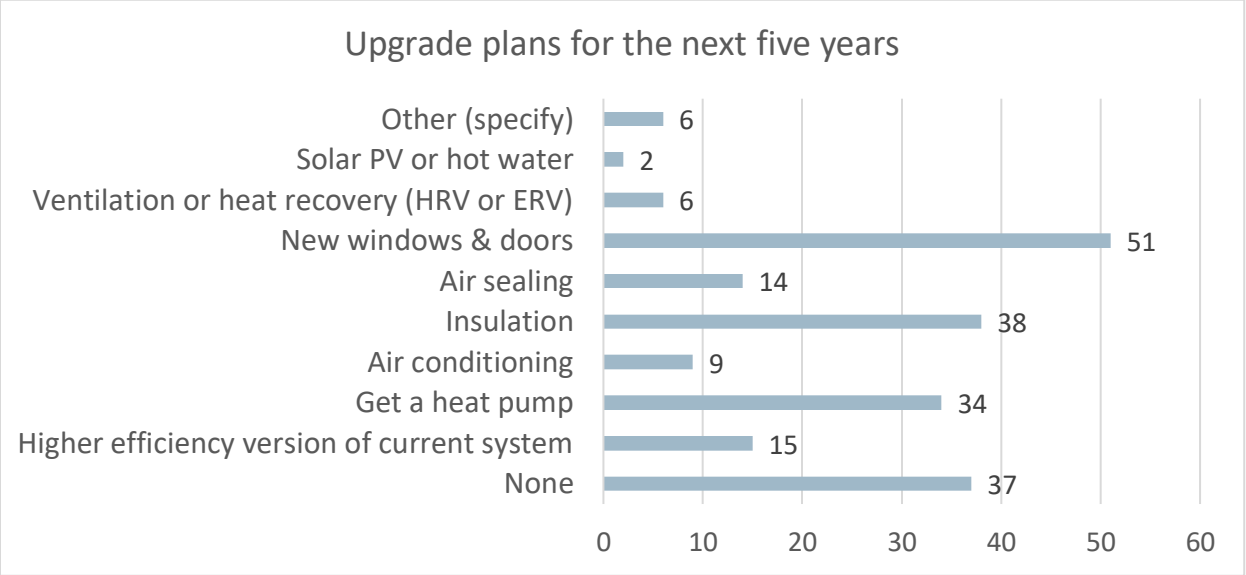


Notably, all respondents with a heat pump rated their household energy costs as affordable or very affordable, and reported their total home energy cost at $1,200-$3,599 per year – on the lower end of cost ranges. All had also completed other energy efficiency upgrades (such as envelope improvements, hot water heating, and heat recovery) in the past ten years. These respondents also indicated awareness of a larger number of rebate programs than respondents with other heating systems.

Respondents were most unhappy with their windows and doors, with 46% selecting dissatisfied or very dissatisfied. Heating received the highest ratings, with 39% indicating that they are satisfied or very satisfied with their heating system. 55% of respondents said that they hadn't made any upgrades to their home's heating system or energy efficiency in the past ten years. The most common upgrades reported were heating system upgrades, window and/or door upgrades, and insulation upgrades.

Unsurprisingly, the reason for upgrades ranked as the most motivating by far was to save money on utility bills, selected by two-thirds of respondents. "Taking advantage of available rebates," and "upgrading broken or aging parts of my home" were the runners up (each selected by 46% of respondents), with comfort in third place (39%), followed by health and safety (29%). Reducing GHGs and increasing home value were only selected by 21% and 15% of respondents, respectively.

30% of respondents had no upgrade plans for the next five years. The measures most frequently planned for by respondents were 1) new windows & doors (selected by 41% of respondents), 2) insulation (31%), and 3) getting a heat pump (28%).



Full survey results can be found in Appendix C.

Key takeaways

- Old, predominantly non-apartment housing stock has strong upgrade opportunities
- Housing and energy affordability are significant issues in the community that could be mitigated by upgrades that reduce home energy costs
- Saving money on utility bills was by far the highest ranked motivator for energy efficiency upgrades on our household survey
- Around 40% of homes use fossil fuels, presenting a strong GHG reduction opportunity in switching to electricity (and electric heat pump heating in particular) as a cleaner energy source

Program landscape

Here we provide an overview of the Federal and Provincial policy and programming that applies to home energy upgrades in BC, and that in many cases significantly reduces the cost of upgrades.

Policy context

Federal supports for home energy efficiency are provided with the aim of reducing greenhouse gas emissions as part of Canada's 2030 Emissions Reduction Plan and goal of net-zero emissions by 2050. One of the main programs, delivered by Natural Resources Canada and the Canada Mortgage and Housing Corporation, is the Canada Greener Homes Initiative. It includes the following programs:

- Canada Greener Homes Grant
- Canada Greener Homes Loan
- Oil to Heat Pump Affordability Program (launched Spring 2023)
- Canada Greener Affordable Housing (launched June 2023)

The Province of BC's CleanBC Roadmap to 2030 is the province's plan for meeting its 2030 emissions reduction goals, reaching net zero by 2050. It intends for all replacement heating systems to be >=100% efficient by 2030, and includes supports to make residential energy-efficiency retrofits more accessible by providing rebates via the CleanBC Better Homes program for residential projects, and the CleanBC Better Buildings program for commercial projects as summarized in the table below. Residential programs are described in further detail in this report.

Overview of BC residential and commercial building efficiency programs

Better Homes – Residential Varying offers from: • Province of BC • BC Hydro • Fortis BC	Renovating	• Retrofit & energy assessment rebates • Heat pump group purchase rebates • Income-qualified programs • Programs for Indigenous communities • Heat pump loans
	Building New	• Energy Step Code & heat pump rebates
	Both	• Municipal rebates & programs • Mortgage insurance & tax refunds
Better Buildings - Commercial Varying offers from: • Province of BC • BC Hydro • Fortis BC • BC Housing	Renovating	• Retrofit rebates
	Building New	• Efficiency measure rebates
	Both	• Custom Programs • Whole Building Efficiency • Energy Efficiency Guidance • Social / Non-Profit and Rental Housing programs

Residential renovation rebates

There are several rebates available for home upgrades in British Columbia. A typical gas-heated home in Prince Rupert can receive up to $14,000 in rebates for switching to a heat pump. The CleanBC Home Renovation Rebate Program offers rebates for heat pumps, insulation, and windows and doors, with amounts ranging from $1000 to $9000 depending on the type of upgrade and the fuel source being replaced. Contrary to the Federal rebate program, pre-and post-retrofit EnerGuide home evaluations are not required. The federal Canada Greener Homes Initiative offers rebates for similar upgrades, including heat pumps, insulation, and windows and doors, up to $5,000 total (plus $600 for EnerGuide evaluations) per home. These are available to all households regardless of income.

BC provincial rebates

Measure	Rebate	Notes
Heat pump – central	$2000 – electric or wood to heat pump $9000 – fossil fuel to heat pump*	HSPF ≥ 10.00 and SEER ≥ 16.00 or HSPF2 ≥ 8.50 and SEER2 ≥ 15.20. A variable speed compressor is required. These specifications are referred to as a Tier 2 heat pump.
Heat pump – ductless	$1000 – electric or wood to heat pump $9000 – fossil fuel to heat pump*	HSPF ≥ 10.00 and SEER ≥ 16.00 or HSPF2 ≥ 8.50 and SEER2 ≥ 15.20 A variable speed compressor is required. A minimum of two indoor head units required
Heat pump – other	Up to $6,000* for dual fuel ducted pumps and air-to-water heat pumps	Must be primarily heat with fossil fuels prior to upgrade
Heat pump water heater	$1,000-$7,000* for combined space and hot water air-to-water heat pump	Amount dependent on combination of primary space and water heating fuels
Insulation	Up to $5,500	Attic – up to $900 Exterior walls – up to $1200 Basement and crawlspace – up to $1200
Windows and doors	Up to $2,000	$100 per window or door New windows/doors must have a metric U-Factor of 1.22 (W/m2·K) or lower.
Electric Service Upgrade	Up to $500	Must upgrade in combination with fossil fuel to heat pump upgrade
Multi-upgrade bonus	$300-$2,000 for two upgrade bonus OR Home Energy Improvement Bonus	$300 for two of the above upgrades, OR $750-$2,000 for 3+ upgrades (requires EnerGuide evaluation)

Group bonus	$200-$500 Group Purchase Rebate	Dependent on size of group.[36]

*Includes an additional $3,000 northern top-up offer which applies to homes north of 100 Mile House.

Indigenous government

The Nisga'a Lisims Government offers the Nisga'a Urban Housing Renovation Grant for Nisga'a citizens who do not reside on Nisga'a Lands. Up to $10,000 is available per property for renovations including but not limited to energy efficiency upgrades (e.g., roof, insulation, plumbing, electrical, ventilation, general repairs).

[36] The Heat Pump Group Purchase Rebate (GPR) is available for groups of homeowners switching from an oil, natural gas, or propane heating system to an air source heat pump. The larger each group becomes, the larger the rebate will be, starting from $200 per home for a group of 2 homes, up to a maximum of $500 for a group of 20 to 30 homes. Interested stakeholders such as contractors, local governments or community groups who are not personally installing a heat pump in their home can start a seeded code and encourage homeowners to join.

Federal Canada Greener Homes rebates

Note an overall maximum of $5,000 per home plus the $600 EnerGuide rebate applies.

Measure	Rebate	Notes (from Greener Homes site)
Heat pump – central	$4000	Central ducted system OR Mini- or multi-split ducted or ductless system with **three** or more warm air supply outlets or indoor heads. HSPF (AHRI Climate Region Zone IV) ≥ 10
Heat pump – ductless	$2500	Mini- or multi-split ducted or ductless system with **two** warm air supply outlets or indoor heads. HSPF (AHRI Climate Region Zone IV) ≥ 10
Heat pump – cold climate	$5000	Central ducted system OR Mini- or multi-split ducted or ductless system with **three** or more warm air supply outlets or indoor heads. HSPF (AHRI Climate Region Zone IV) ≥ 10
Insulation	Up to $5000	Attic – up to $1800 Exterior walls – up to $5000 Basement and crawlspace – up to $1500
Windows and doors	Up to $5000	$125 to $250 per rough opening
Air sealing	Up to $1000	$550 to $1000 depending on airtightness reached
Heat pump water heater	$1000	
Solar PV	$1000 per kW – up to $5000	Capacity equal to or greater than 1.0 kW DC
Other	EnerGuide evaluation rebate - $600	Maximum rebate for both pre- and post-retrofit evaluations

Income-qualified programs

In addition to the above rebates available to any households, there are programs available for households below specific income cutoffs from both the BC and the Federal government.

Provincial

The CleanBC Income Qualified Program (IQP) aims to support low-to-moderate income households by providing higher rebates, and paying contractors directly. Households must use either the IQP or regular rebates, but cannot combine both. However, as with regular Provincial rebates, Federal rebates can be used to cover cost remainders once the IQP is applied. IQP amounts are offered in two levels, with higher amounts (and to a maximum of 95% of upgrade costs) for lower income (level one) households, and lower amounts (and to a maximum of 60% of upgrade costs) for more moderate income (level two) households:

NUMBER OF PEOPLE LIVING IN HOME (INCLUDING ADULTS AND CHILDREN)	COMBINED PRE-TAX ANNUAL INCOME OF ALL ADULTS IN HOME (EXCLUDING DEPENDANTS)	
	Income Level 1	Income Level 2
1	$42,593	$55,903
2	$53,026	$69,596
3	$65,189	$85,560
4	$79,147	$103,880
5	$89,768	$117,820
6	$101,242	$132,880
7 OR MORE	$112,718	$147,943

Maximum amounts available are:

Available rebates	Rebate
Insulation	Up to $5,500
Windows and doors	Up to $9,500
Heat pumps	Up to $9,500
Heat pump water heater	Up to $3,500
Electric service upgrade	Up to $3,500
Ventilation	Up to $1,600
Health and safety	Up to $800

Upgrades and homes must meet eligibility criteria, and the use of an Income Qualified Program Registered Contractor is required. Renters are eligible but require landlord consent. Participants need to pre-register before pursuing upgrades.

Federal

As of 2023, an income-qualified component – the Oil to Heat Pump Affordability Program (OHPA) - has been added to the Canada Greener Homes Initiative.

The OHPA is available to homeowners who are at or below the median household after-tax income, and are currently heating their homes with oil, for switching to electric cold climate air source heat pumps. Homeowners who qualify can receive an upfront payment of up to $10,000 for the purchase and installation of eligible cold climate air source heat pump systems. The funding can also cover other eligible measures related to its installation, such as necessary electrical and mechanical upgrades, safe removal of oil tanks, installation of a back-up electric heating system, and switching over other oil-using household systems.

Applicants must provide proof that the home is their primary residence, proof of home ownership, heating oil proof of purchase (min. 1,000 litres in the last 12 months), their social insurance number for income verification, and a contractor quote. Other requirements include the contractors installing an eligible product (list here) that is sized to heat the entire home, the home being connected to the electrical grid, and completing the upgrade withing

six months. After-tax household income must be equal to or less than the applicable amount indicated in the following table, based on household size. The income amounts vary by province/territory. Those listed below are applicable to BC residents.

Household size	**Household income**
1 person	$ 39,200
2 persons	$ 77,500
3 persons	$ 100,000
4 persons	$ 121,000
5 persons or more	$ 142,000

Eligibility

The following tables provide a summary of eligibility criteria and eligible upgrade types of the regular and income-qualified incentive programs currently offered by the provincial and federal governments. Note that these requirements may change over time and should therefore always be confirmed directly with the respective programs.

Household/home eligibility criteria			
Provincial programs		*Federal programs*	
BC Better Homes Rebates	**BC Income-Qualified Program**	**Canada Greener Homes Rebates**	**Oil to Heat Pump Affordability Program**
No income qualification	Income qualification & proof	No income qualification	Income qualification (verified via SIN)
EnerGuide audit not required		**Pre- and post-retrofit EnerGuide audit required, must complete min. 1 upgrade from**	EnerGuide audit not required

		energy advisor's report	
No registration	Must pre-register with program	Must pre-register with program	
No explicit ownership requirement	Renters eligible with landlord consent form	Must own home	Must own home
Year-round primary residence, min. 12 months old		Primary residence, **min. 6 months old**	
Home type: - Single family home (detached dwelling). - Secondary suite in a single-family home (detached dwelling); the home and secondary suite must be individually metered. - Mobile home that is permanently fixed, sits on a foundation and is structurally complete with installed and connected plumbing, heating, electrical, water and sewer services towing apparatus and axle must be removed. - Duplex, triplex, row home or townhome, where each unit has its own natural gas and/or electricity meter.		Home type: - Single detached house **- Homes with secondary suites are considered MURBs,** whole building needs to be audited - Mobile homes on a permanent foundation - Semi-detached houses, row housing, townhomes - Permanently-moored floating homes - Mixed use buildings (residential portion only) - Low- rise multi-unit residential buildings (three storeys or less with a footprint of 600m2 or less)	
Must have account with listed utility.		No utility list	
Primarily heated by natural gas, propane, oil, or electricity*	Primarily heated by natural gas, propane, oil, wood &	**Agnostic to current heating type**	**Oil-heating** (receipt of purchase of min. 1,000 litres from last 12 months required)

	other solid fuels, electricity		
Installation by licensed contractor with GST # & BC business license for the trade. Heat pump and insulation contractors must be HPCN-registered.	Installation by income-qualified program-registered contractor	All **mechanical systems**, except for thermostats, must be installed by a licensed, trained professional.	
Can use one BC option (regular OR income-qualified, but not both) and combine with federal programs.		Can use both (but not receive money for a heat pump twice) and can combine with either provincial program.	
Must be connected to a utility.			Connected to electricity grid
* Wood and other solid fuels are only eligible for the air source heat pump rebate and the two-upgrade bonus. The existing wood heating can be kept as a back-up heating system if inspected by a Wood Energy Technology Transfer Inc. (WETT)-certified professional.			

Eligible upgrade types			
Measure	**BC Better Homes Rebates**	**BC Income-Qualified Program**	**Canada Greener Homes Rebates**
EnerGuide audits	✗	✗	✓
Heat pumps	✓ Mini/multi-split, ducted, dual fuel, air-to-water*	✓ Mini/multi-split, ducted, dual fuel, air-to-water	✓ Air-source or ground-source. Min. 2 heads if ductless – must service whole home
Heat pump water heaters	✓	✓	✓
Windows & Doors	✓	✓	✓
Air sealing	✗	✗	✓
Insulation	✓	✓	✓
Thermostats	✗	✗	✓
Solar PV panels	✗	✗	✓
Resiliency measures	✗	✗	✓ Batteries connected to PV systems, roofing membrane, moisture-and waterproofing

Electrical service upgrade for fuel-switching homes*	✗	✓	✗
Health & safety	✗	✓	✗
Ventilation	✗	✓	✗
Appliances	✓	✗	✗

*There are slight differences in eligibility criteria for gas-heated homes in Prince Rupert because they are supplied by Pacific Northern Gas: They are ineligible for the electrical service upgrade rebate and for the combined Space and Hot Water Air-to-Water Heat Pump Rebate. The latter is available to those with electric primary space heating.

Most Multi-Unit Residential Buildings (MURBs) do not qualify for the incentive programs outlined above. However, there are a few possible sources of funding for non-profit housing providers as well as private landlords, outlined in Appendix D.

Key takeaways

- Both the provincial and federal governments offer financial incentives for home energy efficiency renovations: The CleanBC Home Renovation Rebate Program and the Canada Greener Homes Initiative
- Both also have separate offers for lower-income households.
- These two programs can be used together, and can offer up to a combined $14,000 in rebates for gas-heated homes in Prince Rupert switching to a heat pump.

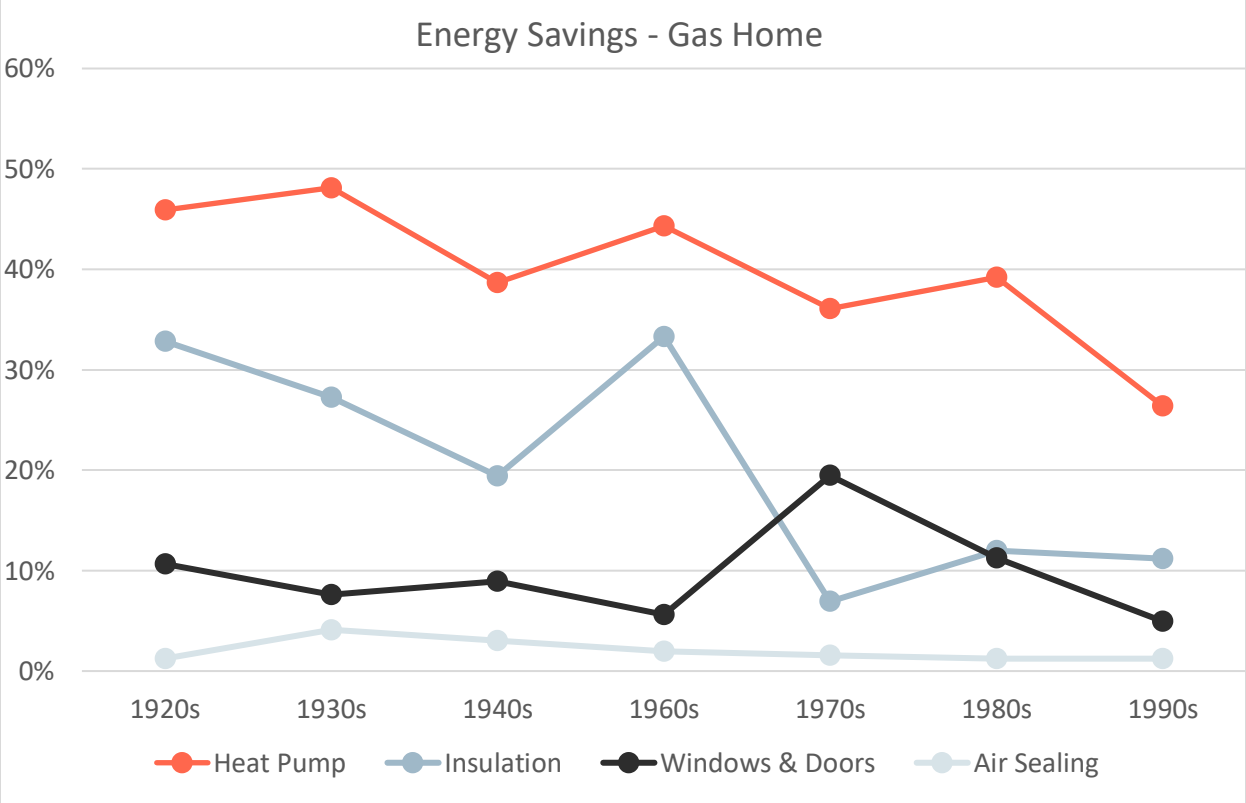
Benefits

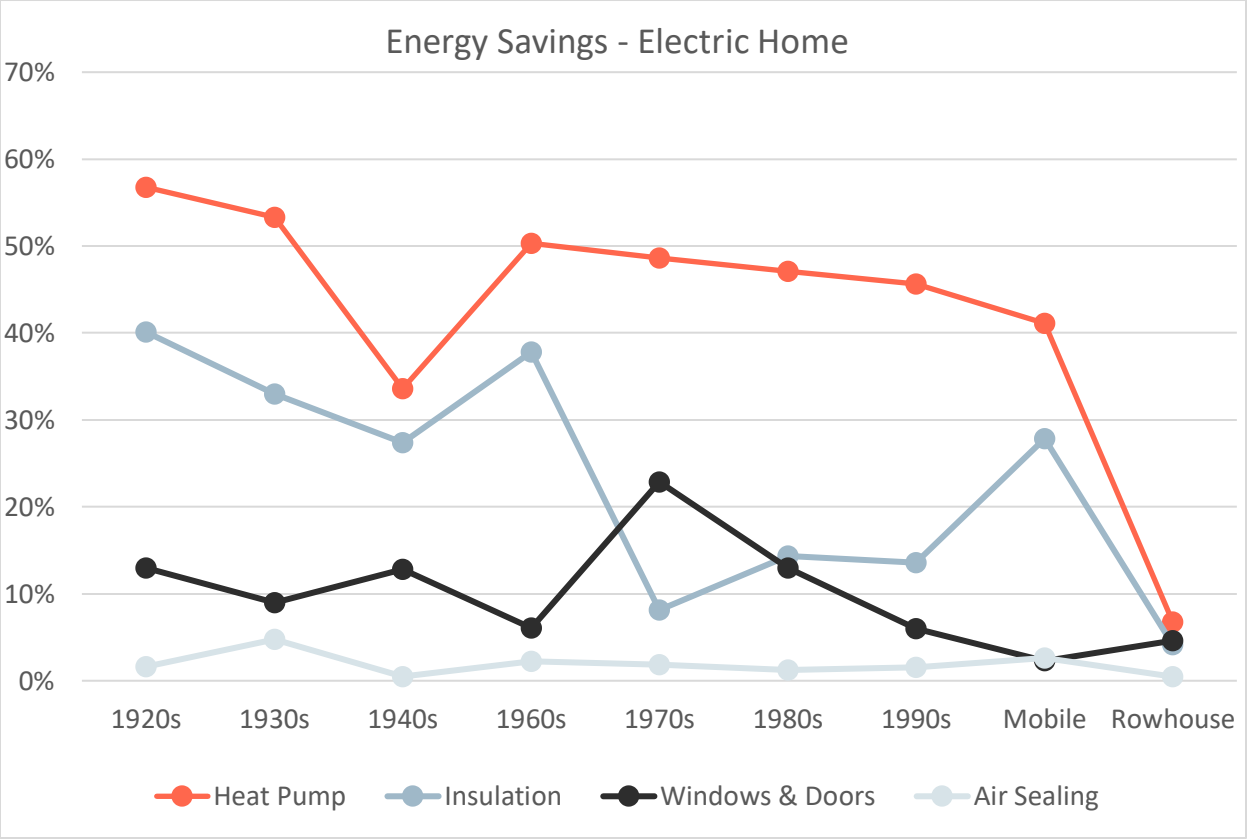
This study assessed potential benefits of efficiency retrofits for households in Prince Rupert by conducting energy assessments in homes that are common in the community, and creating archetypes with energy modeling estimating the potential energy and cost savings for different types of upgrades.

Energy and GHG savings

The following charts summarize the savings potential of gas-heated homes and electrically heated homes by decade of construction and type of upgrade (heat pump, insulation, windows and doors, and air sealing).

Energy and cost savings potential by vintage

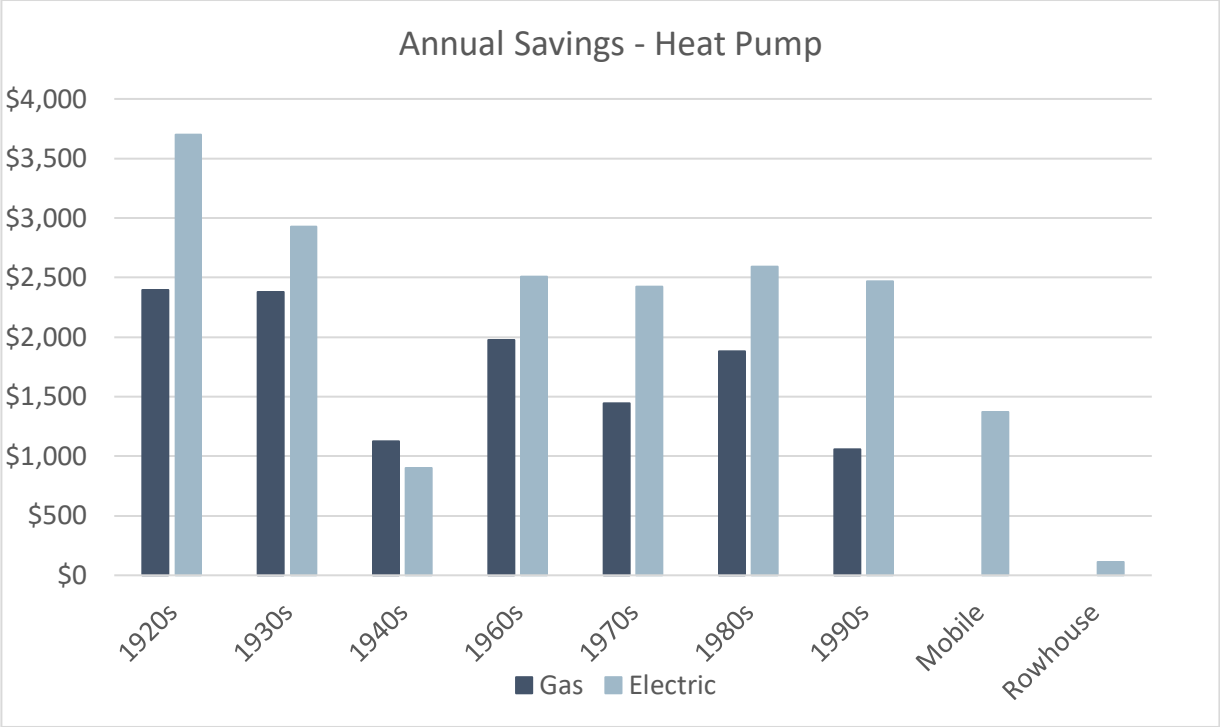


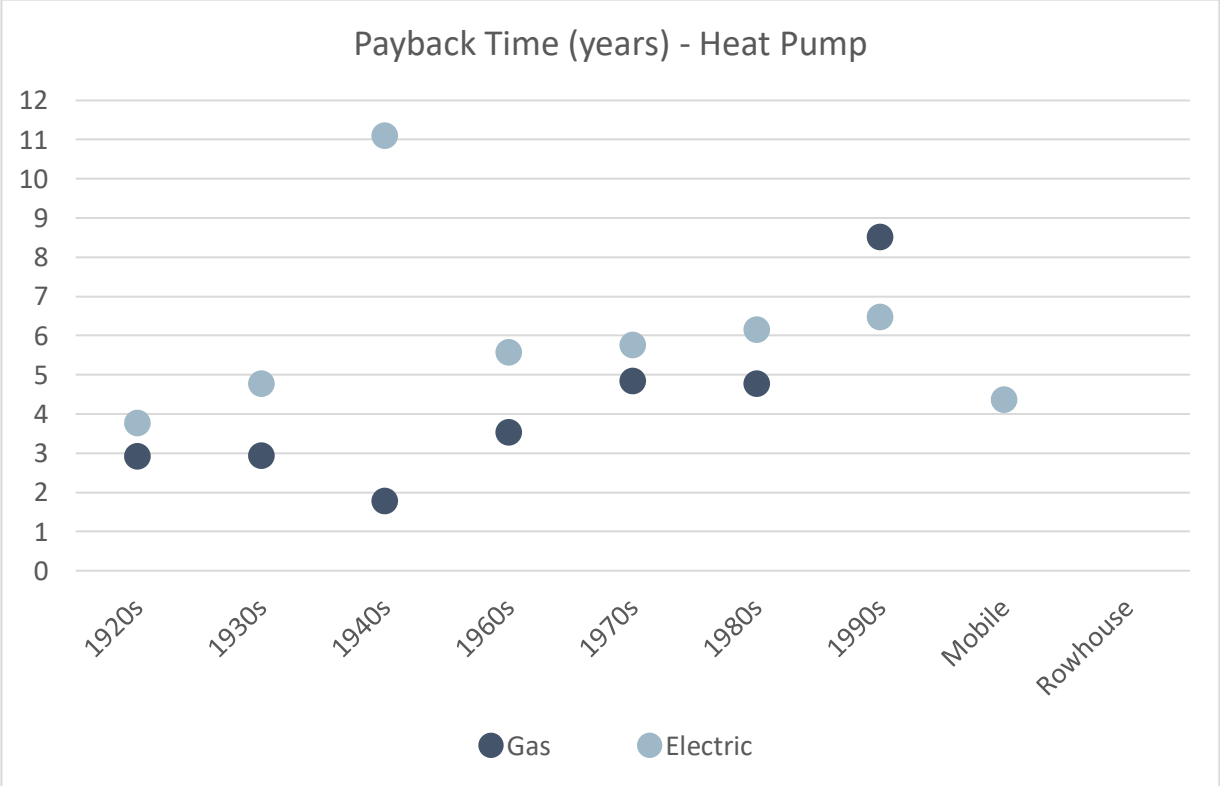


Overall, the modelling suggests that electric air source heat pumps are the retrofit option with the highest potential for energy and cost savings in most Prince Rupert homes, with energy savings approaching or even exceeding 50%. The high cost of natural gas in Prince Rupert makes heat pumps an even more financially attractive option for homes that are currently heating with gas furnaces compared to the southern part of the province.

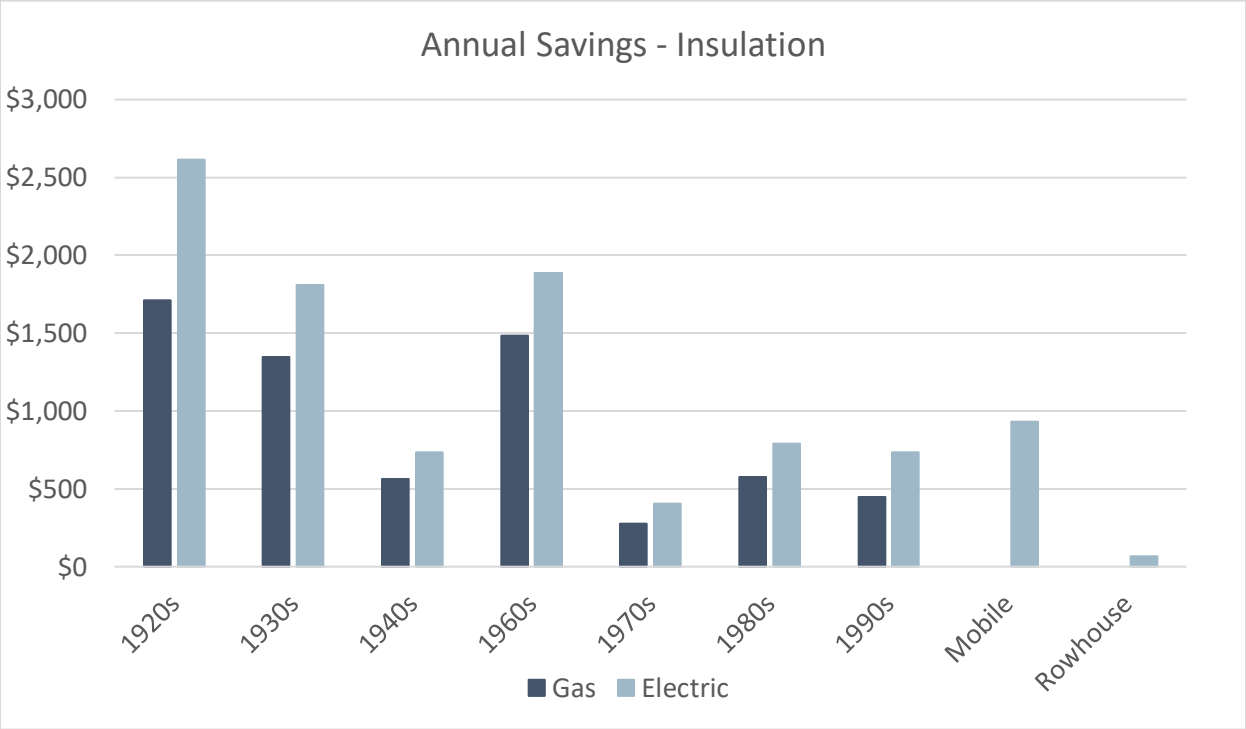
The charts below summarize the cost savings and payback times for different home types and vintages. While potential savings in homes upgrading from electric baseboards to an air-source heat pump are higher overall (up to $3,700 per year), those upgrading from gas heating can also achieve significant savings in the range of $1,000 to $2,400 per year.

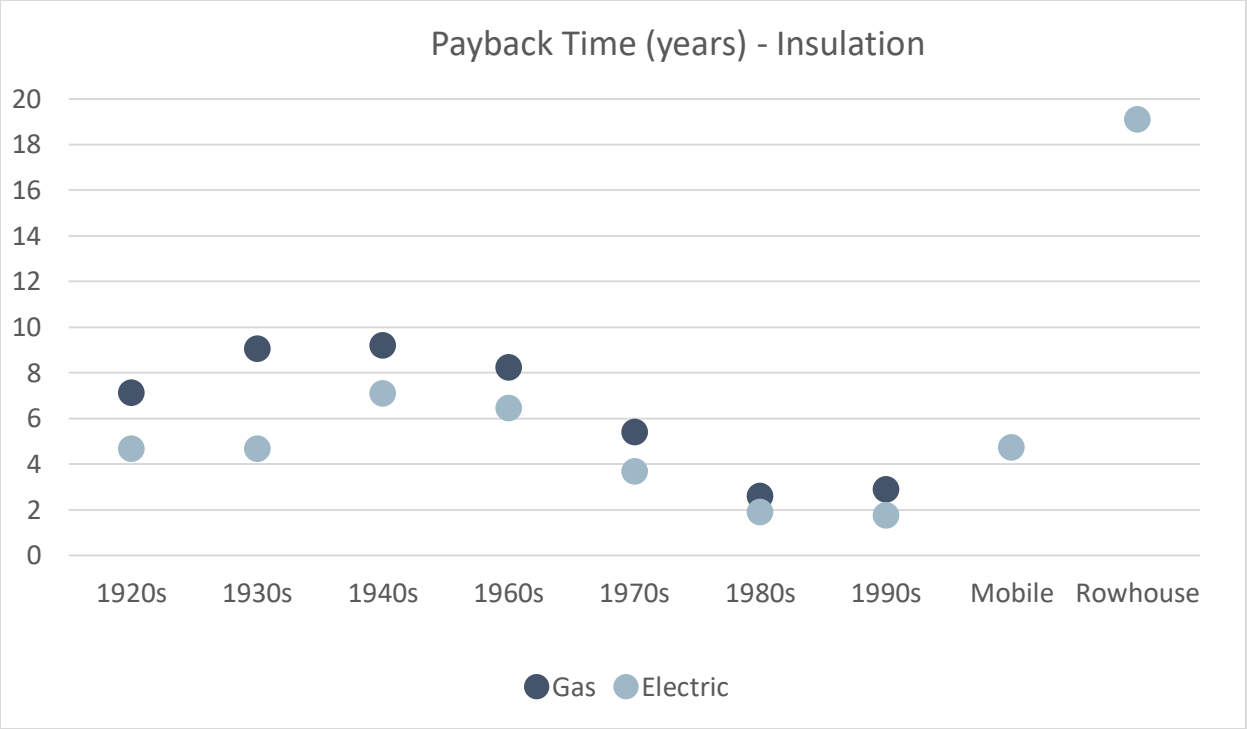
Payback times for heat pump upgrades are short, typically on the order of 3-5 years for homes switching from fossil fuels given the significant incentives currently available. Payback times for home upgrading existing electric baseboards or furnaces are longer due to lower incentive amounts but are still very attractive – typically around 6 years. These payback times are illustrated in the graph below, comparing homes upgrading from gas heating versus from electric baseboard heating, across various home vintages/types.


Annual Savings - Heat Pump
$4,000
$3,500
$3,000
$2,500
$2,000
$1,500
$1,000
$500
$0
1920s
1930s
1940s
1960s
1970s
1980s
1990s
Mobile
Rowhouse
Gas
Electric


Payback Time (years) - Heat Pump
12
11
10
9
8
7
6
5
4
3
2
1
0
1920s
1930s
1940s
1960s
1970s
1980s
1990s
Mobile
Rowhouse
Gas
Electric

Insulation upgrades are also a good investment for many Prince Rupert homes, with significant energy savings potential and payback times on the order of 5-7 years in many cases. These upgrades will be particularly impactful for homes that have little or no foundation or crawlspace insulation, or homes with little attic insulation. Wall insulation upgrades are costlier, and will take much longer to pay back.



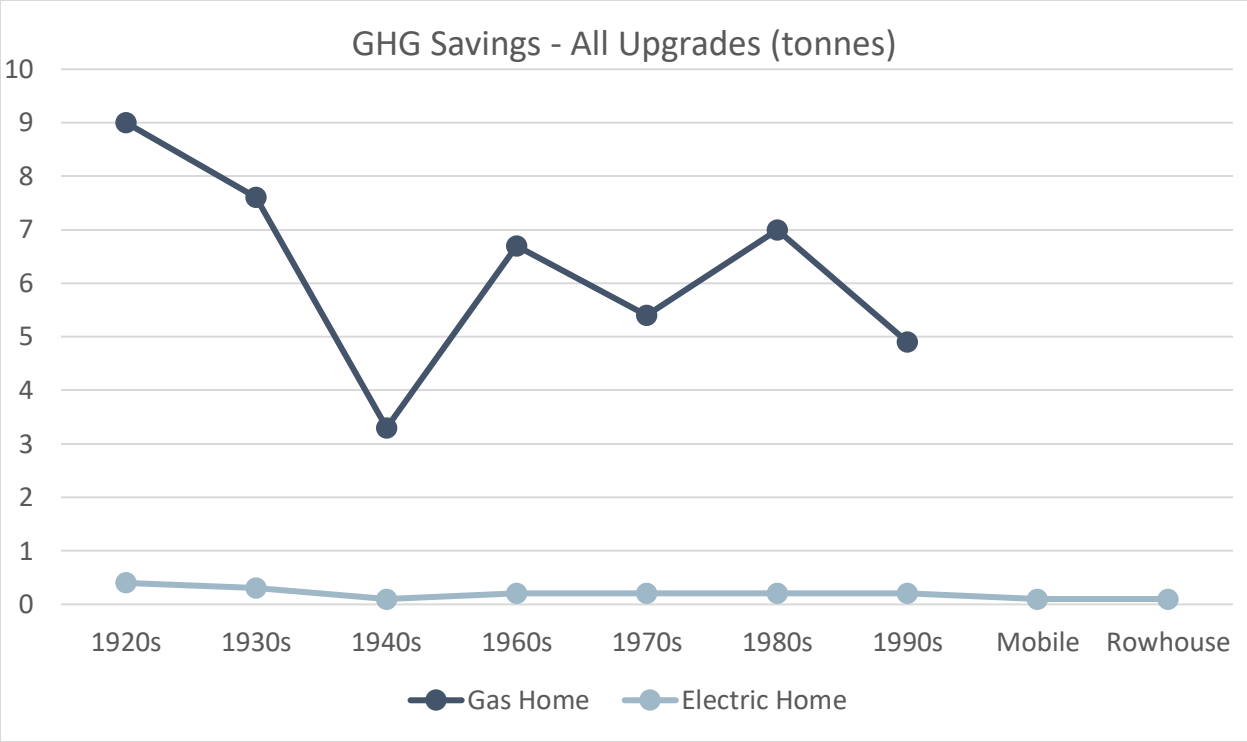


Window upgrades may be a sound investment for homes that still utilize single-paned glazing, particularly if residents experience discomfort near windows due to radiative heat loss. For homes that already have double-glazed windows, a further upgrade will take many years to pay back – typically approaching the expected 25-year lifespan of the window itself.

Finally, air sealing and weatherproofing upgrades are a relatively low-cost option that also typically yields low energy savings, unless the home is extremely drafty. Air sealing may pay for itself in savings in as little as a year. There may be benefits to air sealing upgrades beyond energy savings – for example, improving air tightness can reduce condensation, moisture and mould issues.

Greenhouse gas savings potential by vintage

The following chart shows greenhouse gas emissions reduction potential in gas-heated homes as compared to electrically-heated homes, by construction decade. In general, older homes are less energy efficient and therefore have higher emissions reduction potential. However, home size is a key variable and emissions reductions in particularly small homes as were built in the era of the Second World War (represented by the 1940s archetype) will result in smaller GHG reductions as compared to larger houses.



Upgrades to electrically-heated homes may result in significant energy cost savings for residents in Prince Rupert, but they present almost no potential to reduce GHG emissions. This is due to BC Hydro's extremely low-carbon electricity supply. In contrast, upgrading gas-heated homes has very significant potential to reduce GHG emissions. Emissions can be reduced by upgrading insulation, windows, or airtightness, but they can be completely eliminated by replacing the gas furnace with an electric heat pump. This upgrade represents the single greatest potential, both for energy savings and for emissions reductions, in Prince Rupert homes.

While cost savings are often a key motivation for households, and GHG emissions reduction may be desirable for municipal government climate targets, there are significant other potential benefits from home energy upgrades, including addressing safety issues, mould and moisture problems, and indoor air pollution, all of which can significantly improve the health and comfort of occupants and increase the quality of existing residential housing options.

Representative home savings – combination upgrade

Based on the archetype models described in Appendix A, a house model representing expected energy savings for an average home in Prince Rupert across all vintages was used to

estimate overall program impact. The home was modelled with air source heat pump, attic and foundation insulation, and air sealing upgrades.

Representative Savings – combo upgrade	Gas home	Electric home
Initial consumption (GJ)	186	141
Energy Savings (GJ)	114	69
Energy Savings (%)	61%	49%
Upgrade cost (after rebates)	$ 9,950	$ 16,950
Cost savings ($/yr)	$ 2,143	$ 2,855
GHG Savings - (tCO2e/yr)	7.0 (> 90%)	0.2

Upgrade Details:

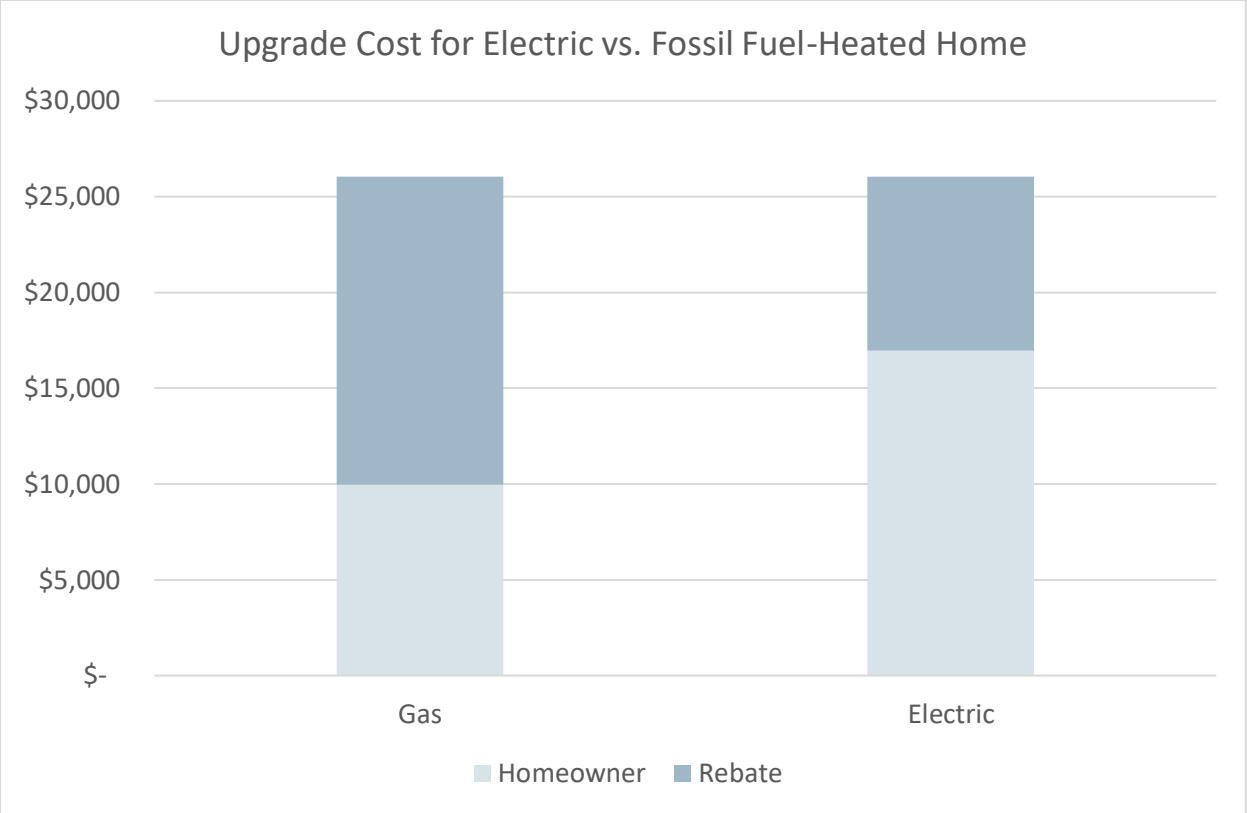
- 78% efficient gas furnace or electric baseboard to air-source heat pump
- HSPF 10 SEER 20
- Attic insulation R28 to R50
- Foundation wall insulation R0 to R20
- Air sealing 4.01 to 3.61 ACH50

Rebate Details:

- $6,000 provincial rebate + $3,000 northern top-up for heat pump
- $4,000 federal rebate for heat pump
- $900 provincial rebate for attic insulation
- $2,200 provincial rebate for foundation/basement insulation

This cost scenario involves a total retrofit cost of $26,050, turning into a $9,950 net cost after $16,100 in rebates are applied for the home switching from gas heating to a heat pump, as shown in the graph below. This results in a payback period of just under five years. A conservative estimate of a 15-year lifespan is used for the heat pump, usual lifespans are 20 or more years. Notably, the net cost is below the average renovation spend of $13,043 among Canadian homeowners in the past year.[37]

[37] Of the homeowners who completed repairs, 9% reporting having installed a new HVAC system according to a survey of 1,110 households: HomeStars. (2022). *2022 Reno Report.* Retrieved July 24, 2023 from https://homestars.com/reno-report/?utm_source=google&utm_medium=cpc&utm_campaign=b2c-unbranded-sn-west-vancouver-dsa-2023&keyword=&matchtype=&utm_term=&utm_content=650228789924_c_&gad=1&gclid=EAIaIQobChMIqIvQl-asgAMV0h2tBh1uWQP3EAAYASAAEgJoCvD_BwE



Representative home savings – individual upgrades

Representative Savings – heat pump and air leak sealing only	**Gas home**	**Electric home**
Initial consumption (GJ)	186	141
Energy Savings (GJ)	108	63
Energy Savings (%)	61%	45%
Upgrade cost (after rebates)	$ 7,000	$ 14,000
Cost savings ($/yr)	$ 1,905	$ 2,617
GHG Savings - (tCO2e/yr)	7.0 (> 90%)	0.2

Representative Savings – insulation upgrade and air leak sealing only	**Gas home**	**Electric home**
Initial consumption (GJ)	186	141
Energy Savings (GJ)	28	20
Energy Savings (%)	15%	14%

Upgrade cost (after rebates)	$ 1,100	$ 1,100
Cost savings ($/yr)	$ 638	$ 850
GHG Savings - (tCO2e/yr)	1.5	<0.1

Market opportunity analysis

Nearly all homes in Prince Rupert are old enough to likely be able to benefit from energy efficiency upgrades. 4,895 (96%) homes were built prior to 2001, and 81% of homes are not in apartment buildings. This results in roughly 3,965 homes over 20 years old that are likely to be eligible for retrofit rebates and have retrofit opportunities, representing the total market opportunity. Of course, only a portion will have interest or capacity to complete renovations.

The BC Government's sectoral target for reducing emissions in the building sector requires a 59-64% reduction in emissions from 2007 baseline levels by 2030.[38] In order to achieve this sectoral target, approximately 80,000 home retrofits per year are needed across the entire province, out of 2 million total households[39] (a rate of 4% of homes per year).[40]

This rate of retrofit activity would translate to approximately 150 home retrofits per year in Prince Rupert, out of a total ~4000 households in the target market.[41] This is the rate of activity that is necessary to address the climate emergency and avoid the most catastrophic impacts of climate change. However, this necessary rate of activity should currently be considered as an upper bound. The experience and conclusion reached by other jurisdictions is that regulation is ultimately necessary to reach emissions targets.

For the purposes of illustration, we will consider two other scenarios – a "moderate" uptake level at 75 homes per year, in line with the 2-3% uptake rates experienced by previous

[38] Province of British Columbia. (n.d.). *Climate action legislation.* Retrieved Nov. 16, 2022, from https://www2.gov.bc.ca/gov/content/environment/climate-change/planning-and-action/legislation
[39] Statistics Canada. (2022, Nov. 30). *British Columbia [province]: Census Profile, 2021 Census of Population.* Catalogue no. 98-316-X2021001. Ottawa. Retrieved from https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E
[40] Pembina Institute. (2021, Apr. 20). *B.C. budget takes small steps toward clean economy goals*. Retrieved from https://www.pembina.org/media-release/bc-budget-takes-small-steps-toward-clean-economy-goals
[41] Province of British Columbia, *Climate action legislation.*

voluntary programs such as LiveSmart BC, and a “low” uptake scenario in which very few participants (5 per year) complete an upgrade.[42]

Of the available market, there are key segments that represent potential program target audiences due to their higher rebate eligibility and/or higher retrofit impact potential. These include homeowners, those facing household energy insecurity and/or living on low-to-moderate incomes, and those currently heating with fossil fuels.

Owner-occupied vs renter segments

38% of Prince Rupert households are renters, while 62% are owners. There are significant challenges under the current tenancy law and rental market situation with supporting renters to retrofit, which are further described in the Barriers section. Most rebates are geared towards owner-occupants, and given they normally have full control of their property, this market segment can more easily be moved towards making retrofits. There are at minimum 2,458 owner-occupied, non-apartment, over 20 years old homes in the City.

Fossil vs electric segments

As of 2020, Pacific Northern Gas had a total of 36,397 residential accounts across its three regions, of which 10,245 accounts were in the West (West) region, which includes the communities of Prince Rupert, Kitimat, and Terrace.[43] According to the BC CEEI buildings data, there were 2,471 PNG connections in Prince Rupert in 2020.[44] Based on the total connections reported in the CEEI, this would mean about 2,273 connections, or 45% of occupied homes in the City use fossil gas supplied by PNG as their main fuel.

The energy use per residential account reported by PNG was 68.3 GJ in 2021. This is forecast to rise to 70.8 GJ in 2024.[45] (For the West service area from Summit Lake to Prince Rupert, including much more heating intensive climates than Prince Rupert).[46] The utility has also

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[42] Pembina Institute. (2016, Nov. 29). *Building Energy Retrofit Potential in B.C.* Retrieved from https://www.pembina.org/docs/event/netzeroforum-backgrounder-2016.pdf

[43] Posterity Group. (2022, June 21). *2021 Conservation Potential Review: Final Report*, p. 44. In: PNG Application for ECI Portfolio Funding 2023-2024. Retrieved from https://docs.bcuc.com/documents/proceedings/2022/doc_68373_b-1-png-energyconservationinnovation-portfoliofunding-application.pdf

[44] Province of British Columbia, *CEEI Buildings Data*.

[45] Pacific Northern Gas. (2022, Nov. 30). *Application to the British Columbia Utilities Commission for Approval of 2023 and 2024 Revenue Requirements*, p. 24. Retrieved from https://docs.bcuc.com/documents/proceedings/2022/doc_69219_b-1-png-west-2023-24-rra.pdf

[46] Ibid., p. 2.

projected uptake for proposed, expanded incentives to reach about 3.2%.[47] This would result in about 51 heating upgrades (including furnace tune-ups, gas-ASHP integration or hybrid systems, HRVs), and 7 envelope upgrades (including insulation, windows, and doors) annually.

According to PNG's residential end-use survey, 39% of customers in the Terrace-Prince Rupert-Kitimat region have considered installing a heat pump.[48] Additionally, PNG estimates that one third of gas furnaces and one fourth of gas boilers currently in use are 20 years old or older. A recent report shows that about one third of homeowners replaced their furnaces because the system broke down.[49] In this situation, not only do they often end up with higher costs (including paying emergency replacement fees of up to $6,000), but they also lose out on the opportunity to explore alternate options or rebates due to the urgency of the situation generally resulting in a like-for-like replacement installation of new gas equipment.[50] Both the households interested in heat pumps, and those with aging gas heating equipment have a strong opportunity for fuel switching and are a high-potential target audience.

[47] Ibid., p. 39: PNG's estimates: 1,172 participants on average annually for its proposed incentives – 755 heating upgrades (including furnace tune-ups, gas-ASHP integration or hybrid systems, HRVs), 310 water heating upgrades (minor interventions like pipe wrap, faucet aerators or EnergyStar washers), and 107 building envelope upgrades (including insulation, windows, and doors).

[48] Pacific Northern Gas, *Application for ECI Portfolio Funding 2023-2024. Response to BCUC Information Request No. 1*, p. 37

[49] Glave, James and Woollard, Donovan. (2022). *Stuck: Why home electrification is lagging in British Columbia and what must be done to break the deadlock on residential carbon retrofits,* p. 18. Open Technologies. Retrieved from https://opentech.eco/stuck

[50] Ibid.

Proportion currently upgrading

Current uptake of provincial rebates in the City is extremely low. In total, only one provincial rebate was issued in Prince Rupert in 2019; three in 2020, four in 2021, and 13 in 2022.

Fiscal Year	ECAP Advanced Insulation	Heat Pump electric to electric	Heat Pump fossil fuel to electric	Insulation	Doors / Windows	Heat Pump Water Heater
2019				1		
2020	1			2		
2021		1		2	1	
2022	1	1	4	1	3	3
2023*		1	1		1	1

Notes:
FY 2023*: Completed rebates as of Feb. 6, 2023
FY 2023 ECAP (Energy Conservation Assistance Program): Advanced data not available until Apr. 2023
Number of open BC Hydro residential accounts as of Feb. 16, 2023 for reference: 6,006

Data on the uptake of federal rebates (Canada Greener Homes) and the federal zero interest loan is not available. However, uptake of Federal offers is likely to be even lower, because unlike Provincial incentives, both the rebates and loan require a home energy assessment pre-and post-upgrade. This has been hard to access in the City of Prince Rupert, due to a lack of local Energy Advisors.

City building permits were searched for upgrades that could commonly increase energy efficiency (window & door replacements and insulation) as well as HVAC work such as wood stoves, boilers, and other heating system changes. Over the past six years, from 2017 to 2022, there were 66-99 separate permits each year (roughly 1-2% of total occupied dwellings annually) for such upgrades. This likely undercounts the number of upgrades, as some work may have been done without a permit, and some permits for larger renovations may not have mentioned each specific measure.

The energy efficiency of these upgrades is uncertain. Window replacements were by far the most common permitted energy-relevant retrofit measure, making up 82% of the 479 permits. It is possible that these projects would have been eligible for rebates, but people did not access them, or that these projects did not improve energy efficiency or utilize rebate-eligible products. This may indicate missed opportunities for awareness of rebate programs, and/or rebate access barriers.

Proportion interested in upgrading

Of our survey respondents, 70% were interested in making upgrades within the next five years, and 45% had made home energy upgrades in the past decade. Given this was a voluntary sample, likely with a higher interest in energy efficiency upgrades, interest is likely lower among the general population. From a 2019 survey, PNG reports that 42% of households were interested upgrading windows and doors.[51] According to a 2022 PNG survey, 41% of households had intentions to complete one or more energy-related upgrades over the next two years.[52] Here the most common intended upgrades were energy efficient windows, upgrading weather stripping, and installing a smart thermostat.[53] At 40%, this would mean roughly 1,500 eligible households in Prince Rupert may be interested in upgrading.

Uptake and Impact

Based on the number of households living in eligible home types that were built prior to 2001, we estimate the potential number of households that broadly fall into the target market, then used to estimate potential participation in a retrofit support program, based on uptake of past and current programs in other jurisdictions.

Total households	5,085
Eligible households (pre-2001 non-apartment)	3,965
Electrically heated eligible homes	2,193
Gas heated eligible homes	1,772

We provide three different uptake scenarios to illustrate potential total impacts depending on the level of participation.

[51] Pacific Northern Gas. (2022, August 12). *Pacific Northern Gas Ltd. and Pacific Northern Gas (N.E.) Ltd. Application for Energy Conservation and Innovation (ECI) Portfolio Funding 2023-2024*, p. 27. Retrieved from https://docs.bcuc.com/documents/proceedings/2022/doc_68373_b-1-png-energyconservationinnovation-portfoliofunding-application.pdf

[52] Pacific Northern Gas, *Application for ECI Portfolio Funding 2023-2024. Response to BCUC Information Request No. 1*, p. 37.

[53] Ibid.

	High Uptake	Medium Uptake	Low Uptake
Total participating homes	150	75	5
Total energy savings - (GJ)	13,118	6,559	437
Total upgrade cost (after rebates)	$ 2,112,000	$ 1,056,000	$ 70,400
Total annual cost savings	$ 384,462	$ 192,231	$ 12,815
Total annual GHG savings (tCO2e)	448	224	15
Economic activity (jobs created)	27	14	1

Below, the three uptake scenarios are broken down into participation by gas-heated homes compared to electrically-heated homes, so as to illustrate the differences in savings.

High Scenario - 150 homes/yr	Gas	Electric	Total
Total participating homes	62	89	150
Energy savings - (GJ)	7011	6107	13118
Total upgrade cost	$ 611,925	$ 1,500,075	$ 2,112,000
Total annual cost savings	$ 131,795	$ 252,668	$ 384,462
Total annual GHG savings (tCO2e)	431	18	448
Economic activity (jobs created)	8	20	27

Med Scenario - 75 homes/yr	Gas	Electric	Total
Total participating homes	31	44	75
Energy savings - (GJ)	3505.5	3053	6559
Total upgrade cost	$ 305,963	$ 750,038	$ 1,056,000
Total annual cost savings	$ 65,897	$ 126,334	$ 192,231
Total annual GHG savings (tCO2e)	215	9	224
Economic activity (jobs created)	4	10	14

Low Scenario - 5 homes/yr	Gas	Electric	Total
Total participating homes	2	3	5
Energy savings - (GJ)	234	204	437
Total upgrade cost	$ 20,398	$ 50,003	$ 70,400
Total annual cost savings	$ 4,393	$ 8,422	$ 12,815

Total annual GHG savings (tCO2e)	14	1	15
Economic activity (jobs created)	0	1	1

Key takeaways

- Electric air source heat pumps are the retrofit option with the highest potential for energy savings (up to or even above 50%) and cost savings in most Prince Rupert homes, with payback times around 3-5 years for those switching from fossil fuels.
- Insulation upgrades are also a good investment for many Prince Rupert homes, with significant energy savings potential and payback times on the order of 5-7 years in many cases.
- Rebate uptake in Prince Rupert has been low, but our survey indicated high interest in making upgrades.
- Three uptake scenarios were estimated to illustrate the potential combined impacts of retrofits.

Barriers and opportunities

A key objective of this feasibility study was to assess programming and financing options to address barriers preventing households from engaging with or successfully completing home energy efficiency upgrades. The study investigated these barriers, which are detailed in this section, via community engagement as well as supplementary market research, to better assess and prioritize potential program options.

Awareness

Awareness gaps were present regarding many aspects of the home energy upgrade process. It was notable in our community engagement activities that many stakeholders were not aware of the available rebates, or only knew of one of the programs. Almost no one we spoke to was aware of the income-qualified program options, or of the higher amounts available as part of the BC northern top-up offer.

The survey also gave insight into some of the issues likely preventing households from upgrading. For instance, one third of respondents had not heard of any of the financial support programs listed. Only about one quarter had heard of Clean BC rebates, and the remaining programs were each selected by 6-17% of respondents. It is likely that households have needlessly self-selected out of pursuing upgrades based on up-front cost, not knowing the rebates and financing they could access, nor the savings they could achieve.

Key awareness gaps also existed regarding Energy Advisors. For instance, most community members we spoke to were unaware that there now is an Energy Advisor based in Prince Rupert, which in some cases led them to believe they could not access Federal rebates, or to abandon their project idea entirely. Others had not known when they completed renovations, that the Federal rebates required energy assessments, one pre- and one post-upgrade. They went ahead with their project only to find out afterwards that they could no longer receive the rebate due to not having completed a pre-upgrade evaluation. Misconceptions such as these, along with the lack of Energy Advisors (up until the end of 2022), appear to have played a major role in tarnishing the reputation of the Canada Greener Homes program particularly for many in the community.

Raising basic awareness of upgrade opportunities and rebate programs is foundational to any progress, and could be achieved through a local public awareness campaign that involves key stakeholders in the City. Many interview participants felt that public education would be key

to increase retrofit activity in Prince Rupert and were interested in supporting efforts through the distribution of communications materials using the channels available to them, and by participating in in-person learning sessions.

Information gaps

Households in Prince Rupert are facing several information gaps that are impeding them from making energy efficiency upgrades to their homes. One significant barrier is the complexity of the upgrade process and the lack of guidance available. Many individuals do not know where to start when it comes to upgrading their homes or what the best order or combination of upgrades should be, and there is a lack of locally relevant information available to guide them in the process. Furthermore, confusion exists regarding what upgrades will function well in the local climate. Individuals may not take any action because they do not feel like they know enough about the process or may not have the time to research and manage the project.

The lack of information available regarding the costs of upgrades prevents homeowners from gaining a clear understanding of how much they can expect to pay for various energy efficiency measures. Without this knowledge, it becomes challenging for households to plan and budget effectively for these upgrades. Furthermore, the uncertainty surrounding the financial benefits of energy efficiency upgrades makes it difficult for households to justify the expenditure. There is a lack of information on the potential cost savings associated with different types of upgrades and the payback times for these investments.

Another significant information gap for homeowners in Prince Rupert is related to the use of heat pumps in upgrading their homes. Specifically, there are concerns about the effectiveness of heat pumps in cold weather, and their noise levels, for instance. Addressing these concerns and providing clear guidance on how to mitigate potential issues may help to encourage more households to consider heat pumps for their homes.

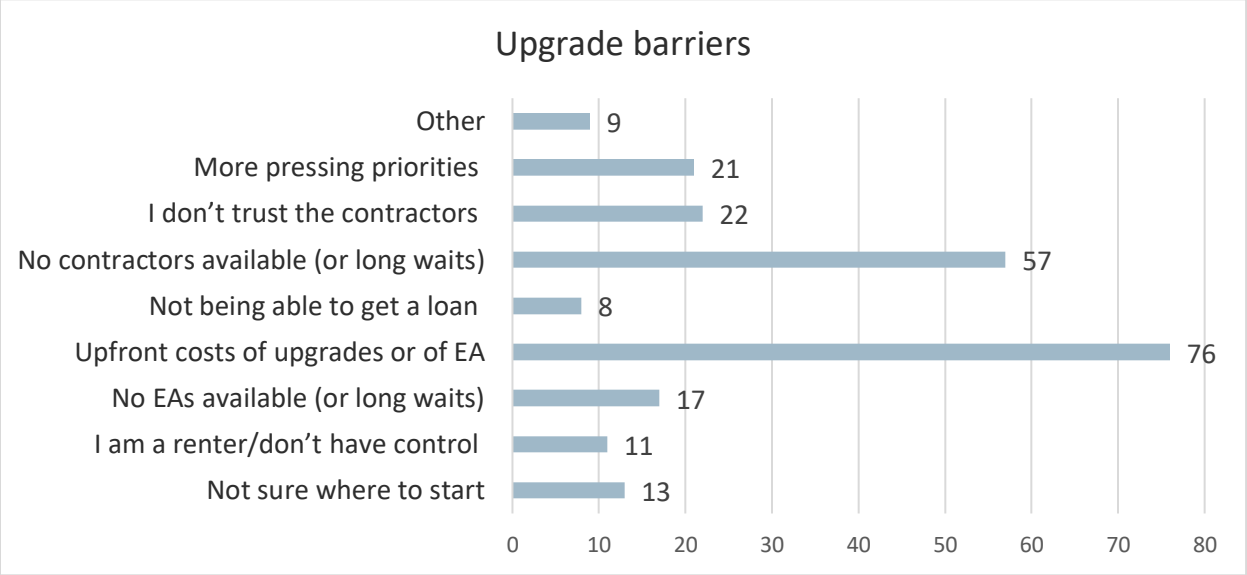
While some of these information gaps, especially the more basic ones, can be addressed via a public awareness campaign or central source of information, even communications targeted to specific audiences will reach limits in what gaps it can address. Some will need one-on-one conversation to effectively integrate and use the information, and many will have questions that are too specific or contingent upon their circumstances to be addressed in a public campaign. This is why most programs offer some level of personal interaction and individual household guidance. Receiving personal, professional advice from a trustworthy third party was identified by survey respondents as a potential solution as well.

Based on research and experience of past programs, some level of individually tailored household guidance (concierge service) will result in much higher chances of households successfully completing the retrofit process, as it is a very complex undertaking for most people. The extent of such guidance can be limited to a set number of households and/or to specific target groups or retrofit measures to limit costs.

Based on our experience providing basic guidance (no financing), support time required ranged from 30 minutes to five hours total per household, averaging at about two and a half hours. External delivery partners may charge about $175 for a single household consultation session, $250 per household for light-touch service, or $750-$1,000 in time costs per household for full start-to-finish support, not including other program administration costs.

Cost and affordability

Cost was by far the most frequently selected barrier (selected by 60% of respondents), followed by long waits for or unavailability of contractors.



Cost of living and affordability in general were brought up frequently as a major issue. Inflation, rising interest rates and the ongoing housing crisis undoubtedly continue to exacerbate this problem. Additionally, many are already financially overextended as

household debt is rising – Canadian households now owe $1.85 on every dollar of disposable income.[54]

Those households already finding their energy costs unaffordable, who would benefit greatly from upgrades that reduce these costs, tend not to be able to afford to making efficiency upgrade investments. Higher priority costs, including food and other basic living expenses along with basic home maintenance, can already be a significant financial challenge. Inflation and increasing costs of goods, incl. gas, as well as increasing property taxes were named multiple times in the survey. As one respondent illustrates the stark reality: “Many of my friends in Prince Rupert are barely making ends meet and sometimes have to choose between heat and food.”

There are multiple dimensions to cost as a barrier: One major obstacle is the up-front costs associated with these upgrades. Even if eligible for significant rebate amounts, households may find it challenging to meet the initial expenses required for energy-efficient improvements, as they have to cover the full cost of the upgrades before receiving any potential reimbursement. Additionally, the lack of information on costs and savings makes accurate budgeting difficult, and the acceptability of payback times depends on individual circumstances, and may shorten for seniors, as some senior respondents pointed out.

The two-tier BC Hydro rate structure currently also puts a financial strain on more electrified homes, potentially disincentivizing full electrification as households are charged a higher rate after a certain level of electricity consumption.

Further, Prince Rupert's higher cost of materials and supplies adds to the financial burden of completing upgrades. In some cases, individuals find it more cost-effective to drive to Terrace to purchase supplies. The lack of an option for do-it-yourself (DIY) projects with provincial rebates also restricts cost-saving opportunities for those homeowners who would be able to undertake their own energy efficiency improvements if it were not for the requirement of using a registered contractor.

Addressing the various dimensions of cost and affordability, such as providing clearer information on costs, rebates, and potential savings; using the house-as-a-system approach that informs EnerGuide assessments to assess the potential for energy upgrades to simultaneously address non-energy issues such as moisture, mould, air quality, and leaks;

[54] The Canadian Press. “Statistics Canada says household debt to income ratio up in Q1.” June 14, 2023. Retrieved from https://globalnews.ca/news/9767692/statistics-canada-debt-disposable-income/

and clarifying DIY options could help overcome cost barriers and encourage more households to complete home energy upgrades.

Contractor-related challenges

Households in Prince Rupert face several challenges when it comes to working with contractors to complete their home energy upgrades. One significant issue is finding reliable contractors; homeowners may struggle to find contractors with the skills and experience necessary to complete energy efficiency upgrades to the required standard. Community members noted that a contractor list would be helpful, both for households and as a resource for business needing to sub-contract required electrical, safety, or other work to complete the retrofit.

Long waits to schedule work are another concern, particularly for window installations. Multiple sources have reported waits of up to two years. However, other projects can generally be completed more quickly. Contractors report currently scheduling non-emergency projects 1-3 months out. Long waits for or unavailability of contractors was the second most selected barrier in the household survey. These long wait times can create significant barriers to homeowners who want to complete energy efficiency upgrades quickly and efficiently.

There are also concerns about unreliable contractors, including a lack of response to inquiries or no follow-through on appointments or planned jobs. It can be challenging for homeowners to determine whether the contractors they are working with will be able to effectively complete the job. A number of these challenges also represent information gaps and lack of transparency for households.

It is a challenge for people to know what work is necessary, optional or unnecessary; whether prices they are quoted are average or outliers; whether a contractor is experienced with the type of retrofit and up-to-date on the latest technology and best practices; how long wait times and actual project work will take; and whether the work completed meets quality and best practice standards. One survey respondent, for instance, reported being quoted prices for multiple projects by a Prince Rupert contractor that were three to ten times higher than quotes from contractors in larger urban centres in BC.

These contractor-related challenges can impact homeowner motivation and decision-making around energy efficiency upgrades. Homeowners may hold off completing energy efficiency improvements due to concerns about finding reliable contractors, or they may be hesitant to

invest in these upgrades altogether. Ensuring that contractors are competent and able to deliver quality work is essential to establishing trust. One survey respondent suggested creating “an online platform to connect contractors and homeowners, with an opportunity for homeowners to post their prospective project for contractors to browse, as well as contractor listings,” while another suggested contractors start maintaining waitlists if they haven’t yet.

The labour market can also challenge retrofit businesses. Work is not steady - summer is extremely busy for construction, while in winter there may not be enough work. Additionally, fluctuations in the availability of work in the port has repercussions on businesses in the City. To create more stability, promotion of energy efficiency programs must be managed carefully, so as to drive steady work, but avoid creating a sudden spike in demand that cannot be serviced and leaves people disappointed or with extremely long waits.

Finding skilled labour remains a challenge and shortages were reported in all home energy-efficiency related areas. There is no trades training available in town, which is hampering local entry into energy-efficiency related work. It would be worth considering a longer-term strategy specifically to address this issue. For busy contractors it can be a challenge to keep up with rebate programs and ongoing changes to them. Regular provision of updates and materials for contractors to know and to be able to pass on to clients would be helpful.

Tenure and property rights

Renters are unable to retrofit without landlord consent, and as most renters under current regulations cannot be certain of their security of tenure, retrofits are not usually a safe investment for tenants. Depending on their circumstances, renters may not have the option of moving or choosing more energy efficient units due to low vacancy rates, high competition for available units, housing discrimination, and rapidly rising rents foreclosing the option of moving. Where landlords choose to renovate, tenants face potential rent increases and the risk of renoviction. Community members also noted that non-profit housing providers may not have sufficient funding for even regular unit upkeep, and therefore may not be able to pursue energy efficiency retrofits.

The BC Income-Qualified Program does offer a pathway for renters to obtain landlord consent as well as the funds to cover upgrade costs. Income-qualified renters may therefore be a suitable target audience. Landlords stand to gain a highly subsidized renovation of their property if they support upgrades and cover remaining costs. Unfortunately, by agreeing to participate in the program, landlords are only required to commit to keeping the property as

rental housing for income-qualified tenants for one year, and no avenue for recourse is described if they fail to keep this commitment.

The unique difficulties of improving energy efficiency in rental units are difficult to address without changes to the larger regulatory and market forces at play. As one survey respondent suggested, regulation may be needed to require landlords to upgrade and ensure compliance. However, the BC Income-Qualified Program is likely an opportunity worth pursuing for some households, while being aware of its shortcomings and potential risks.

Other challenges

Age of housing stock

As detailed in the housing profile, Prince Rupert's housing stock is relatively old. While this presents a great opportunity for impactful upgrades, it may also make some upgrades more challenging and costly or require non-standard interventions.

Any retrofits that increase electrical load, such as a home switching from fossil fuel-based heating systems to an electric heat pump, may require a panel upgrade to handle the load increases and ensure safety. Depending on the home and work required, these can be very expensive, especially if underground feeder cables need to be replaced or other rewiring is required. In these cases, it would be worth exploring other efficiency upgrades to reduce overall load or implementing load sharing strategies in the home.

Many homes may also have asbestos, especially those constructed or renovated from the 1950s to 1990s.[55] This may make some homeowners hesitant to consider insulation retrofits where asbestos removal may be required first and should be flagged as an important health and safety consideration for any retrofits that disturb home components which may contain asbestos.

Climate

Another challenge lies in the climate – the high frequency and volume of rainfall, high humidity, and low sunshine make moisture and ventilation-related issues common in Prince Rupert homes. Leaks in the building envelope are common. Windows, a visible envelope component where leakage and mold may be more obvious, and which offer a way to increase

[55] WorkSafeBC. (n.d.). *Asbestos awareness for homeowners.* Retrieved July 27, 2023 from https://www.worksafebc.com/en/health-safety/hazards-exposures/asbestos/think-asbestos

indoor brightness in a low-sunshine climate, were the part of their home that people reported being the most unsatisfied with. Windows and doors were also the second most reported recent energy efficiency related upgrade, and top planned upgrade in the household survey.

Key takeaways

- Major barriers preventing households from pursuing or successfully completing energy efficiency upgrades are:
    - significant gaps in awareness (of rebates, upgrade options/benefits),
    - lack of information throughout the upgrade process (e.g. process, costs),
    - upfront costs and overall affordability of upgrades,
    - challenges with contractor capacity.
- Additional challenges include:
    - for renters, lack of control and security of tenure,
    - particularly old homes,
    - and a uniquely rainy climate.

Financing assessment

This study included a review and assessment of the benefits, trade-offs, and feasibility of the following financing options:

- Property Assess Clean Energy (PACE): Loan would be made by the municipality and paid back directly on property tax bill. Enabling legislation currently stalled, however, the Local Improvement Charge (LIC) mechanism could be used, as has been demonstrated by pilots in other jurisdictions in BC.
- Third-party financing: Loan from a bank, credit union, or other lender.

Available Financing

Canada Greener Homes interest-free loan

The Canada Greener Homes Loan offers interest-free financing products and installations that are part of a retrofit recommended by an energy advisor as part of the required pre-retrofit evaluation, and eligible for the Canada Greener Homes Grant. The loan can be between $5,000 and $40,000, has a 10-year repayment term. The application is submitted online and requires a property tax statement, ID, confirmation of income and employment, and contractor quotes.

A key drawback and significant accessibility challenge with this loan is that only up to 15% of the cost can be received upfront. Since contractors usually require 50% deposits, and the loan is not disbursed until both the installation and the post-retrofit EnerGuide evaluation are complete and all reporting is submitted, the homeowner needs to be able to pay for a significant portion and potentially the full project costs up front.

CleanBC Better Homes financing program

The CleanBC Better Homes Low-Interest Financing Program is delivered by point-of-sale lender Financeit, and provides up to $40,000 loans with a promotional interest rate of 0% for switching from fossil fuel (oil, propane or natural gas) heating system to a heat pump. Upgrades must be eligible products installed by a Finance Registered Contractor. The key drawback of this loan is that households must choose between it and the available rebates, making this loan offer uncompetitive.

Point-of-sale loans

Multiple financial technology platforms are available to homeowners. These platforms offer easy and more integrated loan access, however, the level of consumer protection is unclear. They are delivered via the contractor, who can use a mobile app to submit customer and project information, receive fast online approvals, and share the payment scenario with the customer on the spot.

Financeit is a Toronto-based mobile-friendly financing platform that offers flexible loans for home renovations through participating contractor businesses, who are paid directly via the platform. Loans can be up to $60,000, with amortization periods ranging from 12 months to 20 years. Interest rates vary depending on the size of the loan, the details of the credit report, and the type of product or project purchased, and are not publicly available.

For a fee, contractors can offer their customers promotions such as lower or zero-percent interest or deferred payments to make the loan more accessible. Contractors benefit from receiving full payment instantly from Financeit. Customers' loan repayments are automatically withdrawn from their bank accounts, and there are no penalties for early repayment. This platform is actively used by at least one contractor in the City.

Similar to Financeit, SNAP Home Finance is a private, third-party home renovation loan product offered by Toronto-based SNAP Financial Group. Financing terms, interest rates, and lending conditions are not publicly available.

Financing option A: PACE Financing

Property-Assessed Clean Energy (PACE) financing is perhaps the most well-known example of municipally administered retrofit program models in North America. PACE loans are provided by the municipality to the homeowner, are generally tied to the property, and are repayable via property tax billing. They involve placing a lien on a property much like a mortgage.

There are two primary mechanisms by which a municipality in BC is theoretically able to offer a PACE-style loan program. The first option is through the mechanism of local improvement charges (LICs), which are an established method for financing community improvements such as sidewalks. BC's Community Charter sets out the areas of authority of municipalities in the province, including the power to levy local improvement charges (LICs) or local area services, which in BC are broadly defined as "service that the council considers provide

particular benefit to part of the municipality," meaning it neither specific allows nor prohibits energy efficiency improvements on private property.[56]

However, using LICs as a means to establish a PACE program for home energy retrofits is often considered unconventional and may be interpreted as not being within the spirit of this legislation, so legal uncertainty around doing so remains. Costs to the municipality administering a LIC program include interest on capital expenditures, staff and council time, program promotion, and contractor certification.[57] If needed, a municipality may borrow capital without approval of the electors for this purpose if the costs are recovered.[58]

The second, and generally preferable mechanism for establishing a residential PACE program in BC is for the Province to introduce legislation specifically permitting the use of the property tax mechanism as a means for municipalities and their program partners to recover lending costs related to energy efficiency financing. After several years of municipal lobbying through channels such as the Union of BC Municipalities, the Government of BC commissioned a roadmap for implementation of PACE programs in the province in 2021.[59] However, this roadmap was not publicly released, and with no mention of PACE in the most recent ministerial mandate letters, its future is unclear, meaning LICs remain the only option at the time of writing.

[56] King's Printer. (2003). Division 5 – Local Service Taxes, 210 (2). In *Community Charter.* Victoria, British Columbia. Retrieved from https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/03026_00_multi#division_d2e18164

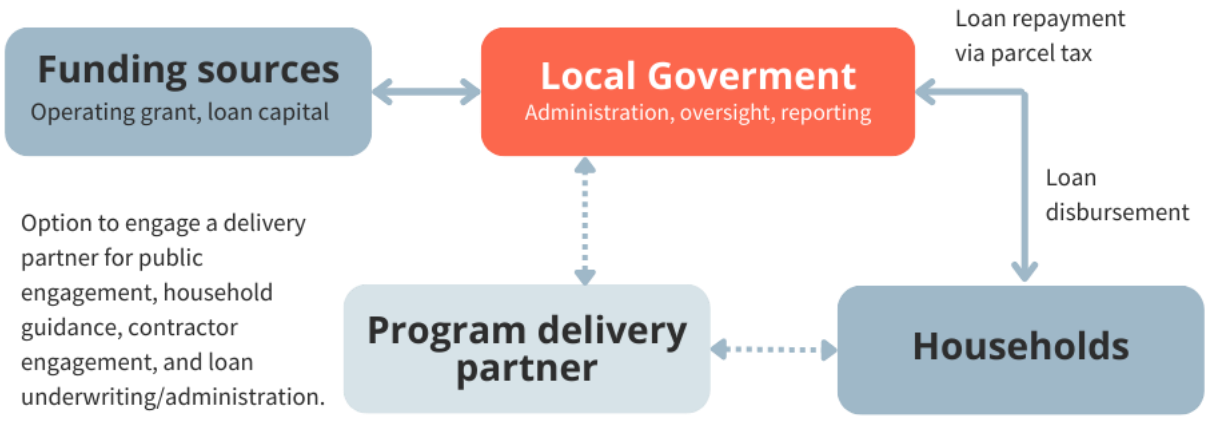
[57] Pembina Institute. (2005). *Using local improvement charges to finance energy efficiency improvements*. Retrieved from https://www.pembina.org/pub/using-local-improvement-charges-finance-energy-efficiency-improvements

[58] King's Printer. Division 5 – Local Service Taxes, 217 (1). In *Community Charter*.

[59] Dunsky Energy + Climate Advisors. (2021, Jan. 12). *Dunsky to develop British Columbia PACE retrofit financing roadmap*. Retrieved from https://www.dunsky.com/dunsky-to-develop-british-columbia-pace-retrofit-financing-roadmap/

Process

The following graphic illustrates possible actors and tasks of a LIC program.



Example – Saanich, BC

In the absence of PACE legislation in BC, the municipalities of Saanich and Central Saanich each successfully created nearly identical Oil to Heat Pump Financing Programs. The District of Saanich's (pop. 119,000) Oil to Heat Pump Financing Program was established with the adoption of the Heat Pump Financing Service Bylaw, 2022, No.9761 and publicly launched in April 2022.[60] The service provides up to $12,000 in zero-interest (0%) financing to homeowners to encourage the replacement of oil heating with low-carbon electric heat pumps and support related costs such as electrical service upgrades.

A local area service (LAS) bylaw to provide the financing is enacted for participating properties which enables the debt to be attached to the property, as opposed to the individual. The financing is recovered through a parcel tax, which is repaid over ten years and billed annually on the general tax notice. Municipal departments involved include the Sustainability Division, Finance Department, Legislative Services and Legal Services.

The Program was designed as a pilot to support 50 households, 25 of which were reserved for income-qualified participants. The income-qualified component was designed to integrate with the income-qualified program (IQP) offered by CleanBC. Integration included an option

[60] The Corporation of the District of Saanich. (2022, Mar. 28). *Bylaw no. 9761: To establish a financing program for the conversion of residential oil heating systems to electric heat pumps*. Retrieved from https://www.saanich.ca/assets/Local~Government/Documents/Bylaws~and~Policies/Council~Policies/heat-pump-financing-program-bylaw.pdf

to use the IQP confirmation code as proof of income, accounting for the IQP incentive in calculating the total financing amount, and the ability to pay contractor deposits, which are not disbursed under the IQP program.

Example – Saskatoon, SK

The City of Saskatoon launched a PACE-style loan program in September 2021 that is currently fully allocated.[61] It offered loans of $1,000-$60,000, with a $500 admin fee (waived for low-income households). Interest rates were based on loan term (ranging from 4.32% to 4.86%). In contrast with some of BC's municipal programs, Saskatoon's program pays the contractor directly, avoiding the need for the homeowner to pay out of pocket. It also does not require credit checks or income verification, instead relying on good standing with City taxes and bills.

Benefits and Trade-offs

For BC local governments, municipal financial reserves, the Municipal Finance Authority of BC, and FCM's Green Municipal Fund are possible sources of capital. It is recommended that a minimum improvement cost be set to justify transaction costs, and payments should be scheduled to ensure the amount is offset by the energy savings achieved.[62] LICs effectively address barriers related to:

- high upfront costs, as the homeowner is not required to pay out of pocket
- access to capital, as they do not add to personal debt
- long payback periods, in being tied to the property, there is no disadvantage to the owner who initiated the retrofit if the home is sold.

Benefits of PACE or LIC programs in comparison with other financing options include:

- loans being attached to the property rather than an individual
- municipal rather than for-profit provision can allow for favourable loan terms and pursue accessibility to households with limited access to credit without being predatory
- low risk,[63] which can be further minimized via special priority lien, caps on loan amount based on property value, and loan loss reserves as offered by FCM

[61] City of Saskatoon. (n.d.). *Home Energy Loan Program*. Retrieved Mar. 14, 2023, from https://www.saskatoon.ca/environmental-initiatives/energy-water/home-energy-loan-program-help
[62] Additionally, the property tax increase resulting from the upgrade should be factored into this calculation.
[63] California's PACE programs have not made a single claim into its loan loss reserve in first five years of its existence. See: Clean Air Partnership. *Accelerating retrofits: A toolkit for municipalities,* p. 123.

- administrative charge on loan can be considered to recover operating costs to municipality.

Nonetheless, PACE requires the municipality to have the capacity for such a program, which will require some time investment even if the day-to-day administration is outsourced. Program administration and loan capital, as well as loan loss reserves need to be accessed and monitored. Especially in the case of third-party program administration, careful regulation and monitoring of the provider is recommended to avoid predatory lending and maximization of private profits at the expense of vulnerable households.

Saanich's LIC program, for instance, required the following loan administration related tasks of City staff:

- Review property tax statuses to qualify applicants.
- Certify petitions and prepare Local Area Service bylaws.
- Review and sign Financing Agreements with homeowners.
- Process batch disbursements for contractor payments.
- Prepare Parcel Tax Bylaw for loan repayment.

Another potential challenge lies in mortgage lenders' and insurers' concern if the municipality applies a priority lien. Finally, PACE/LIC mechanisms are generally not feasible in on-reserve First Nation communities, foreclosing any future regional scaling of a PACE/LIC program to these communities.

Financing option B: Third-party

The second financing option assessed by this feasibility study is third-party financing. This involves engagement of an external lender, such as a bank, credit union, or private lender, to administer loans directly to households. In this case, the City (or its program delivery partner) coordinates the program and provides any wrap-around supports, but refers participants to the lending partner for loans.

Risk management elements that should be considered when engaging third-party financing include:[64]

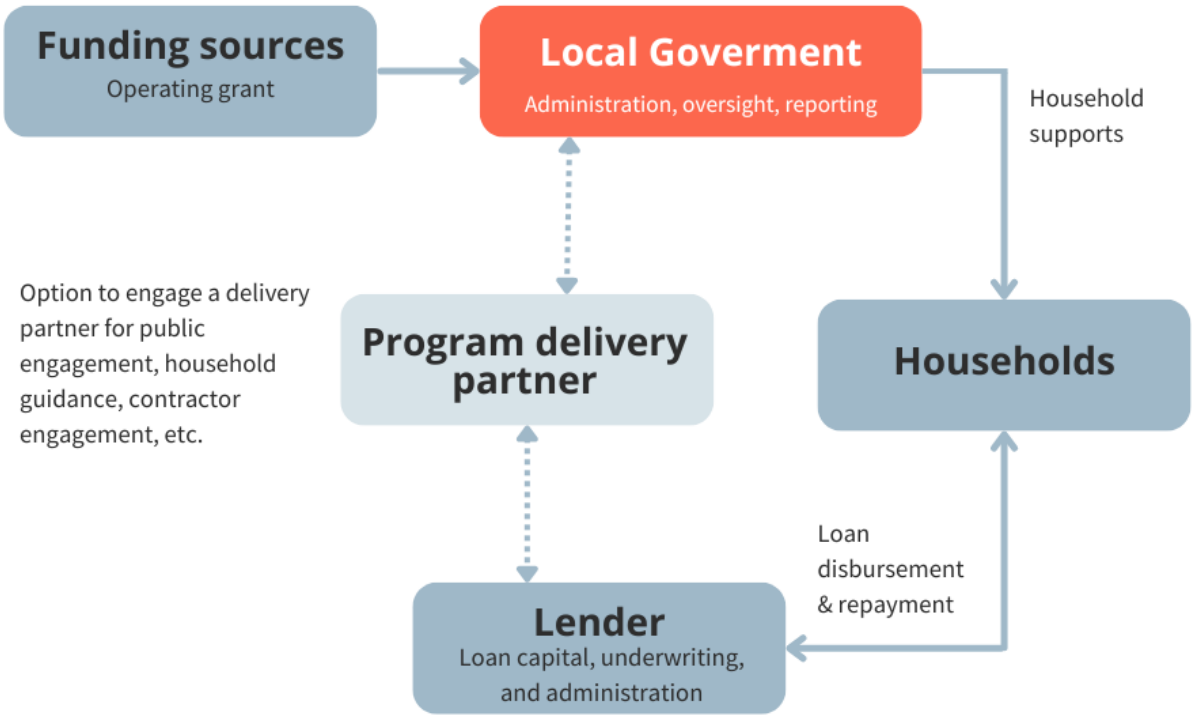
- Financing terms

[64] Iacampo, M. (2021, Oct. 6). *Community Efficiency Financing online learning session: Loan underwriting.* Green Municipal Fund.

- Underwriting criteria (property tax/utility account standing, savings-to-investment ratio, mortgage lender consent, debt-service ratio, loan-to-value ratio, credit score)
- Eligible measures
- Marketing & promotions
- Consumer protection (incl. contractor qualifications, work standards, quality assurance, anti-fraud measures)
- Quality assurance/quality control

Process

The following graphic illustrates possible actors and tasks of a third-party lending program.



Example – Durham Regional Municipality, ON

The Durham Greener Homes program involves a partnership with two local credit unions who provide home upgrade loans of $5,000-$40,000 directly to homeowners.[65] Energy efficiency, renewable energy and EV charging upgrades are eligible as long as a minimum 50% GHG reduction is achieved. The Regional Municipality of Durham provides a loan loss reserve

[65] See https://durhamgreenerhomes.ca/ for details.

allowing the credit unions to offer participants access to preferential interest rates and repayment terms. Participants receive support (up to four energy coach sessions) delivered by a local non-profit organization.

Benefits and Trade-offs

Benefits of third-party financing include no requirement of property tax payment history (as with PACE/LIC), which can exclude newly moved residents. It can be easy to access, but this depends on the financing provider and household financial status. The wide variety of programs and usually profit-driven providers may in some cases also present trade-offs in accessibility and consumer protection. It may be more likely to exclude lower-income households.

A key advantage of this option is that it avoids burdening the City with the administration of loans as PACE/LIC would. For municipal governments and their third-party financing partners, the Federation of Canadian Municipalities offers start-up and operating grants in combination with credit enhancement to offset the additional risk a financing partner may incur if offering their loan product at advantageous terms for the purpose of a retrofit program.

Comparison

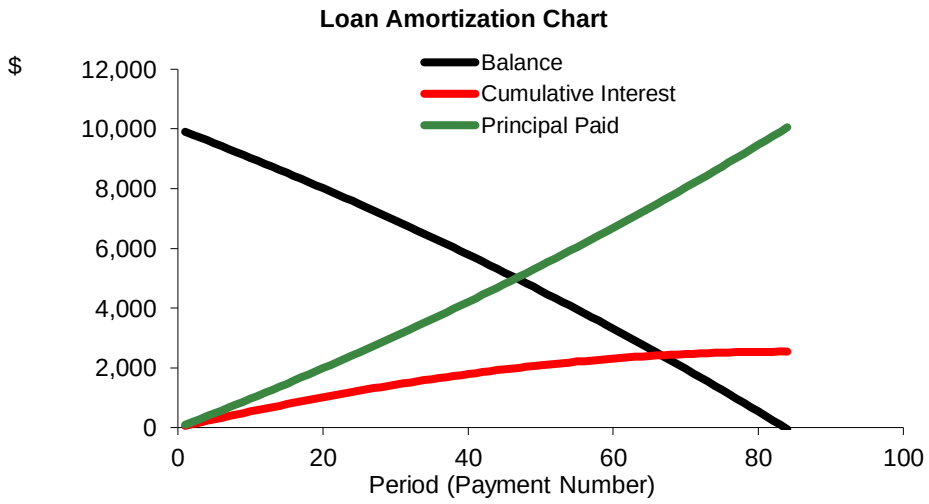
The table below compares PACE/LIC financing with third-party financing.

	Local improvement charges (LIC)	**3rd party lender**
City administration	Loan administration in addition to overall program admin	Overall program administration only, loans administered by lender
Capital provided by	FCM	Credit union, bank, or private lender
Flow of capital	FCM -> City -> household -> City -> FCM	Lender -> household -> lender
Debt	Municipal debt	No municipal debt

Transferability	Yes, attached to property, can be transferred to subsequent owner at sale, unless clause is added to require repayment at sale	No, attached to homeowner (e.g., line of credit, home equity line of credit, or term loan)
Accessibility	Easier for homeowner due to existing property tax mechanism with City. Less restrictive qualification options (e.g., tax payment history) Loan terms likely better	Must create account with loan provider. Loan qualification more exclusive (income & credit check), but does not require property tax history. For-profit provision likely to result in less favourable loan terms.
Risk management	Loan loss reserve (5% of total loan capital disbursed) mitigates financial risk to City	80% coverage for unrecovered loan loss for lender; City to ensure lender has appropriate consumer protections

Financing Example

Initial loan amount	$ 10,000
Interest rate	6.7 % annual (current prime rate – May 2023)
Monthly payment	$ 150
Loan period	7 years
Total interest paid	$ 2,543



Potential Lending Partners

Northern Savings Credit Union already offers an energy efficiency specific loan that could potentially be incorporated into a local retrofit financing program. Its EnergySave Loan offers up to 0.75% off standard mortgage rates and up to 0.50% off standard personal loan rates for the following upgrades: insulation, heat pumps, energy efficient windows and doors, skylights, energy efficient furnaces, and solar panels.[66] The credit union has expressed preliminary interest in collaborating. To be eligible for FCM funding, the credit union would need to use the credit enhancement offer to enable advantageous loan terms or relaxed loan

[66] Northern Savings. *EnergySave Loan*. Retrieved Mar. 15, 2023, from https://www.northsave.com/Personal/LoansAndCredit/PersonalLoans/EnergySAVELoan/

qualification requirements in addition to what is already on the market. Other banks did not respond to inquiries or declined participation.

Key takeaways

- Multiple retrofit-specific financing options are available, including the Canada Greener Homes loan, and Northern Savings' EnergySave loan.
- PACE/LIC financing is possible to implement despite the lack of enabling legislation in BC, and can offer more accessible loans that can be tied to the property instead of the owner.
- Third-party financing avoids the administrative burden that PACE/LIC loans may create for municipal staff.

Program design considerations

Key program design considerations that have significant impacts on administrative processes and resources required, and were considered in this feasibility study, include:

- Program delivery (in-house vs. external delivery partner)
- Type of financing (PACE/LIC vs. 3rd party), if any
- Program target audience, scope, and services provided.

These were considered in the specific context of Prince Rupert and City capacity and preferences, with input from City staff as well as community members.

Administration

From a program administration perspective, the common tasks involved in delivering a municipal retrofit concierge program include:[67]

Setup:

- Putting in place administrative staff resources for program coordination/oversight
- Legal/regulatory review of and preparation for chosen activities/financing
- Putting in place funds and/or partnerships for financing
- Contractor (and Energy Advisor) engagement

Operation:

- Marketing/promotion and community engagement
- Providing contact options (e.g. web page and/or social media, phone number, email) and responding to questions
- Participant intake (registration process, collecting relevant household/home information to required to provide guidance) and screening for eligibility
- Guiding participant households in upgrade process navigation (e.g., applications, project planning, access to government rebates, financing, retrofit completion, proper operation and maintenance of new systems)
- Loan administration, or referrals to financing partner
- Monitoring and reporting on the program

[67] Adapted from: Clean Air Partnership. (2020). *Accelerating home energy efficiency retrofits through local improvement charge programs: A toolkit for municipalities,* p. 86. Retrieved from https://www.cleanairpartnership.org/wp-content/uploads/2020/05/FINAL-LIC-TOOLKIT-Accelerating-Home-Energy-Efficiency-Retrofits-Through-LIC-Programs-2020-1.pdf

Optional additional services could include:

- Funds to cover cost gaps for households, e.g., to top up the income-qualified program, provide additional rebates for specific upgrade types, or fund pre-upgrade work like electrical upgrades or health and safety work
- Deeper collaboration with contractors to streamline processes for households, provide capacity-building/training, or address business challenges
    - A key barrier for retrofit businesses is a shortage of skilled labour – training or other supports addressing this issue may be needed as part of a program
- Maintaining a list of qualified locally active EnerGuide auditors and retrofit contractors
- Contracting services like EnerGuide audits directly, to offer to households free of charge
- Supporting group purchasing and group rebate codes to lower project costs

Program examples

The most successful local programs have created local retrofit ecosystems that address major barriers simultaneously and support all aspects of the retrofit process in a one-stop shop. Such programs often include:

- Targeted outreach to raise awareness, provide information, and educate households as well as other participants in the home retrofit space.
- Customized guidance from a local, trusted advisor to support households through the retrofit process.
- Financial support, incl. supporting rebate access, rebate top-ups, free or subsidized energy assessments, and/or retrofit loans
- Collaboration with contractors and energy advisors to increase market capacity.

To illustrate how different programs have integrated solutions to multiple barriers, including financing, we describe a few current examples here.

The Greater Victoria and City of Vancouver's **Home Energy Navigator** program offers an energy concierge to interpret EnerGuide home assessment reports, choose and plan upgrades, select contractors, evaluate quotes, and apply for rebates.[68] It serves as a one-stop-shop for the full upgrade process and offers a resource library related to efficiency retrofits. It is limited to homeowners of single detached, mobile, duplex and row homes, but not restricted by home age, heating fuel type, or upgrade type. The program is funded by the

[68] See https://homeenergynav.ca for details.

Capital Regional District and participating municipalities, and concierge services are provided by non-profit delivery partner City Green Solutions.

In Alberta, an income-qualified **Home Upgrades Program** is now available to residents of the Cities of Calgary and Edmonton, specifically targeted to households that struggle to pay their energy bills and where upgrades will significantly improve affordability and comfort.[69] It is delivered in partnership between Empower Me and Alberta Ecotrust Foundation, and funded by the Cities of Calgary and Edmonton and a utility. The program offers multilingual energy education and mentorship, as well as heating, lighting, and insulation upgrades completely free of charge to those who qualify. It is limited to homeowners of detached homes, duplexes and townhouses.

Energize Bridgewater is administered by the City of Bridgewater, Nova Scotia (population: 8,790), with upgrade guidance services provided by a non-profit program delivery partner.[70] It aims to reduce energy poverty with deep retrofits (over $60,000 per home) that reduce both reduce energy demand by >50% and improve household cash flow by >50%, by integrating provincial and utility grants with municipal loans into a single one-stop shop program. It includes hiring and managing Energy Advisors and contractors on behalf of households. Additionally, the City has set up a community organization to holistically address energy poverty, housing vulnerability, and homelessness, with housing support workers that provide wrap-around programming, including tenant supports and financial literacy.

[69] See https://www.homeupgradesprogram.ca/ for details.
[70] See https://www.energizebridgewater.ca/ and https://www.ssoda.org/ for details.

Program delivery

A key consideration for a local government is whether to deliver programming in-house, or via an external delivery partner. Some of the benefits, drawbacks, and options considered are outlined here.

In-house delivery	External delivery partner
• Greater control and ability to align with city priorities • Build city staff capacity • Local employment (external partner is likely to be based in southern BC) • Local knowledge and in-person presence • Potentially lower cost	• Likely more flexibility to scale up/back according to program uptake & funding • Potentially lower startup cost if the delivery partner is experienced • Likely higher hourly rates if using a for-profit partner, while non-profit partners can sometimes leverage other funding to subsidize cost • Avoid hiring challenges in case of labour shortage

There are a few organizations in BC currently delivering concierge-type program services that support households throughout the retrofit process. Some have developed an independent concierge brand that covers multiple municipalities and can be expanded to additional communities. This would reduce some of the program design, start-up and administration costs, but limit some choices (branding, process, service offered), as compared with developing a stand-alone program completely tailored to the City of Prince Rupert. Two examples are:

1. Home Energy Navigator - https://homeenergynav.ca. Operated by: City Green Solutions, a BC non-profit. Currently services: Greater Victoria area, City of Vancouver

2. Retrofit Assist - https://www.retrofitassist.ca/. Operated by: Community Energy Association. Currently services: Rossland, Squamish, Whistler. Similar to Home Energy Navigator, its service includes: 1. Making a plan, 2. Connecting to local resources, 3. Financing options, 4. Rebate applications.

Both broadly service homeowners rather than specific populations such as low-income households. Empower Me (https://empowerme.ca/home-bc/) on the other hand, focuses on

providing service to new Canadians and multi-lingual communities and provides this type of support, for example, to CleanBC Better Homes. It also recently launched the aforementioned Home Upgrades Program focused on provided free upgrades for households in energy poverty in Alberta.

Financing

Two key financing options, PACE and third-party lending, were considered and are detailed in the financing assessment section above. Programs that include financing may benefit from the community efficiency financing grant and loan funding streams currently available from the Federation of Canadian Municipalities' (FCM) Green Municipal Fund (GMF). This fund offers support for both the PACE/LIC and the third-party financing options. The funding requirements are outlined here as they may be a consideration for pursuing either financing program option.[71]

FCM GMF funding streams

In the case of PACE/LIC, FCM offers:

- Capital loan (up to $10 million), plus
- Operating grant
    - to a maximum of 50% of total loan capital
    - to a maximum of 80% of total program costs
- City (and program delivery agent, if external) are counterparties to FCM contract.
- Loan capital flows to municipality, where debt obligation generally resides.
- Operating grant flows to municipality or program delivery partner.

In the case of third-party financing, FCM offers credit enhancement for the financing partner (up o $2 million), plus:

- Operating grant up to $5 million
    - to a maximum of 50% of total loan capital, and
    - to a maximum of 80% of total program costs.
- Loan capital provided by lenders directly to homeowners, no municipal debt obligation.
- Operating grant flows to municipality or program delivery partner.

[71] Green Municipal Fund. *Capital program: Loan or credit enhancement for local home-energy upgrade financing program.* Retrieved Mar. 15, 2023 from: https://greenmunicipalfund.ca/funding/capital-program-loan-credit-enhancement-local-home-energy-upgrade-financing-program

Note: All FCM funding is tied to financing. If neither financing option can be realized, a different source of funding would be required to implement a program. Economic development funding may be an avenue worth exploring to focus on tackling industry capacity challenges.

Target audience and scope

A program can prioritize, or provide service exclusively to a specific target market, depending on local priorities and resources. This can be defined based on demographics, geographic area or neighbourhood, home type, or upgrade type. Demographic scoping, for instance, can be significant in achieving equitable participation, while geographic scoping can serve to support neighbourhood revitalization, build community around the upgrade process, or target neighbourhoods known to have overall less energy-efficient homes. Prioritizing specific types of homes or upgrades can help focus efforts to achieve maximum impact (e.g., energy savings, emissions reductions), and can simplify program delivery.

As part of this feasibility study, the local context, housing stock, energy profile, available rebate programs, estimated energy and emissions reduction potential in local home types, common barriers to upgrades, and potential solutions to these barriers were all considered to inform our recommendations on program scope and target audience. These are detailed in the recommendations section below.

Key findings and recommendations

This section provides a brief overview of the key findings of this feasibility study and details programming recommendations.

Upgrade potential and types

This feasibility study confirms that the potential impact of retrofits in Prince Rupert is significant. Struggles with high energy costs are commonplace as the cost of natural gas is very high compared to other parts of BC, and those using electricity for heating mostly rely on inefficient equipment such as baseboard heaters. Nearly all of Prince Rupert's residential buildings are more than 22 years old, with 75% constructed before 1981, and most of these homes would benefit significantly from retrofits due to poor energy efficiency standards at the time of construction. 80% of the City's 5,085 occupied homes are single- or semi-detached (incl. row homes, duplexes, mobile homes), i.e., they are types of homes that are eligible for provincial and federal upgrade rebates.

Based on our analysis of archetypal homes in the city, we developed several specific scenarios of potential savings different types of retrofits can achieve for different types of homes (see our archetypes in Appendix A). We recommend prioritizing heat pump retrofits as the upgrade with the highest potential for energy savings (often in the realm of 50% reduction) and cost savings in most Prince Rupert homes. Roughly 40% of homes use fossil fuels (gas, propane, oil), producing about three quarters of home energy GHG emissions. We recommend insulation upgrades in homes with little or no foundation, crawlspace, or attic insulation. We do not recommend air sealing or window and door upgrades as standalone measures justified on an energy efficiency or GHG reduction basis, however they may be priority upgrades if broken or for comfort or other non-energy efficiency reasons.

Barriers

While home energy retrofits offer significant benefits to most Prince Rupert households, multiple barriers are preventing uptake at scale. While provincial and federal rebates reduce the financial barriers to pursuing common retrofits, these one-size-fits-all programs are not easily accessible to many households. Key barriers that were confirmed during our study are:

1. **Information and awareness gaps** regarding the availability of rebates, upgrade benefits, and the availability of Energy Advisors, among households as well as among contractors significantly hamper home energy efficiency upgrades.

2. **Affordability** is a major issue preventing households from engaging with retrofits. However, rebates, if households are aware of their availability and able to access them, can mitigate this barrier. Upgrades also represent a significant opportunity to improve the affordability of household energy costs in the long term.

3. **Contractor availability**, capacity, and related challenges can make it difficult to find the right professional and to complete upgrades. Businesses in the energy efficiency space are challenged to find skilled workers and keep up with demand.

Financing

Financing options were examined as part of the study as a potential solution to address the high up-front costs of upgrades, and incorporating existing financing offers into programming is recommended. This includes retrofit-specific loans offered at preferred rates by Northern Savings Credit Union, as well as Canada Greener Homes zero-interest loans. PACE-style financing delivered by municipal governments would be administratively burdensome for a municipality whose staff capacity is already stretched, especially as it is not yet enabled by provincial legislation in BC. For this reason, this financing option is not recommended at the current time. We recommend revisiting this option if a) provincial legislation is put in place, and/or b) uptake of other retrofit programming in the city is high and demand for financing is not met by other existing options.

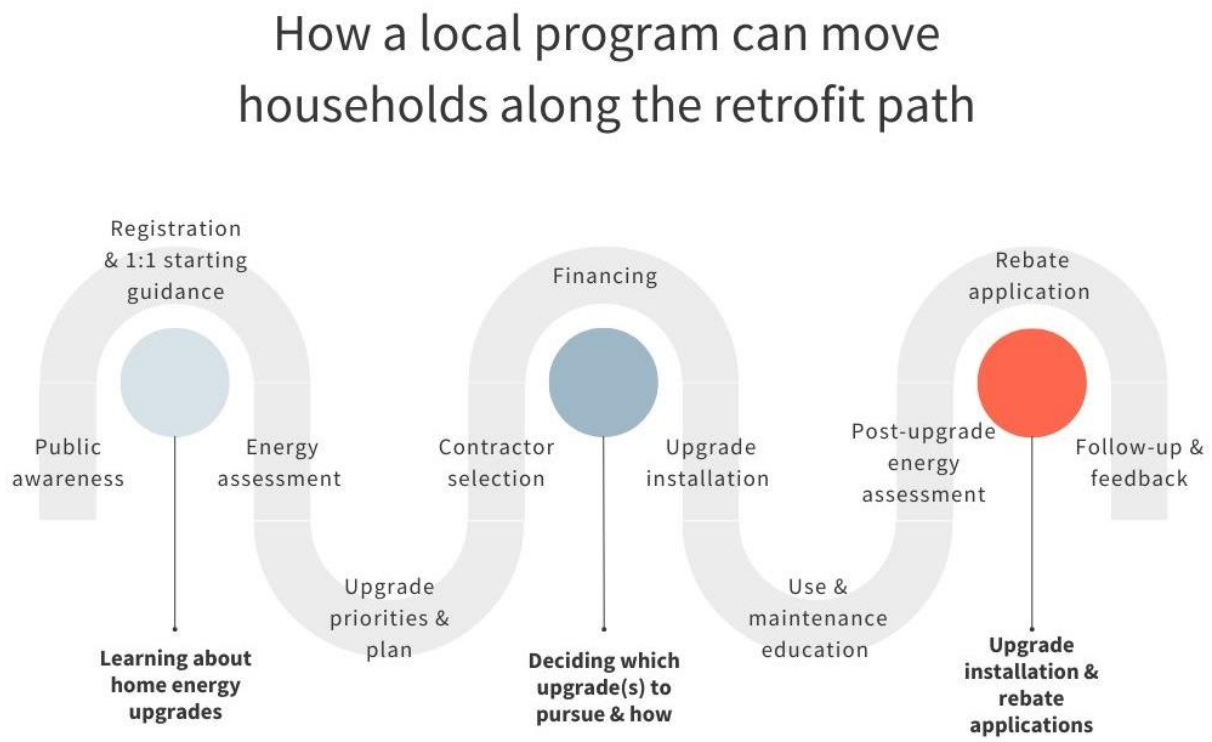
Third-party financing is recommended as an option for those households that require it and are not overextended, and could serve to enable more households to complete upgrades. However, it was not found to be one of the top barriers facing households, and is not a key priority component for a program. According to HomeStars, 80% of homeowners funded their renovations with cash/savings as opposed to loans/credit.[72] The highest priority is addressing awareness barriers and information gaps around available rebates, including the northern

[72] HomeStars, *2022 Reno Report.*

top-up offer and income-qualified options, as well as around the availability of Energy Advisors, and all aspects of working with contractors.

Primary recommendation: Retrofit concierge program

Based on these key findings, our primary recommendation is to implement a “one-stop shop” local concierge-type program providing a single local point of contact for all steps in the home energy upgrade process. This program would provide public awareness and education work, individual household guidance, and engagement with contractors and Energy Advisors, making the process of completing home energy efficiency upgrades more accessible and successful for a greater number of households. The intended impact would be to increase retrofit activity in Prince Rupert to maximize energy and GHG savings, combat household energy insecurity, and improve public health. Solutions would be introduced throughout the upgrade process which is illustrated in the graphic below.



Below we detail the recommended program scope and elements intended to address the key barriers identified by this study.

Delivery model

We recommend that the program be administered by an external program delivery partner who takes on the responsibility of managing the program and guiding households through the entire process. This includes tasks such as public awareness communications, assisting households with upgrade questions and rebate applications, and liaising with Energy Advisors and contractors. The delivery partner also collaborates with community organizations (see table below for potential partners) to effectively reach targeted households, and refers to third-party lenders for retrofit financing if desired. Finally, City staff support would be impactful in leveraging expertise and City communications channels to enhance outreach.

The following table outlines the various organizations that may be able to support a program and collaborate in creating a more supportive overall market ecosystem for home energy renovations.

Group	**Potential role**
Contractors, Energy Advisors, Home Performance Contractor Network, and relevant industry/businesses	Delivering upgrades, support program awareness/outreach/ learning activities.
First Nations and Indigenous organizations	May be able to support program awareness/outreach/learning activities, or provide insight from any on-reserve retrofit projects.
Community and service organizations	Support program awareness/outreach/learning activities. Opportunity for collaboration to reach specific target audiences, such as lower income households.

BC provincial government	Offers the most comprehensive source of information on retrofit programming at all levels of government, and administers the Income-Qualified Program.
Federal government	Offers retrofit rebates, the Oil-to-Heat Pump Affordability Program, financing, and supports Energy Advisor training.
BC Hydro	Administers some of the provincially available incentives.

As part of a supportive ecosystem, it is also recommended to examine municipal regulations and processes for any obstacles to home retrofits, such as bylaws that may restrict certain renovations, and for opportunities to streamline and facilitate upgrades, for instance by waiving permit fees for energy efficiency upgrades.

Program elements

Address public awareness gaps

Our recommendation is to implement a comprehensive and sustained local awareness and education campaign to address three main information gaps:

1. Address the lack of awareness of available incentive programs.

   This awareness is a crucial base for any effort to increase retrofits in Prince Rupert. Existing points of homeowner interaction, where households are more likely to be considering upgrades, should be utilized to intervene with information. This includes, for instance, household interaction with contractors, Energy Advisors, realtors, banks, the City, hardware stores, etc.

2. Create better understanding of cost-benefits, particularly potential cost savings, as this is the highest priority for most households. This information can be provided on a dedicated program website, where homeowners can access resources that outline the financial benefits of energy efficiency improvements for different home types. Additionally, this information can be shared with contractors and included on quotes to potentially mitigate "sticker shock" when homeowners see the pre-rebate costs. Information on the features of different upgrade types (such as the air filtration and cooling features of heat pumps) are important information to share as well, as cost and efficiency may not be the only consideration for households.

3. Share information on available Energy Advisors and contractors. This could include an updated list of active and eligible businesses serving the City. Such a list could also include useful details such as current wait times, any upcoming trips to specific outlying communities households could sign onto to reduce travel costs, customer reviews and references, pricing information, and other relevant elements that can help homeowners make informed decisions about which contractors or Energy Advisors to work with.

To effectively reach priority groups, such as low-income households and those interested in fuel-switching, targeted outreach and collaboration with community organizations will be crucial. One approach to consider is a neighborhood-based strategy that focuses on targeting lower-to-moderate income areas. By coordinating bulk energy assessments and installations of upgrades in these areas, the program can help promote energy efficiency while also creating opportunities to reduce costs for participants.

Additionally, identifying and engaging volunteer neighborhood champions could help support outreach, education, and coordination efforts in these priority areas. These individuals can serve as a liaison between the program and the community, helping to build trust and strengthen relationships within the target neighborhoods. Overall, targeted community outreach efforts can help ensure that the program reaches those who stand to benefit the most from home energy upgrades.

Address individual information gaps

We recommend that information gaps be further addressed through individual guidance via a program representative who supports households to navigate the upgrade process from start to finish. This contact would be available to answer questions, provide one-on-one guidance along the upgrade process, and refer to resources based on the household's needs.

The individual guidance component may begin with an intake process to obtain household information that will help tailor guidance. Based on this information, the relevant rebate or income-qualified programs should be identified, and a household may receive support to determine their eligibility and register for these programs as needed. A household could also be offered examples of cost-benefit estimates based on the home archetypes developed as part of this study, and can be supported in identifying their priorities and budget at this stage.

Connection to Energy Advisors and interpretation of energy assessment results (if needed) will also support upgrade prioritization.

When a household is ready to begin renovation work, connecting them to relevant contractors, understanding quotes, and referring to lenders or loan programs for financing may be desired. Finally, post-upgrade support and education will ensure the household is able to successfully apply for and receive rebates, address any upgrade quality concerns, and understand proper use and maintenance of newly installed systems such as heat pumps. This follow-up also serves to gather evaluation data and measure impacts at the household and program levels.

Address affordability barriers

Perhaps the most important solution to affordability barriers is to support households in accessing provincial and federal financial incentives, which can drastically reduce upgrade project costs. Additional support can be provided by connecting interested households to the financing option most suited to their needs. This could be a local credit union loan, a Canada Greener Homes loan, or other market options available as detailed in the financing section. Finally, we recommend considering a fund to provide cost gap coverage for energy assessments and upgrades for income-qualified program participants, as these households may be prevented from pursuing upgrades by relatively small cost amounts remaining after income-qualified funding is applied.

With wider economic trends including inflation, cost of living increases, and lack of affordable housing, many households are financially stretched, and may face competing upgrade priorities or trade-offs between the various costs of housing and living. Here advice that takes into account the functioning of the whole home (e.g., from Energy Advisors, who follow a house-as-a-system approach) and complementary benefits of upgrades (such as potential to address moisture, leaks, air quality or health and safety issues) will be crucial, as will be a reliable upgrade cost information and estimates of energy savings specific to the home (as would be obtained via an EnerGuide assessment) from which cost savings can be projected.

Address market capacity

In the context of a provincial trades shortage, compounded by Prince Rupert's geographic location and port-related labour market dynamics, it is often a challenge to find qualified and available contractors locally. Working to facilitate this process between households and contractors, and providing information to improve transparency and allow households to

make informed choices is recommended and will be key to successful upgrades. [73] BC is moving towards a more standardized home performance approach and contractor registration and qualifications systems, which can be used to support quality control. [74]

We recommend engaging retrofit contractors and Energy Advisors (EAs) as part of all activities to ensure they can inform and be active participants in program delivery. Additionally, this would support contractors and EAs in the dissemination of accurate and up-to-date information to households, including current availability, services offered, product supply, and pricing. This could include information sharing efforts to increase transparency and service information for customers as well. It may also involve connecting contractors to the Home Performance Contractors Network to become registered, receive training, and be able to offer provincial rebate-eligible services. Finally, raising awareness of incentives in the wider market ecosystem, with professionals such as realtors, lenders, retailers, and other adjacent stakeholders will support increased awareness and uptake.

Exploring additional more substantial initiatives focused on job training to encourage new entrants into the industry would be supportive in the long term to increasing local contractor capacity and availability, but is largely outside of the scope of the type of program recommended here.

Program scope

Target audience

Targeting specific audiences helps a program better reach households and achieve uptake goals. It can also serve to address poverty and equity issues. Outreach and service to marginalized groups should be specifically tailored. It is important to note that not targeting demographics that face higher barriers is likely to result in disproportionate participation of (and a greater level of free ridership by) wealthier households.

We recommend prioritizing households that are eligible for the BC income-qualified program (IQP) and/or the federal Oil to Heat Pump Affordability Program (OHPA) (i.e., low/moderate household income) to maximize impact and minimize free ridership. To better serve this

[73] Past and present research and programming experience across the country has emphasized the importance of involving contractors in home retrofit programming. Most recently, the Community Energy Association noted the importance of contractor connection in on their own Retrofit Assist programming: Community Energy Association. (2023). *Newsletter July 2023.* Retrieved from https://www.communityenergy.ca/news-events/

[74] Home Performance Stakeholder Council. (n.d.). *Working Roadmap.* Retrieved Jul. 12, 2023, from https://guides.co/g/hpsc-working-roadmap/149890

demographic, a program may consider providing cost gap funding to households eligible for IQP level one (95% cost coverage) to make upgrades at no cost to the household. Additionally, engaging renters who are eligible for the IQP and their landlords (incl. nonprofit housing providers) to participate should be trialed. Details of the program terms as they apply to renters and landlords are available here.

Home types

We recommend prioritizing homes built prior to 2001 to maximize the savings potential of retrofits and address the segment of the housing stock that is more likely to require upgrades to maintain the home. Further, we suggest focusing on those home types that are eligible for both the provincial (CleanBC) and federal (Greener Homes) rebate programs, as rebate eligibility drastically improves the affordability and payback times on these retrofits, making them accessible to far more households. Eligible home types include single-detached homes, row homes, duplexes, triplexes, and suites in Part 9 buildings only (buildings that are 3-storeys or less, with a building area less than 600m2). Further eligibility criteria are detailed in the program landscape section. Due to the lack of incentives and increased level of complexity, this excludes larger multi-unit apartment buildings.

While very old homes (e.g., pre-1940) can be more challenging to upgrade due to older systems, requiring electrical upgrades, heritage considerations, and construction differences that require non-standard interventions, we recommend including these homes given they make up a significant proportion of the housing stock in Prince Rupert.[75]

Upgrade Types

We recommend proactively targeting households with gas furnaces as well as oil and propane heating systems that are over ten years old and therefore more likely to need replacement soon. The goal would be to support households in maintaining a functioning heating system and avoiding emergency replacements, which carry extremely high costs and generally foreclose the opportunity to consider and choose between options, use rebates, or switch to a heat pump. The incentives available for fuel-switching are also significantly higher, improving affordability and cost-benefits for these households. Finally, switching from a fossil fuel heating system to an electric heat pump is generally the single most impactful way to

[75] See https://www.vancouverheritagefoundation.org/grants/heritage-energy-retrofit-grant/ for considerations specific to homes built prior to 1940.

achieve both significant energy savings (often near or over 50%) as well as high emissions reductions.

Another key upgrade to focus on will be insulation. Foundation, crawlspace or attic insulation upgrades in particular have very high cost-benefits, which often result in payback times of five to seven years. The potential for combining insulation upgrades with a heat pump upgrade allows for the optimization of heat pump sizing.

While windows and doors are generally both expensive and not as impactful on the overall energy efficiency of a home, they would not usually be a priority upgrade for a home based on energy efficiency or cost savings. However, they may provide significant energy efficiency improvements if a home still utilizes single-paned glazing, and they are a high-demand upgrade in the City. Survey respondents were most unhappy with their windows and doors, and it was the most frequently planned upgrade measure. Raising awareness of available rebates and any savings potential is recommended for those households already considering window and door upgrades.

Focusing on these three key upgrade types ensures maximum impact and simplifies program set-up and support processes.

Alternative or complementary option: Market-capacity focused initiative

An initiative could focus on addressing the lack of contractor availability and capacity in the City through targeted home energy retrofits skills training, apprenticeship opportunities, labour retention and small business support.

Training could be provided at no or low cost to Prince Rupert residents interested in joining the energy efficiency industry, as well as existing tradespeople wanting to gain new skills relevant to home energy efficiency and evolving technology in this field. Potential partners include Coast Mountain College, Hecate Straight Employment Development Society, First Nations, and local construction, electric, HVAC, and Energy Advisor businesses.

Some level of market capacity work could be integrated into a concierge program as outlined above, or alternatively, a standalone program could be developed to focus specifically on this approach. One idea brought up by stakeholders was to create relevant training as part of the high school curriculum, allowing youth to explore and gain skills in energy efficiency building trades that is currently undervalued and underserviced in terms of local training

opportunities. If of interest, this option would require further research into available funding sources, potential process and program offerings, and stakeholder capacity.

Program recommendations summary

Recommended program activities	
Awareness and education	<u>Public communications and targeted outreach</u> • Intervene with information at existing points of interaction • Improve understanding of cost-benefits of upgrades • Share information on availability of contractors and EAs • Support neighbourhood organization, grouping <u>Household guidance</u> • Intake to determine eligibility and goals • Referral to appropriate information, programs, and EAs/contractors • Post-upgrade support and education • Follow up to measure impacts
Affordability	• Facilitate access to incentives • Financing referrals • Cost-gap coverage for income-qualified participants • Assessing potential savings, other non-energy benefits
Market capacity	• Contractor and EA engagement • Information on availability, services, products, and pricing • Facilitating connection in market ecosystem
Scoping	
Target audience	• Prioritize outreach to income-qualified households
Home types	• Built prior to 2001 • Eligible for provincial and federal rebates
Upgrade types	• Fossil fuel to electric heat pump upgrades • Foundation, crawlspace and attic insulation • Windows and doors

Appendices

Appendix A: Home Energy Upgrade Archetypes

All cost estimates are as of March 2023.

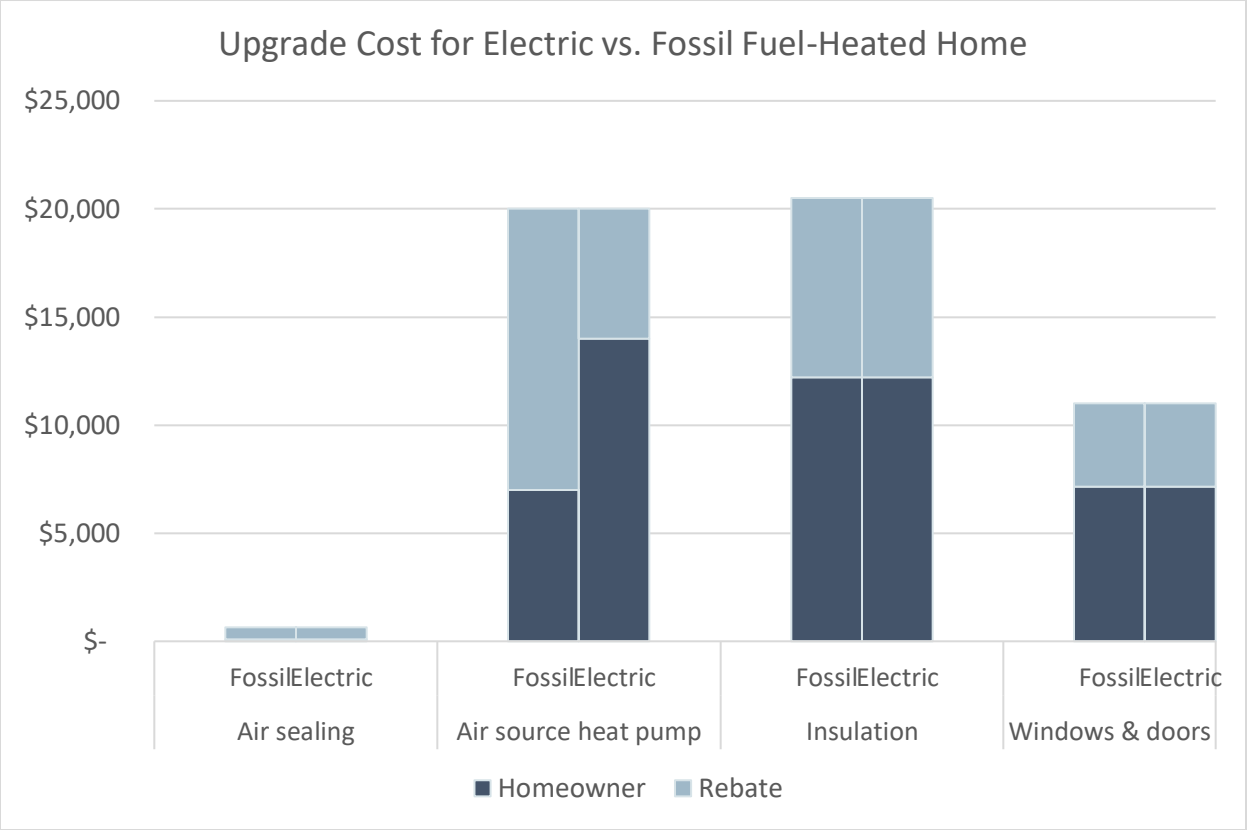
Archetype 1 – 1920s crafts-style home

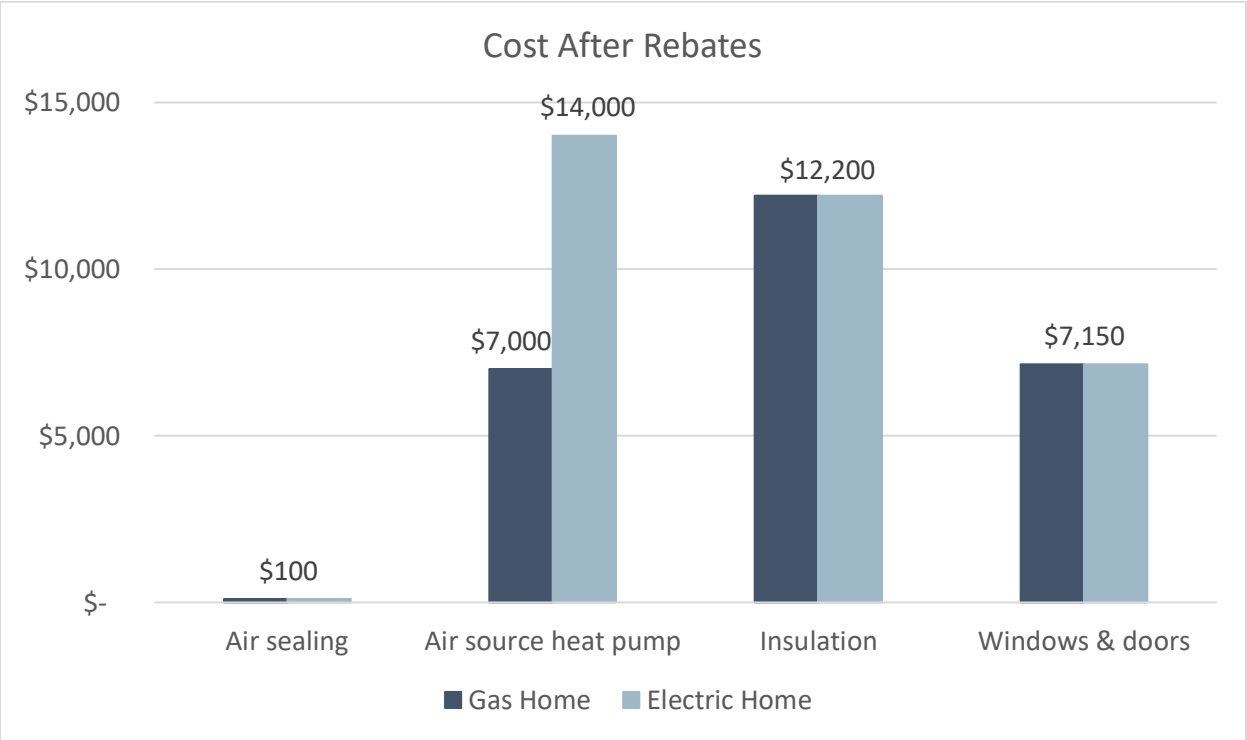
Mid-sized single or 1.5 storey home built in the 1920s or 1930s. These homes may or may not have a heritage designation, and were typically heated with oil furnaces or wood stoves before the introduction of gas to the community. Many have little or no insulation in the walls and ceiling, original single-paned windows, earthen crawlspaces or basements, and a moderate air tightness rating. These homes are often good candidates for insulation, window, and heat pump upgrades.

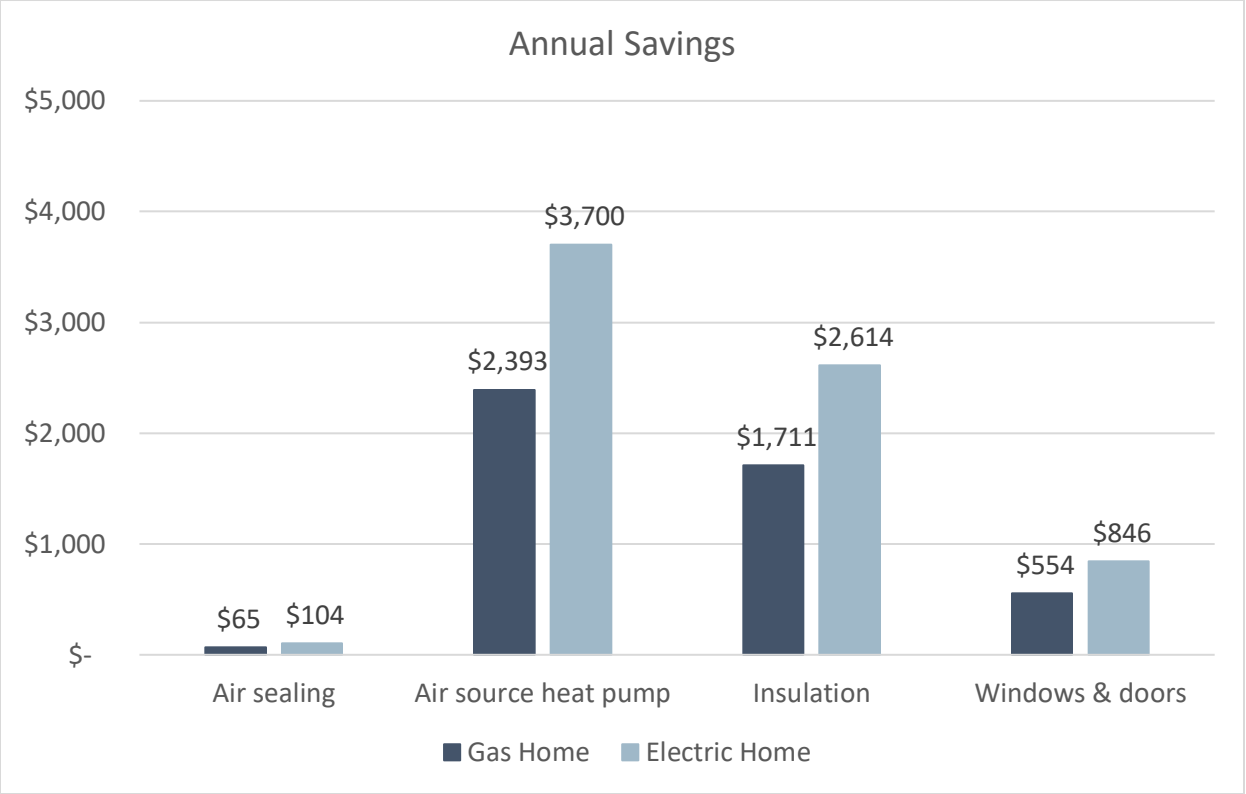
Average annual energy costs: $6,520 electric heated, $5,210 gas heated

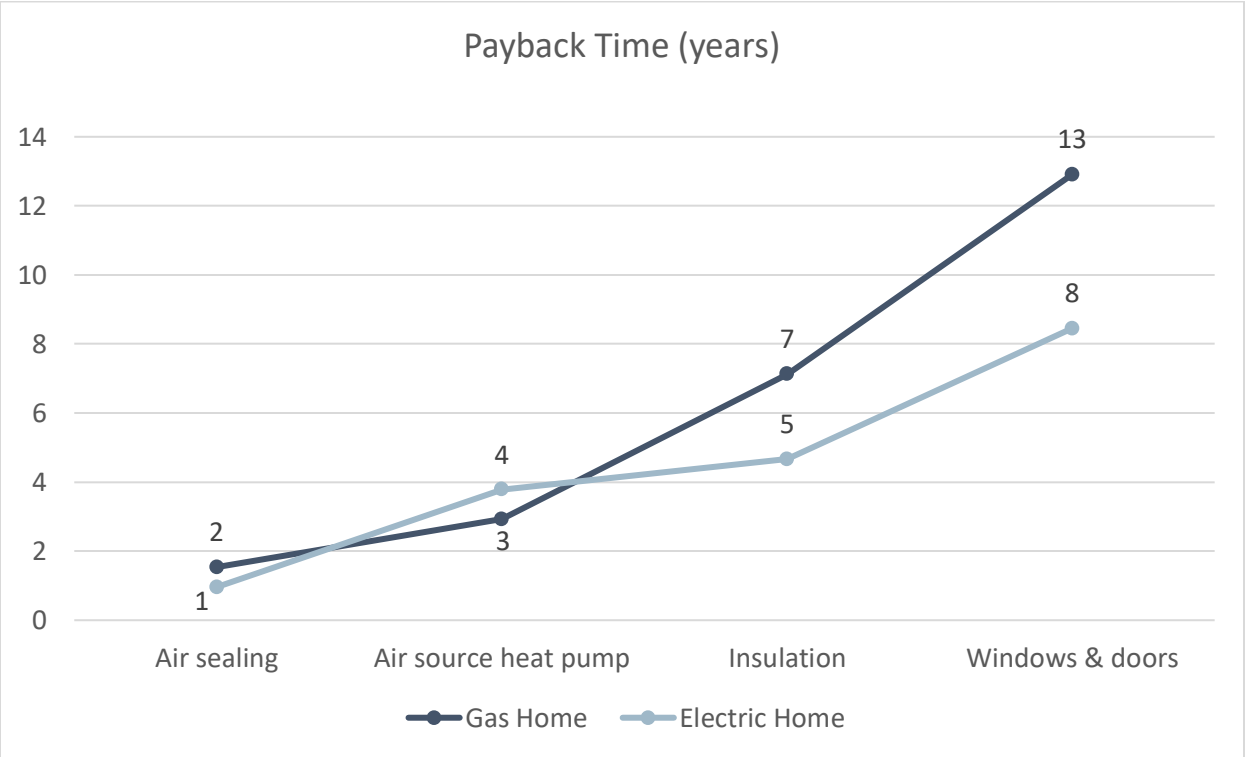
Annual energy costs after upgrades: $1,770

Variable	**Archetype 1**
Vintage	1920s
Floor area (sf)	1,600
Ventilation type	None
Ceiling insulation (R)	12
Wall insulation (R)	None
Foundation insulation (R)	None
Windows	Single pane, wood
Doors	Solid, wood
Air Tightness (ACH50)	7.4
Energy consumption – gas heated (GJ)	219
Energy consumption – electrically heated (GJ)	174
Carbon emissions – gas heated (tCO2e)	9.2


Upgrade Cost for Electric vs. Fossil Fuel-Heated Home
$25,000
$20,000
$15,000
$10,000
$5,000
$-
FossilElectric
Air sealing
FossilElectric
Air source heat pump
FossilElectric
Insulation
FossilElectric
Windows & doors
Homeowner
Rebate


Cost After Rebates
$15,000
$10,000
$5,000
$-
$100
$7,000
$14,000
$12,200
$7,150
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home


Annual Savings
$5,000
$4,000
$3,000
$2,000
$1,000
$-
$65
$104
$2,393
$3,700
$1,711
$2,614
$554
$846
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home


Payback Time (years)
14
12
10
8
6
4
2
0
1
2
3
4
5
7
8
13
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home

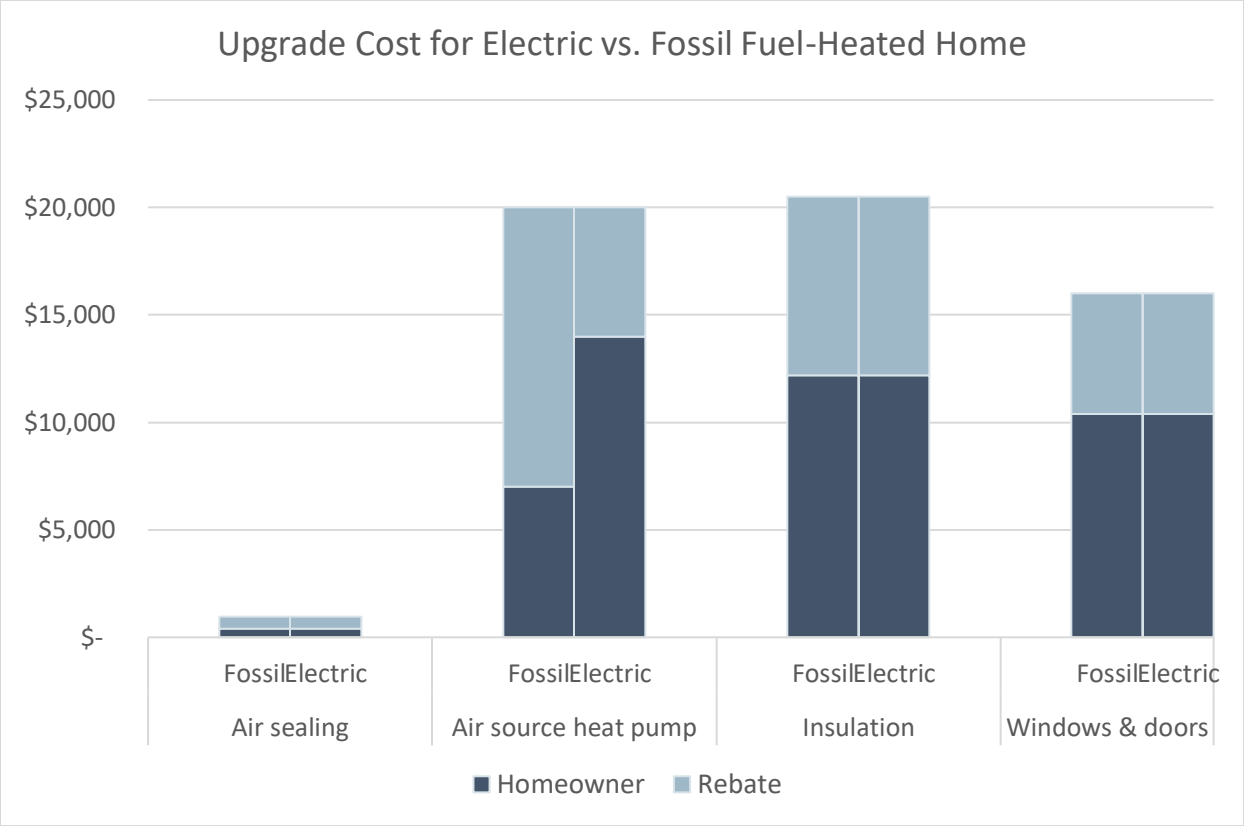
Archetype 2 – 1930s home

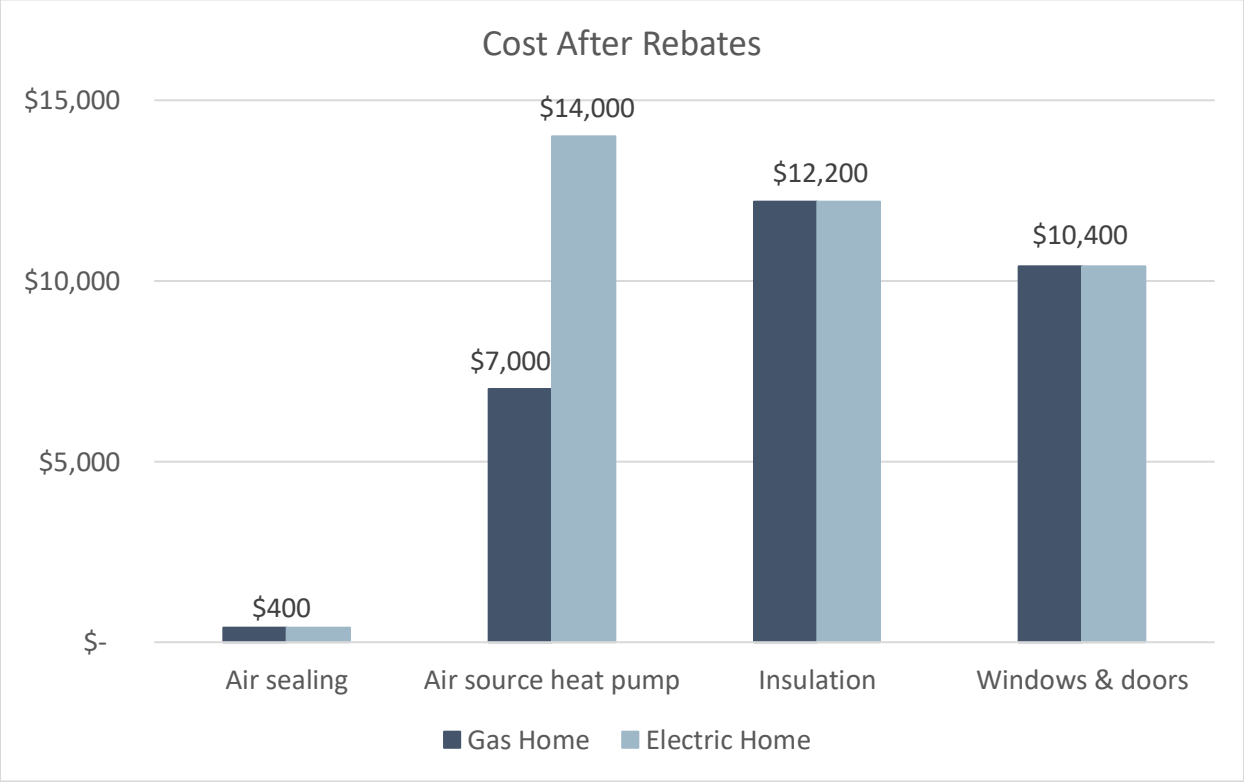
These are generally single storey homes with basements in a range of sizes. Some of these homes continue to utilize oil furnaces, which were common originally, while some are electrically heated. Many of these homes have low levels of wall and ceiling insulation, poor airtightness ratings, and original single paned or older double paned windows. These homes are often good candidates for insulation, air sealing, heat pumps, and window upgrades.

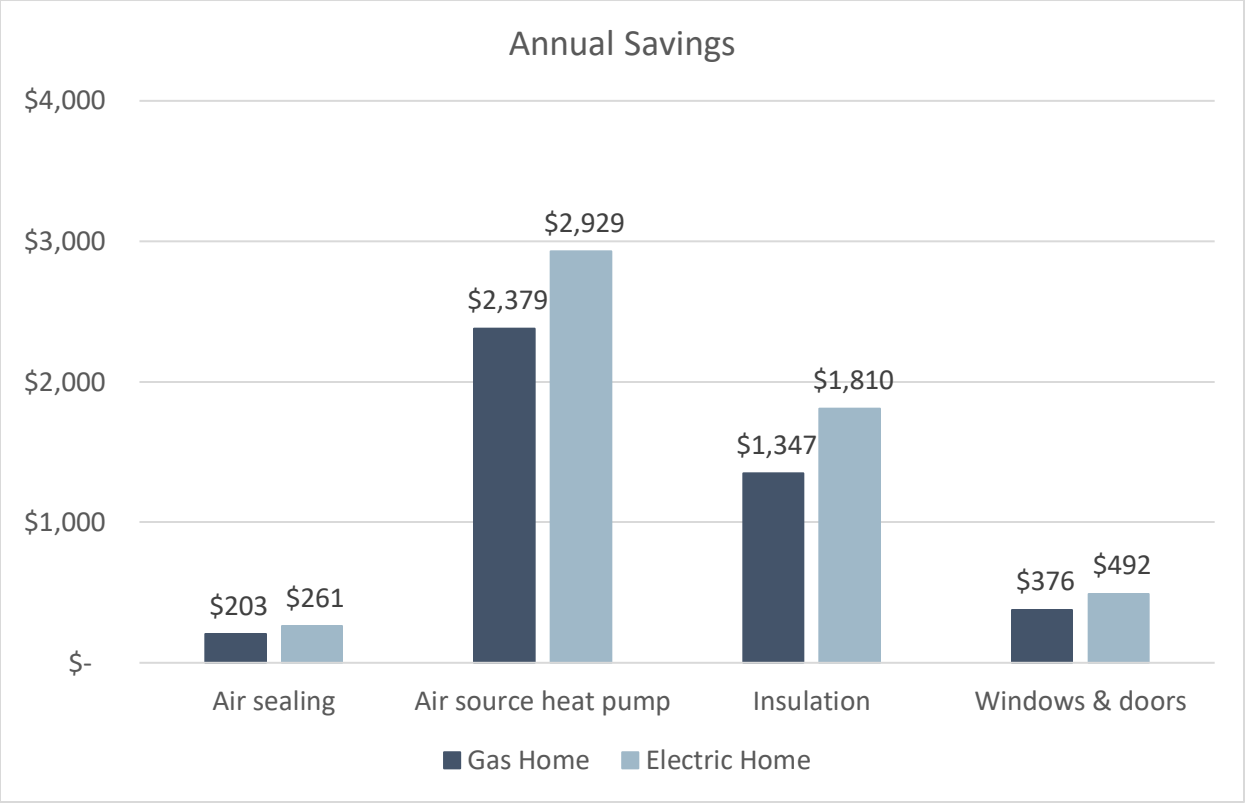
Average annual energy costs: $5,490 electric heated, $4,940 gas heated

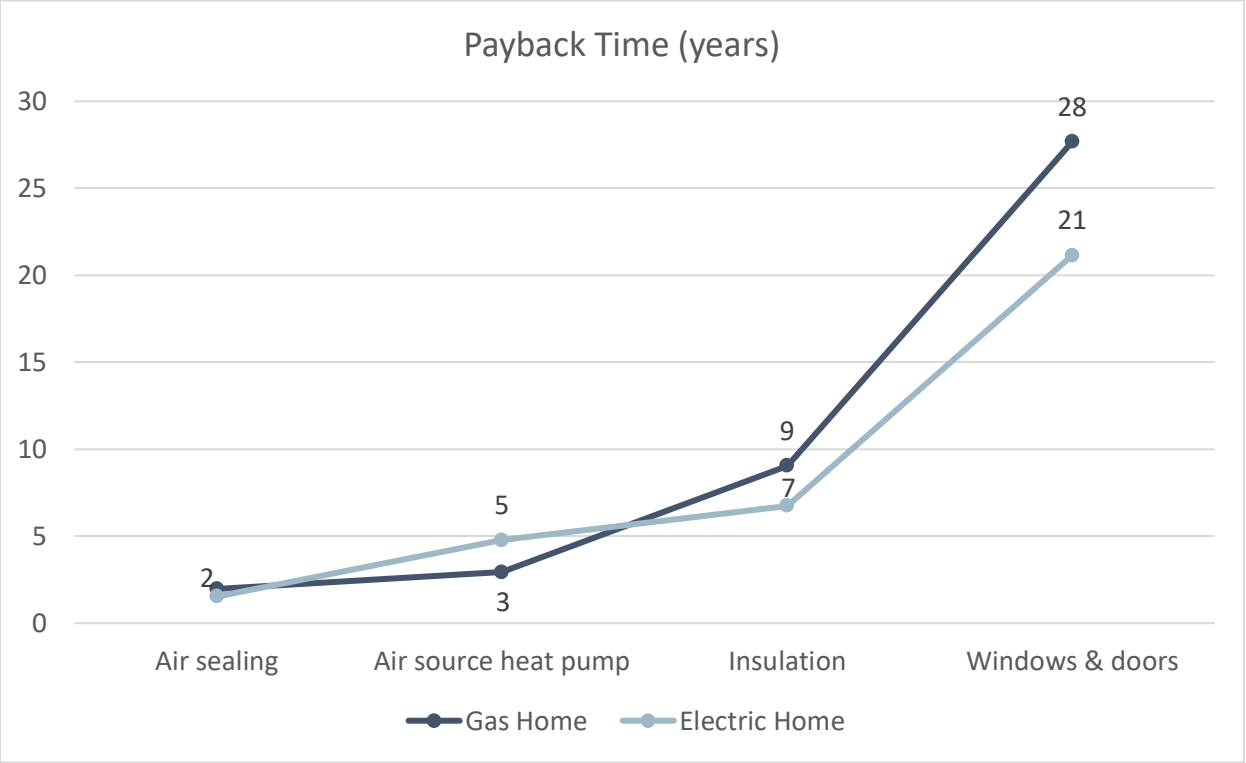
Annual energy costs after upgrades: $1,890

Variable	**Archetype 2**
Vintage	1930s
Floor area (sf)	1,800
Ventilation type	None
Ceiling insulation (R)	10
Wall insulation (R)	8
Foundation insulation (R)	None
Windows	Single pane, wood
Doors	Hollow, wood
Air Tightness (ACH50)	12
Energy consumption – gas heated (GJ)	192
Energy consumption – electrically heated (GJ)	141
Carbon emissions – gas heated (tCO2e)	7.8


Upgrade Cost for Electric vs. Fossil Fuel-Heated Home
$25,000
$20,000
$15,000
$10,000
$5,000
$-
FossilElectric
Air sealing
FossilElectric
Air source heat pump
FossilElectric
Insulation
FossilElectric
Windows & doors
Homeowner
Rebate


Cost After Rebates
$15,000
$10,000
$5,000
$-
$400
$7,000
$14,000
$12,200
$10,400
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home


Annual Savings
$4,000
$3,000
$2,000
$1,000
$-
$203
$261
$2,379
$2,929
$1,347
$1,810
$376
$492
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home


Payback Time (years)
30
25
20
15
10
5
0
2
3
5
9
7
28
21
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home

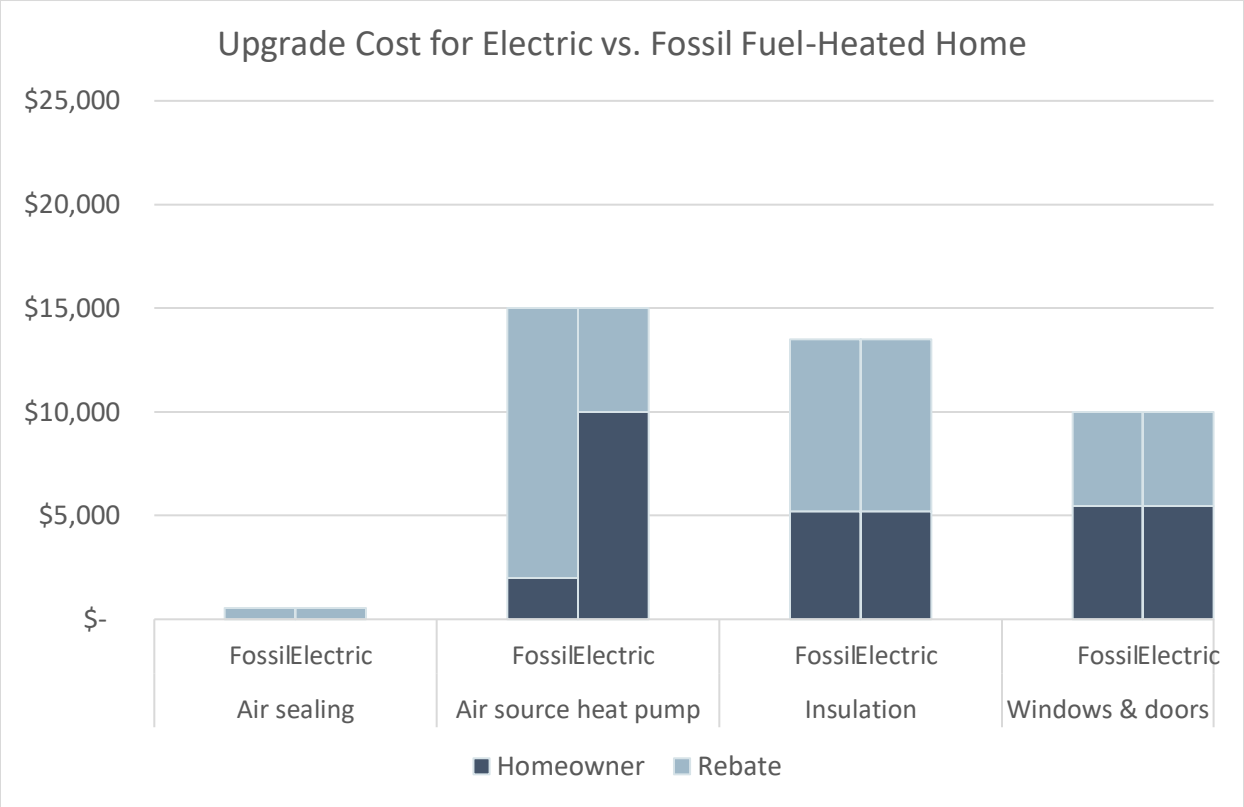
Archetype 3 – 1940s WW2-era home

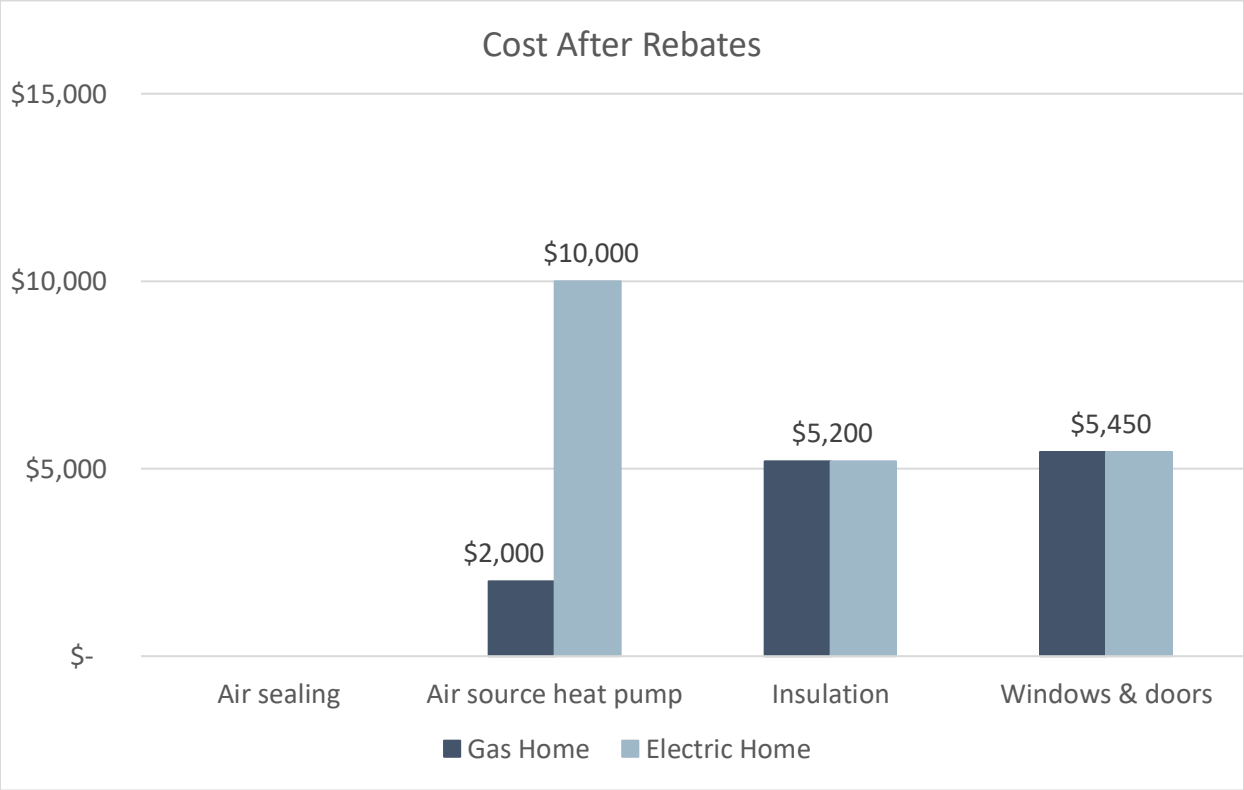
Typical modest 1940s single-storey home. Poor levels of insulation and airtightness typical for the time period, typically on a crawlspace but sometimes on a shallow foundation. Often electrically heated. Good candidates for ductless heat pump and insulation retrofits, and window upgrades if single paned.

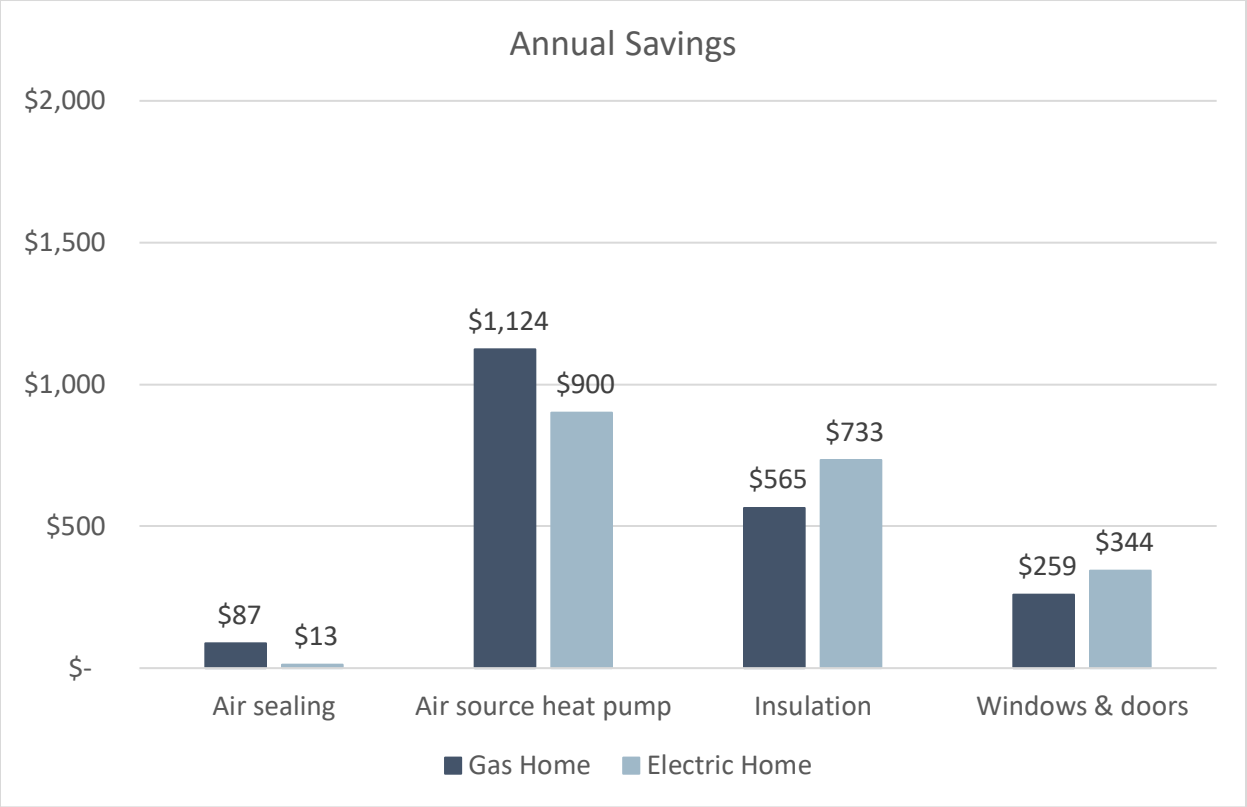
Average annual energy costs: $2,680 electric heated, $2,910 gas heated

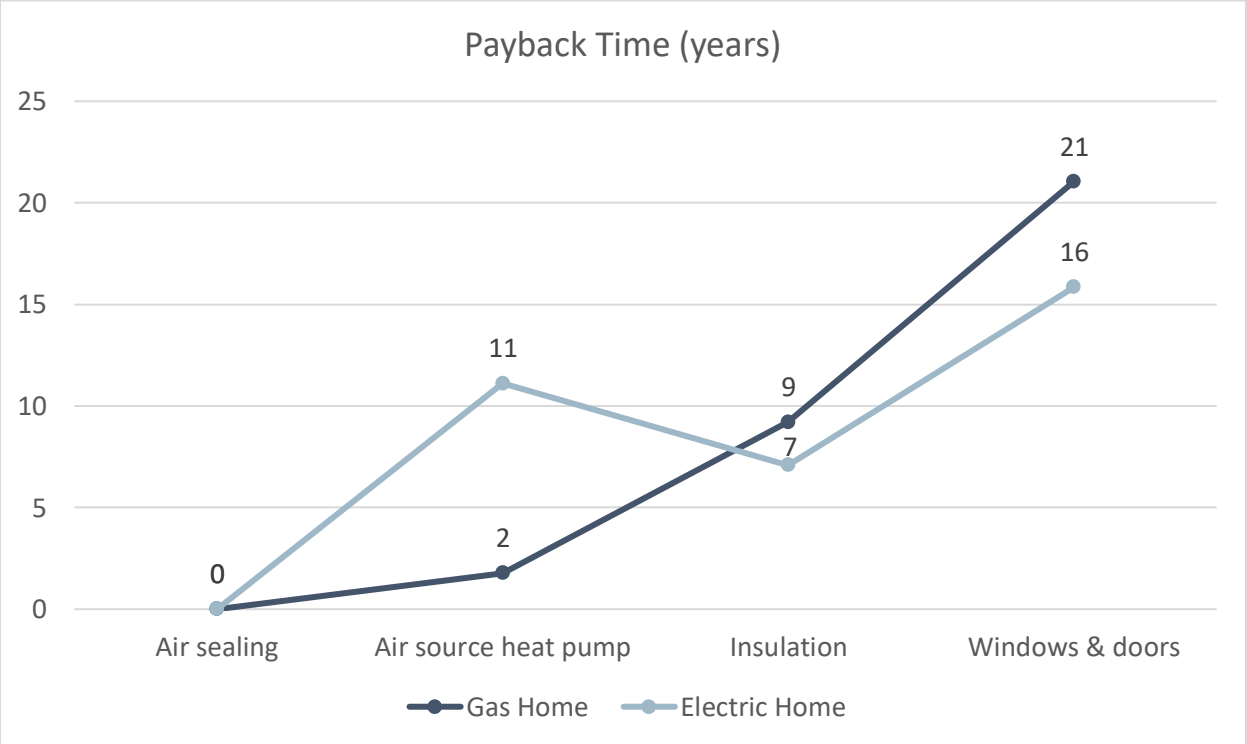
Annual energy costs after upgrades: $1,520

Variable	**Archetype 3**
Vintage	1940s
Floor area (sf)	800
Ventilation type	None
Ceiling insulation (R)	12
Wall insulation (R)	8
Foundation insulation (R)	None
Windows	Single pane, wood
Doors	Solid, wood
Air Tightness (ACH50)	6.38
Energy consumption – gas heated (GJ)	104
Energy consumption – electrically heated (GJ)	74
Carbon emissions – gas heated (tCO2e)	3.4


Upgrade Cost for Electric vs. Fossil Fuel-Heated Home
$25,000
$20,000
$15,000
$10,000
$5,000
$-
Fossil
Electric
Air sealing
Fossil
Electric
Air source heat pump
Fossil
Electric
Insulation
Fossil
Electric
Windows & doors
Homeowner
Rebate


Cost After Rebates
$15,000
$10,000
$5,000
$-
$2,000
$10,000
$5,200
$5,450
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home


Annual Savings
$2,000
$1,500
$1,000
$500
$-
$87
$13
$1,124
$900
$565
$733
$259
$344
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home


Payback Time (years)
25
20
15
10
5
0
0
11
2
9
7
21
16
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home

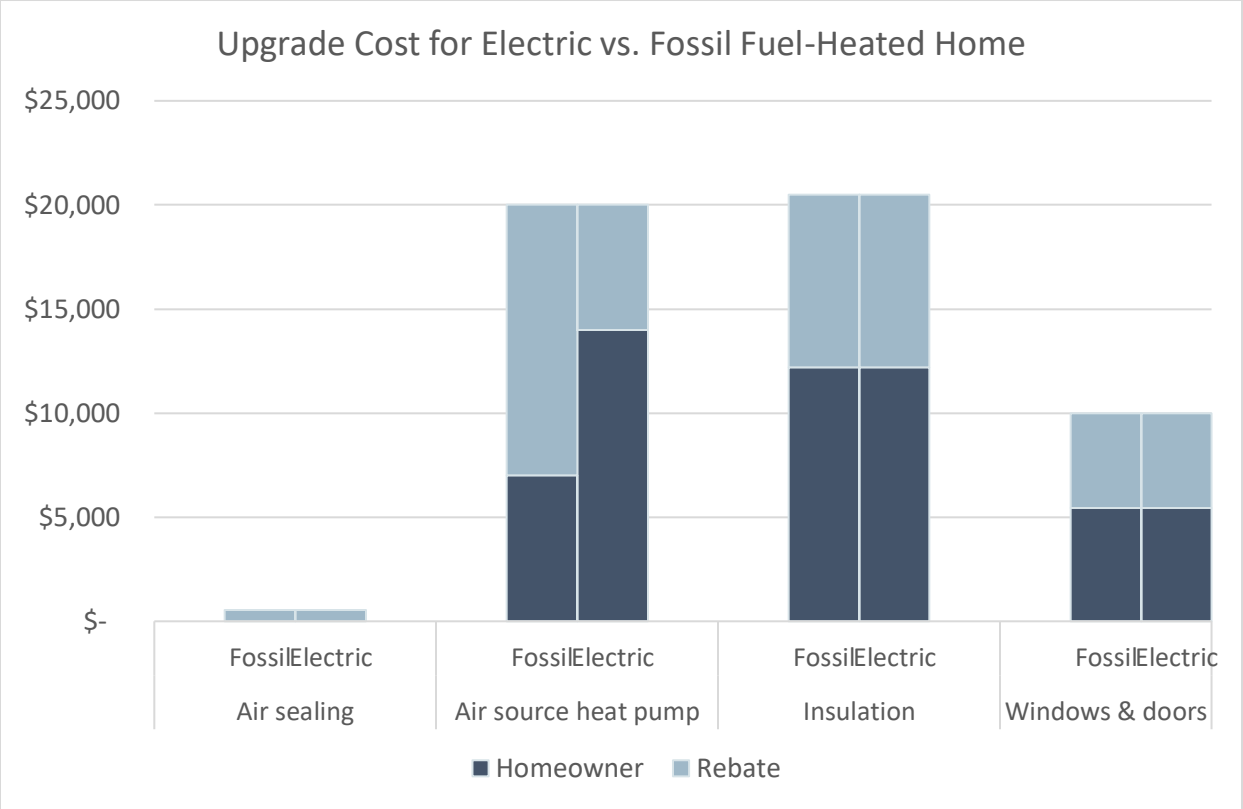
Archetype 4 – 1960s split-level home

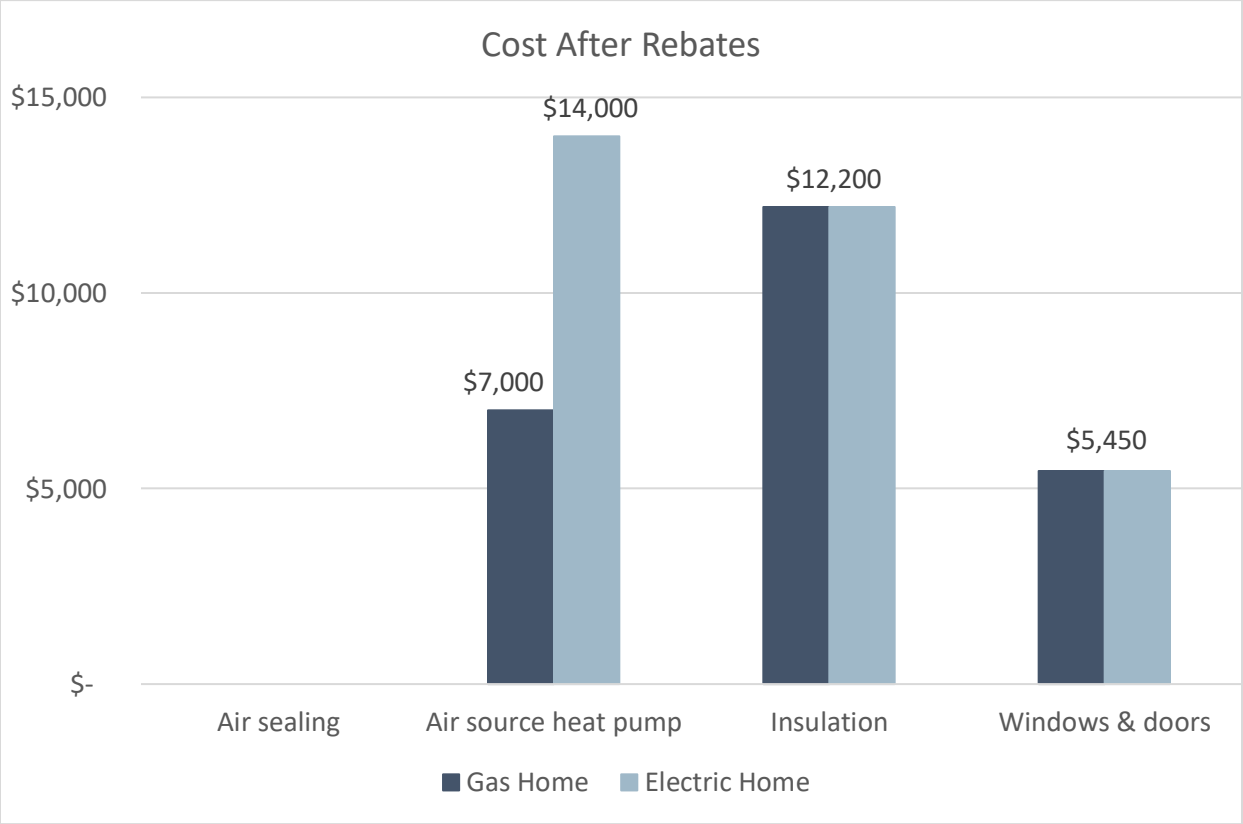
Split level home from the mid-20th century with full basement and sealed crawlspace components. Upgraded windows. Moderate wall and ceiling insulation and air tightness levels typical for the period. Usually electric or gas heating. Good candidate for insulation and heat pump upgrades and air sealing.

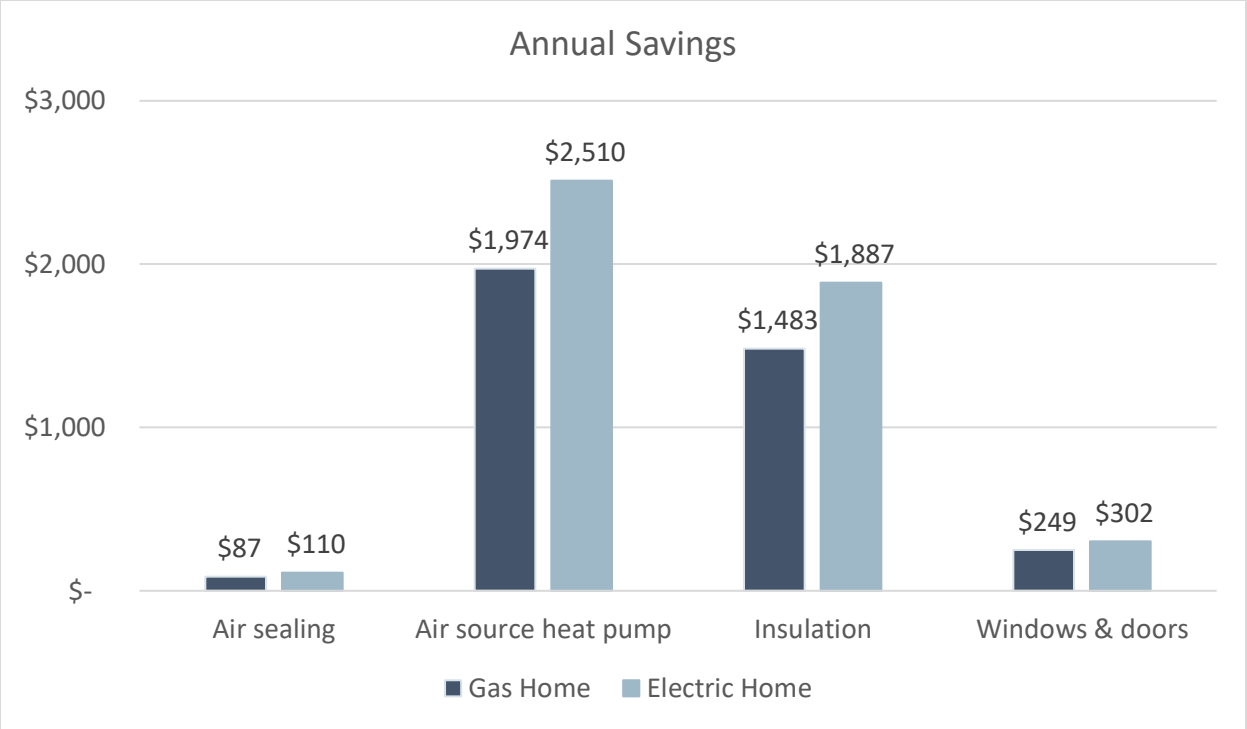
Average annual energy costs: $4,990 electric heated, $4,450 gas heated

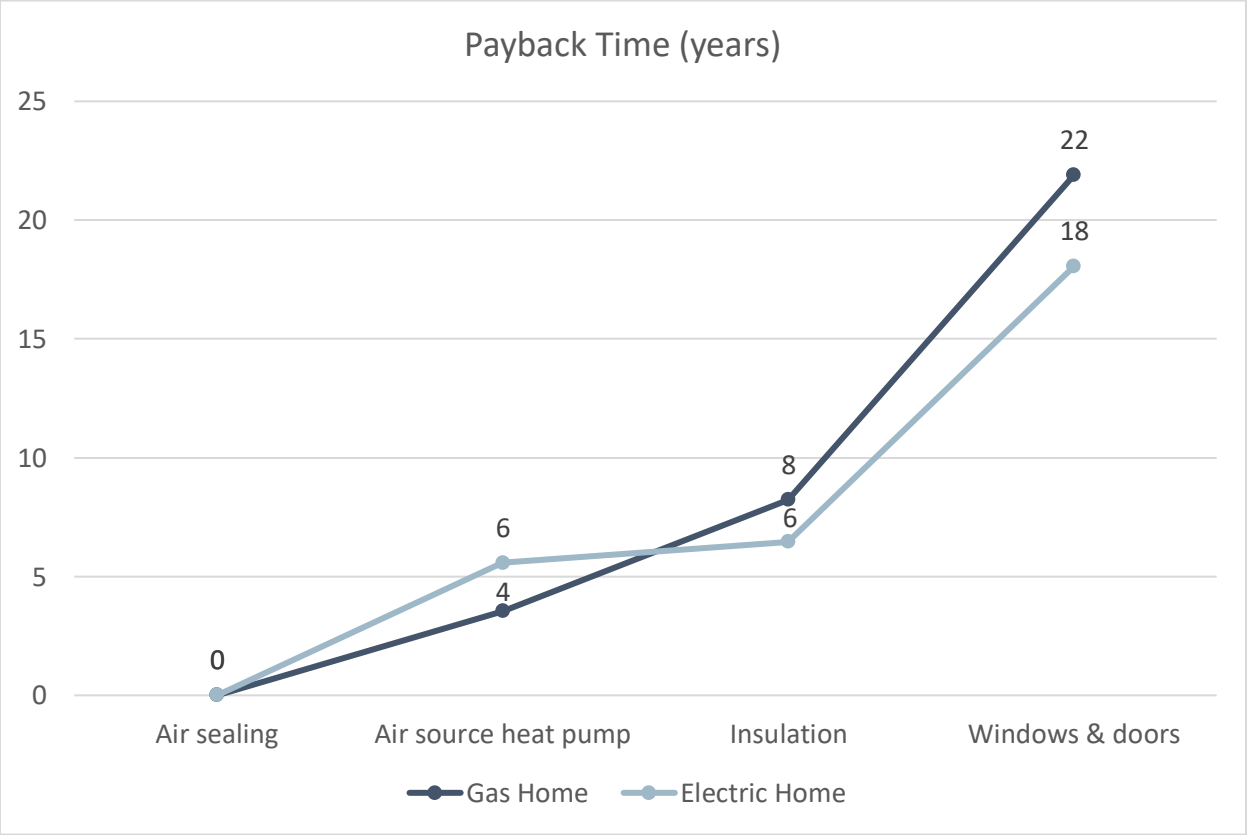
Annual energy costs after upgrades: $1,040

Variable	Archetype 4
Vintage	1960s
Floor area (sf)	1,800
Ventilation type	Bathroom, range fans
Ceiling insulation (R)	10
Wall insulation (R)	8
Foundation insulation (R)	None
Windows	Double pane, vinyl
Doors	Solid, wood
Air Tightness (ACH50)	7.72
Energy consumption – gas heated (GJ)	174
Energy consumption – electrically heated (GJ)	135
Carbon emissions – gas heated (tCO2e)	6.9


Upgrade Cost for Electric vs. Fossil Fuel-Heated Home
$25,000
$20,000
$15,000
$10,000
$5,000
$-
Fossil
Electric
Air sealing
Fossil
Electric
Air source heat pump
Fossil
Electric
Insulation
Fossil
Electric
Windows & doors
Homeowner
Rebate


Cost After Rebates
$15,000
$10,000
$5,000
$-
$7,000
$14,000
$12,200
$5,450
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home


Annual Savings
$3,000
$2,000
$1,000
$-
$87
$110
$1,974
$2,510
$1,483
$1,887
$249
$302
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home


Payback Time (years)
25
20
15
10
5
0
0
6
4
8
6
22
18
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home

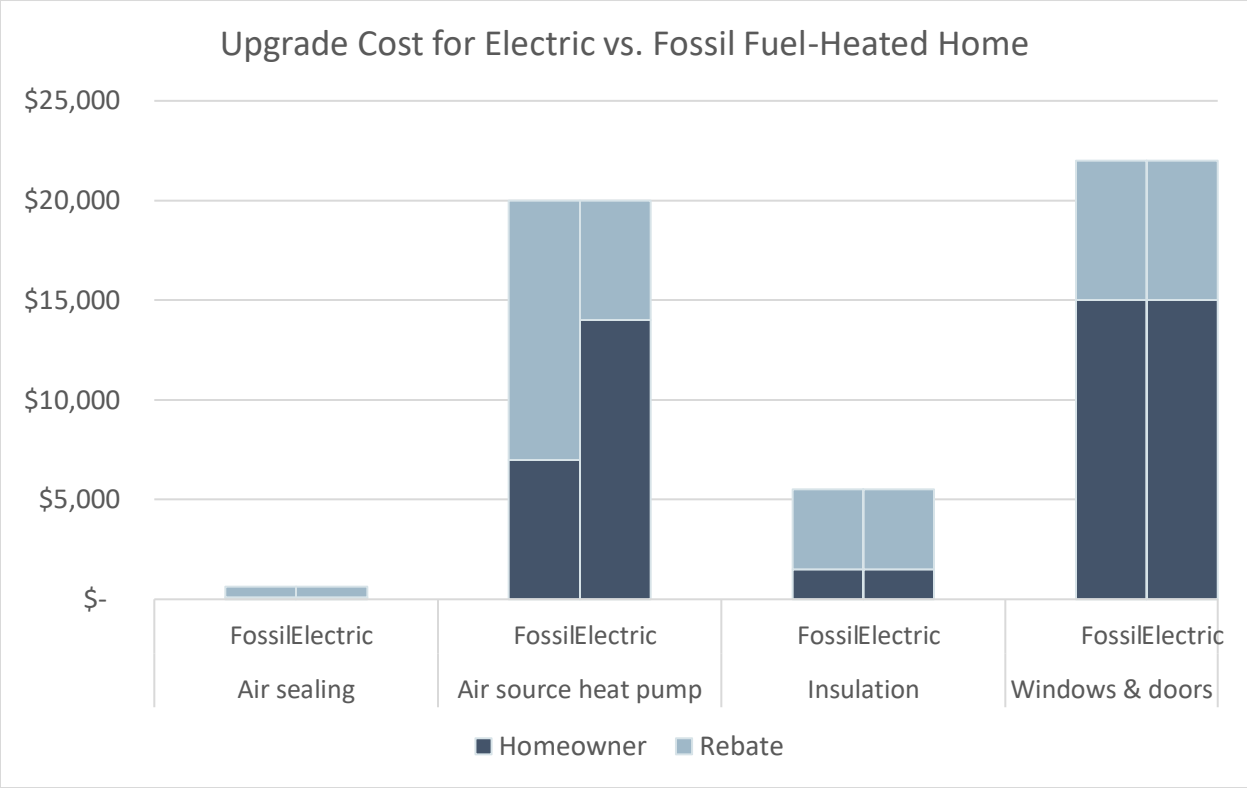
Archetype 5 – 1970s “BC Box”

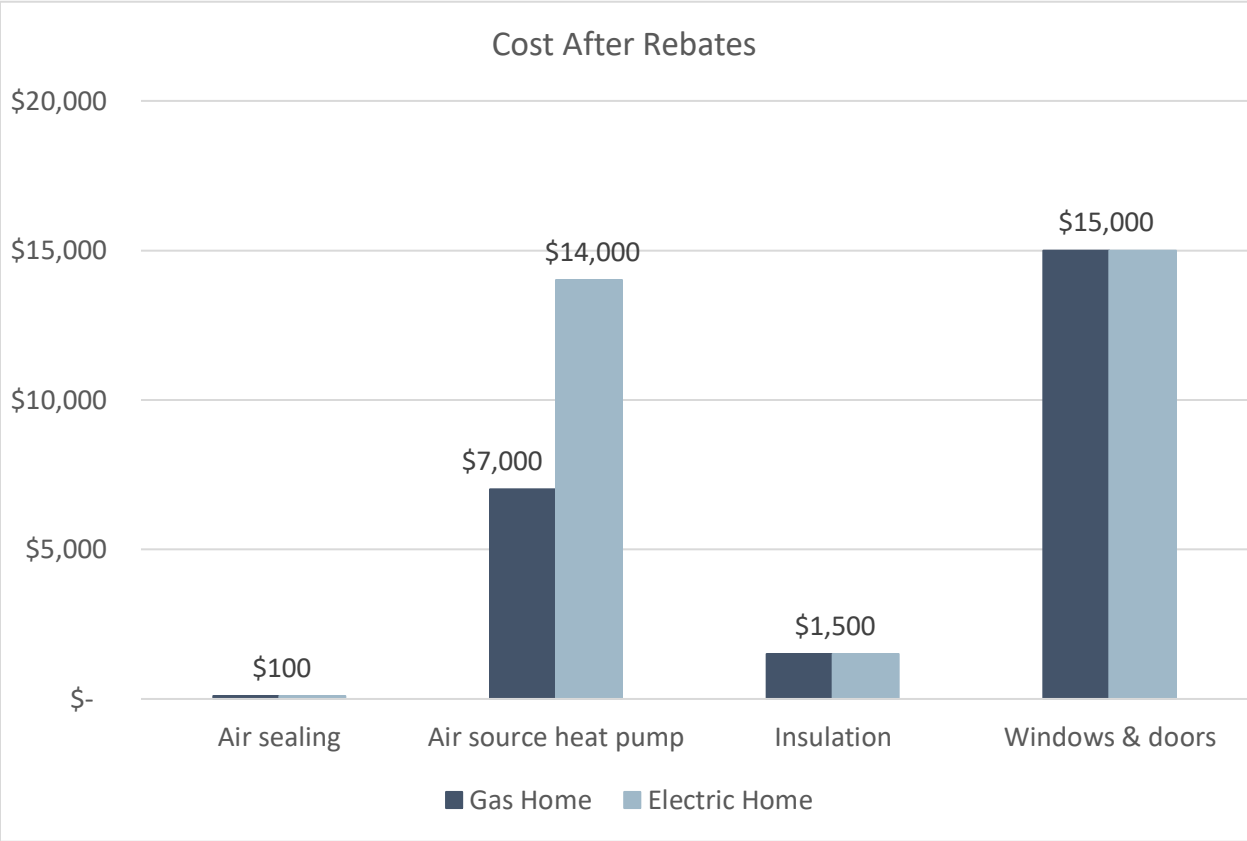
Extremely common 1970s-1980s housing archetype throughout coastal BC. Walk-up entry or separate entrances with a full basement, many with original deck over carport configuration converted to upstairs living space and/or garage. Moderate levels of wall and ceiling insulation and air tightness typical for the period. Often originally heated with oil, many homes have converted to electric or gas. Often good candidates for insulation, windows, and central heat pumps.

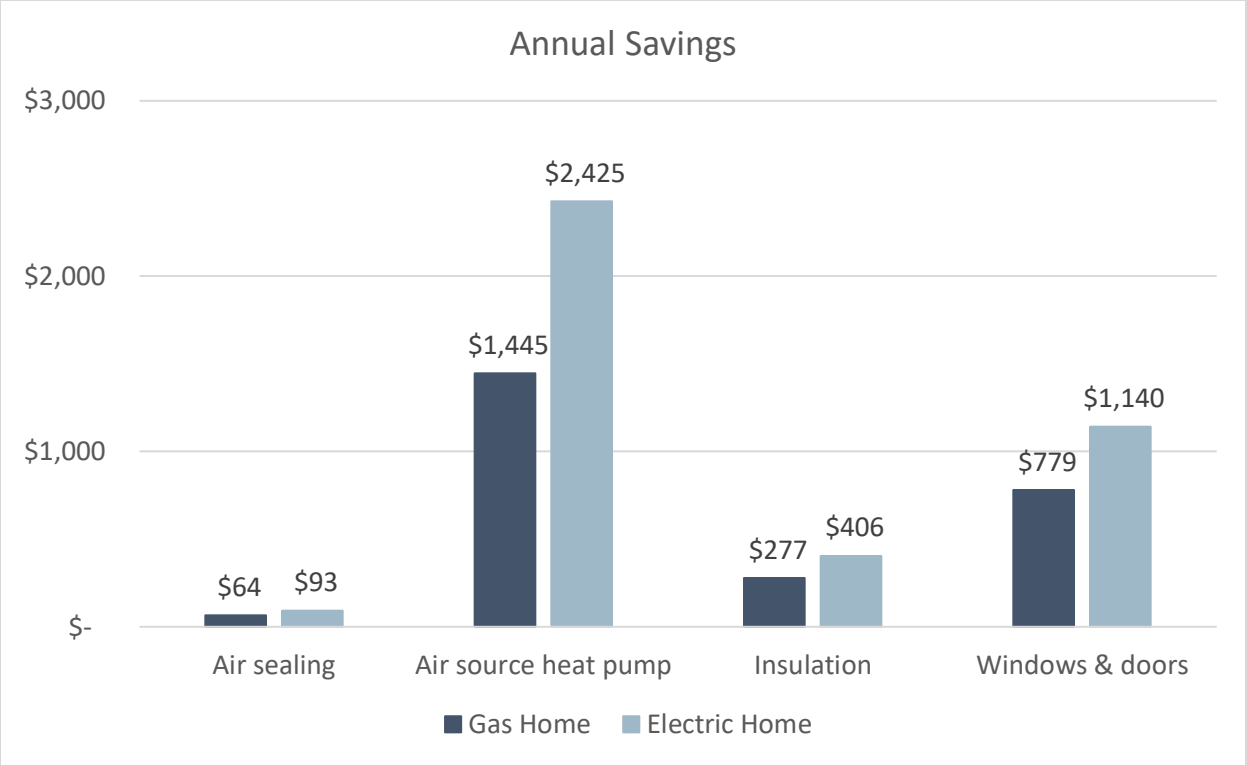
Average annual energy costs: $4,980 electric heated, $4,000 gas heated

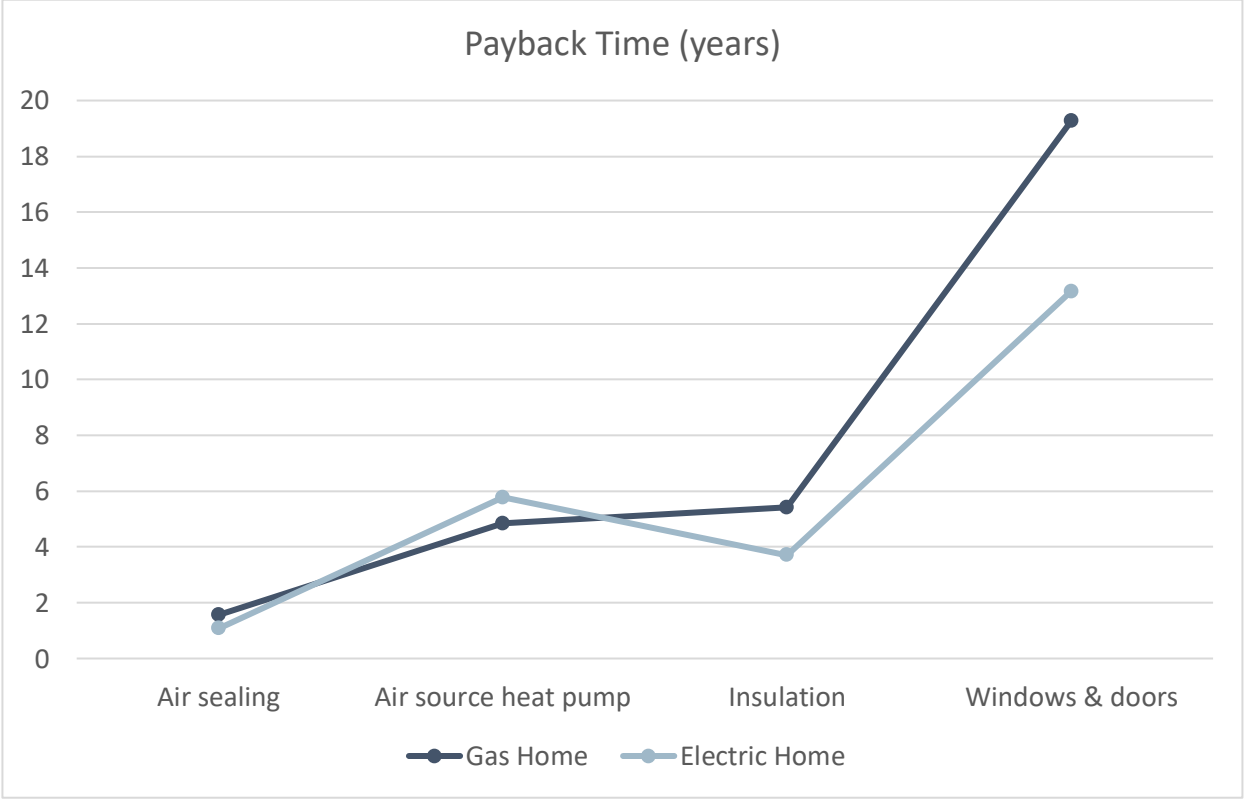
Annual energy costs after upgrades: $2,030

Variable	**Archetype 5**
Vintage	1970s
Floor area (sf)	2,400
Ventilation type	Bathroom, range fans
Ceiling insulation (R)	20
Wall insulation (R)	12
Foundation insulation (R)	None
Windows	Double pane, metal
Doors	Solid, wood
Air Tightness (ACH50)	7.05
Energy consumption – gas heated (GJ)	150
Energy consumption – electrically heated (GJ)	129
Carbon emissions – gas heated (tCO2e)	5.6


Upgrade Cost for Electric vs. Fossil Fuel-Heated Home
$25,000
$20,000
$15,000
$10,000
$5,000
$-
FossilElectric
Air sealing
FossilElectric
Air source heat pump
FossilElectric
Insulation
FossilElectric
Windows & doors
Homeowner
Rebate


Cost After Rebates
$20,000
$15,000
$10,000
$5,000
$-
$100
$7,000
$14,000
$1,500
$15,000
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home


Annual Savings
$3,000
$2,000
$1,000
$-
$64
$93
$1,445
$2,425
$277
$406
$779
$1,140
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home


Payback Time (years)
20
18
16
14
12
10
8
6
4
2
0
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home

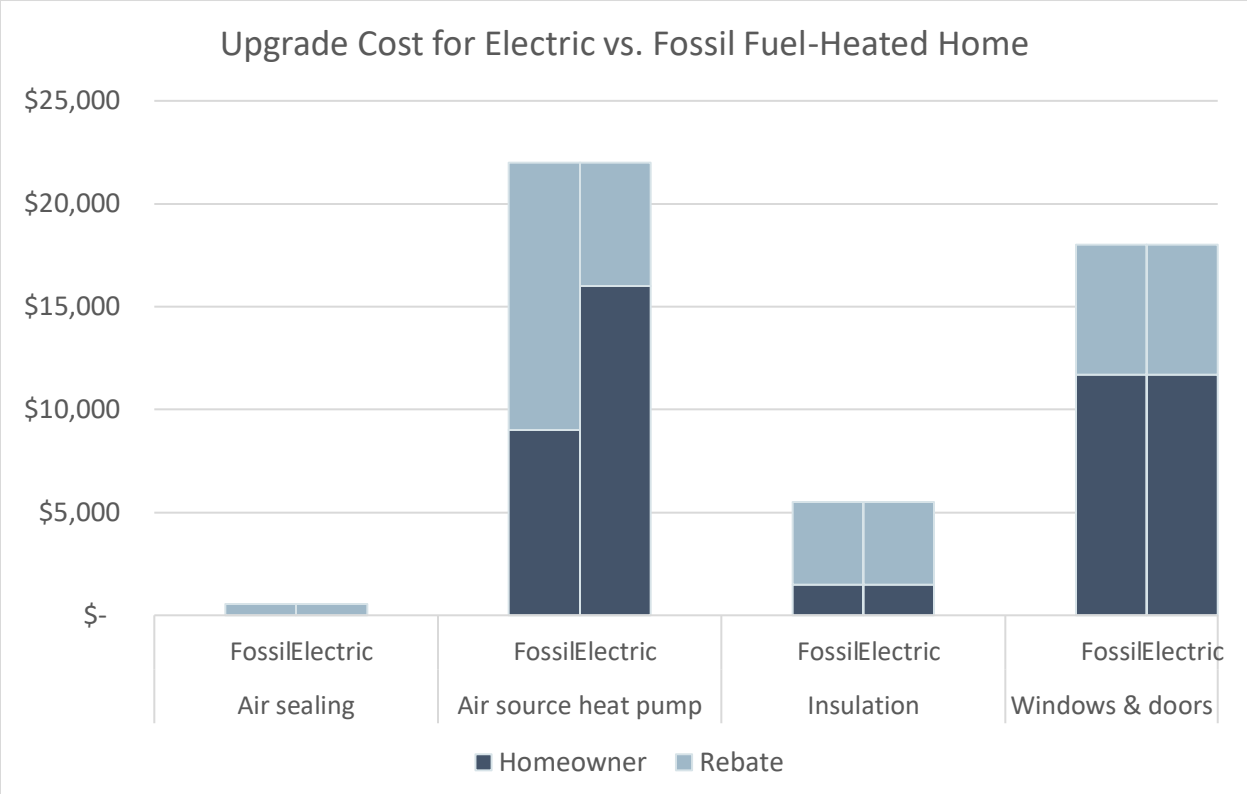
Archetype 6 – 1980s two-storey

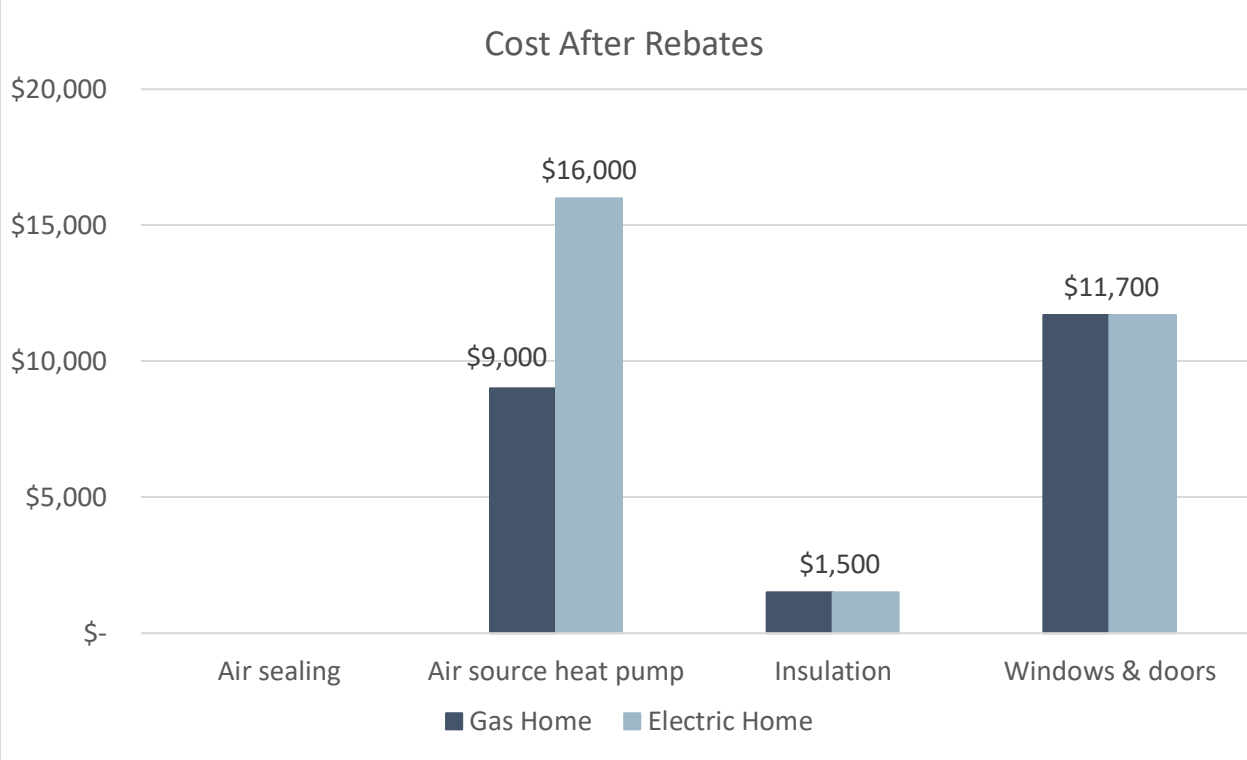
This archetype is typical of single-family homes built in newly developed areas in the late 20th century. Larger amounts of glazing, bigger floor area, and gas heating are typical for this vintage of home. Gas fireplaces are common. Near-modern levels of insulation in ceilings and walls, with good airtightness ratings. These homes are good candidates for central heat pumps, foundation insulation, and heat pump water heaters.

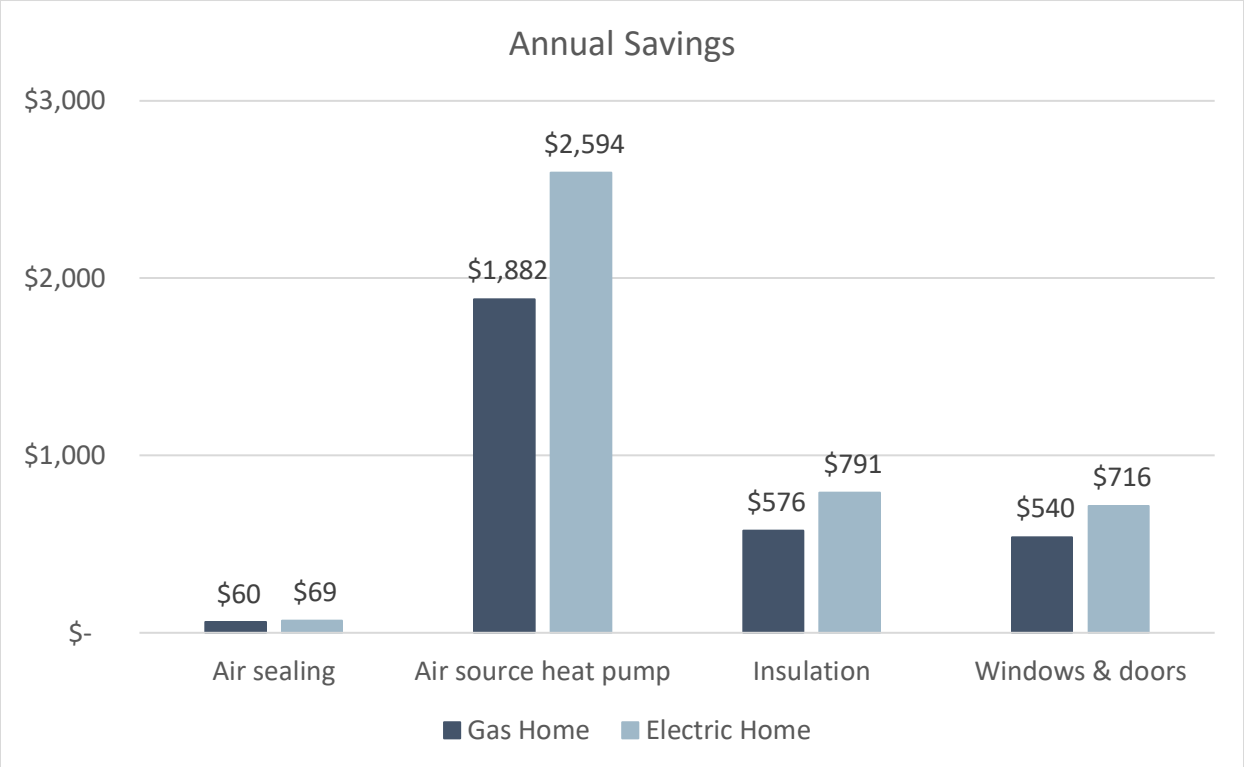
Average annual energy costs: $5,510 electric heated, $4,800 gas heated

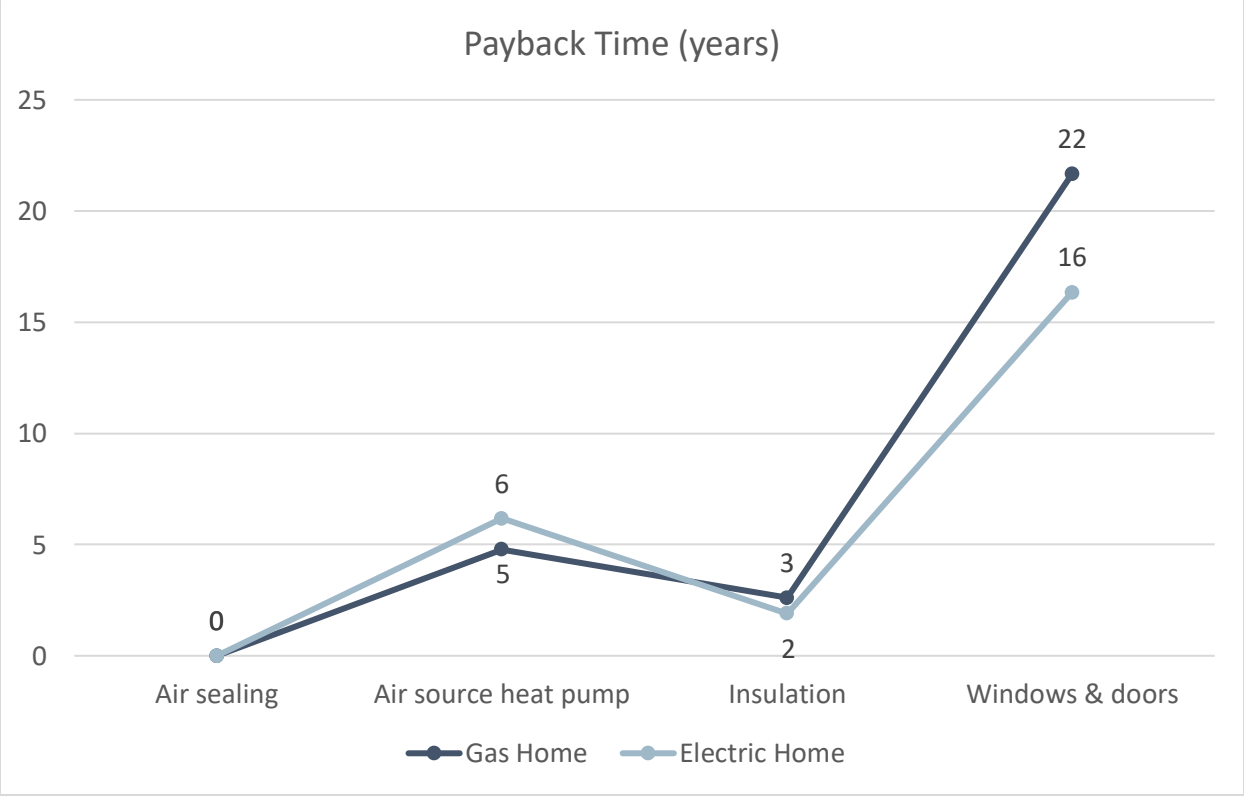
Annual energy costs after upgrades: $2,420

Variable	**Archetype 6**
Vintage	1980s
Floor area (sf)	3,000
Ventilation type	Bathroom, range fans
Ceiling insulation (R)	28
Wall insulation (R)	12
Foundation insulation (R)	None
Windows	Double pane, aluminum
Doors	Steel, foam core
Air Tightness (ACH50)	4
Energy consumption – gas heated (GJ)	186
Energy consumption – electrically heated (GJ)	141
Carbon emissions – gas heated (tCO2e)	7.5


Upgrade Cost for Electric vs. Fossil Fuel-Heated Home
$25,000
$20,000
$15,000
$10,000
$5,000
$-
FossilElectric
Air sealing
FossilElectric
Air source heat pump
FossilElectric
Insulation
FossilElectric
Windows & doors
Homeowner
Rebate


Cost After Rebates
$20,000
$15,000
$10,000
$5,000
$-
$16,000
$9,000
$1,500
$11,700
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home


Annual Savings
$3,000
$2,000
$1,000
$-
$60
$69
$1,882
$2,594
$576
$791
$540
$716
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home


Payback Time (years)
25
20
15
10
5
0
0
6
5
3
2
22
16
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home

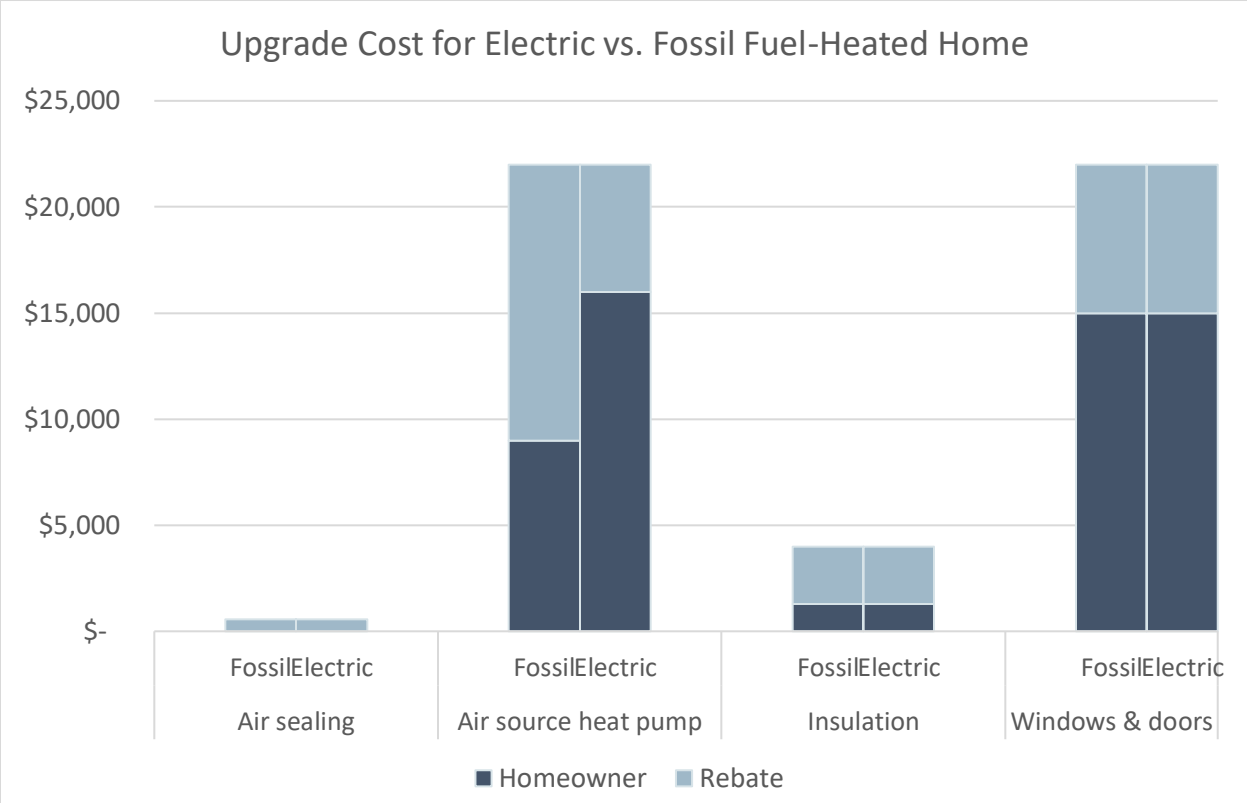
Archetype 7 – 1990s two-storey

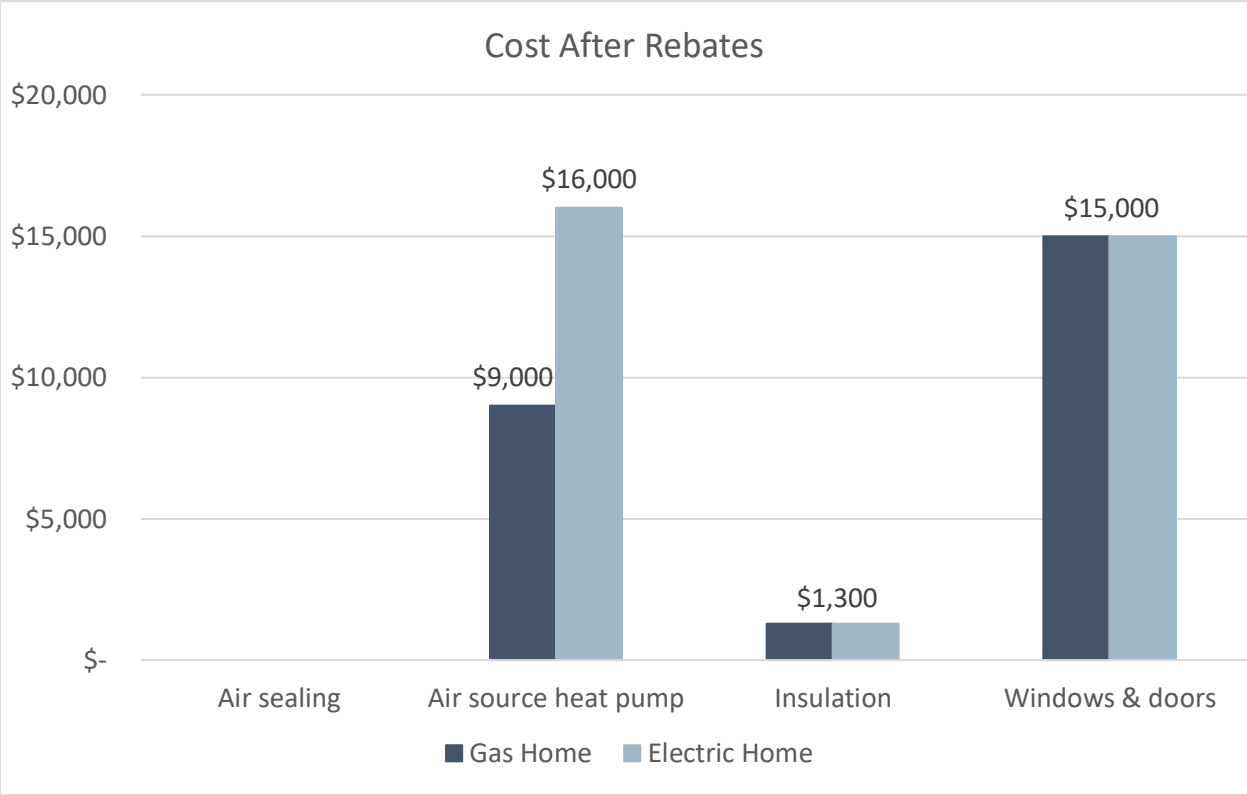
This archetype is typical of large single-family homes built in the 1990s, with large windows, large floor area, and attached garages being typical. Condensing gas furnaces and fireplaces are common. Modern levels of insulation in ceilings and walls, with good airtightness ratings. These homes are good candidates for central heat pumps, foundation insulation, and heat pump water heaters.

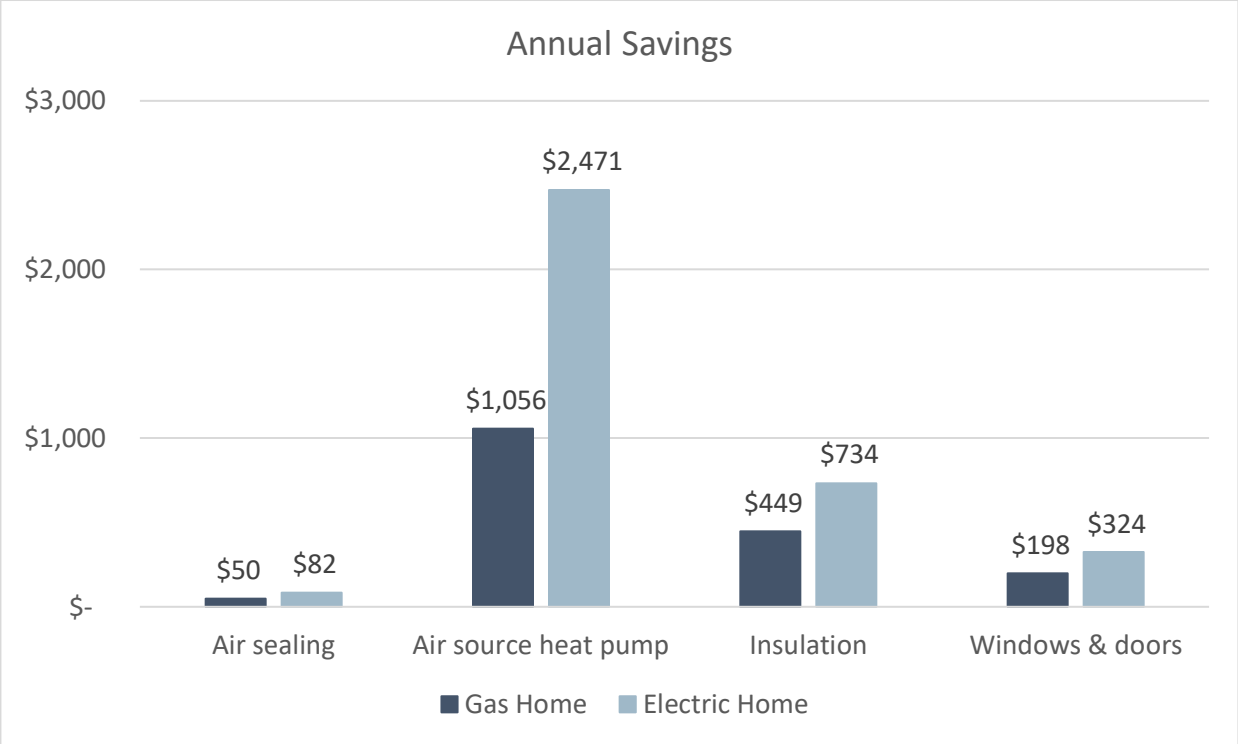
Average annual energy costs: $5,420 electric heated, $4,000 gas heated

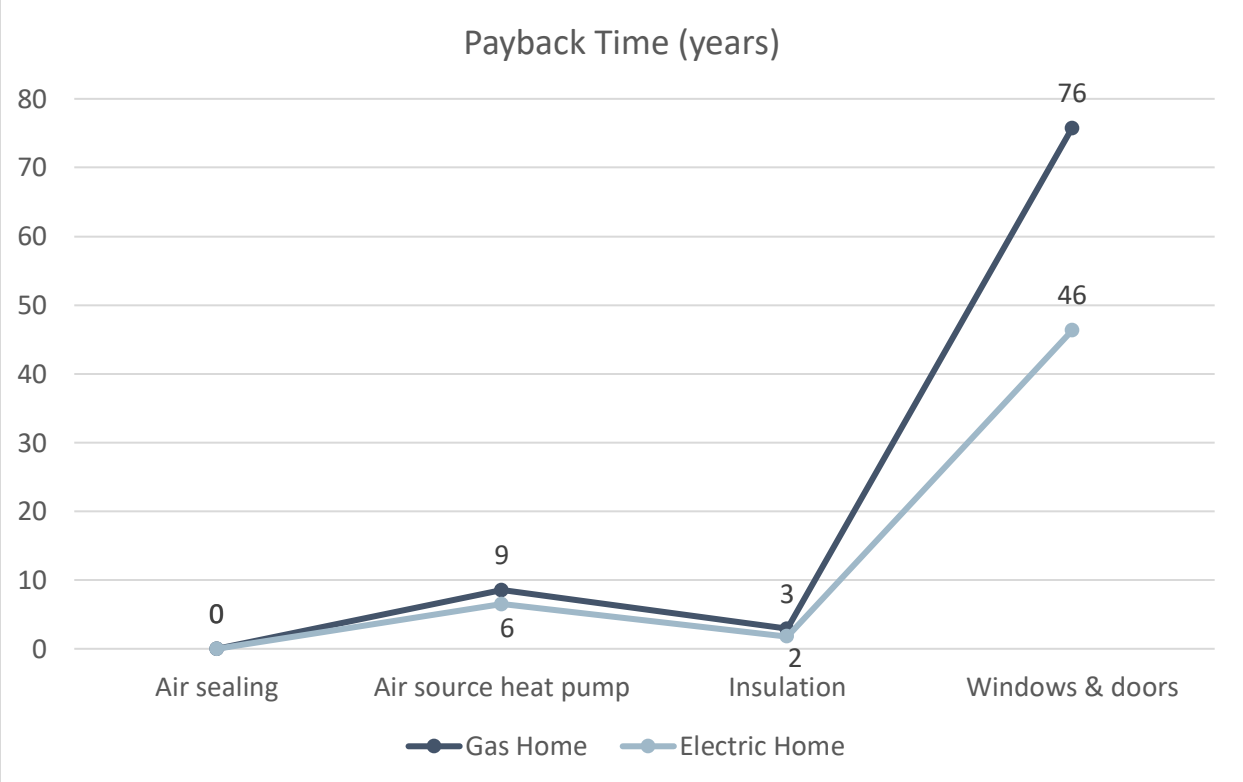
Annual energy costs after upgrades: $2,570

Variable	**Archetype 7**
Vintage	1990s
Floor area (sf)	3,500
Ventilation type	Bathroom, range fans, HRV possible
Ceiling insulation (R)	28
Wall insulation (R)	12
Foundation insulation (R)	6
Windows	Double pane, vinyl
Doors	Steel, foam core
Air Tightness (ACH50)	3.2
Energy consumption – gas heated (GJ)	149
Energy consumption – electrically heated (GJ)	139
Carbon emissions – gas heated (tCO2e)	5.4


Upgrade Cost for Electric vs. Fossil Fuel-Heated Home
$25,000
$20,000
$15,000
$10,000
$5,000
$-
FossilElectric
Air sealing
FossilElectric
Air source heat pump
FossilElectric
Insulation
FossilElectric
Windows & doors
Homeowner
Rebate


Cost After Rebates
$20,000
$15,000
$10,000
$5,000
$-
$16,000
$9,000
$1,300
$15,000
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home


Annual Savings
$3,000
$2,000
$1,000
$-
$50
$82
$1,056
$2,471
$449
$734
$198
$324
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home


Payback Time (years)
80
70
60
50
40
30
20
10
0
0
9
6
3
2
76
46
Air sealing
Air source heat pump
Insulation
Windows & doors
Gas Home
Electric Home

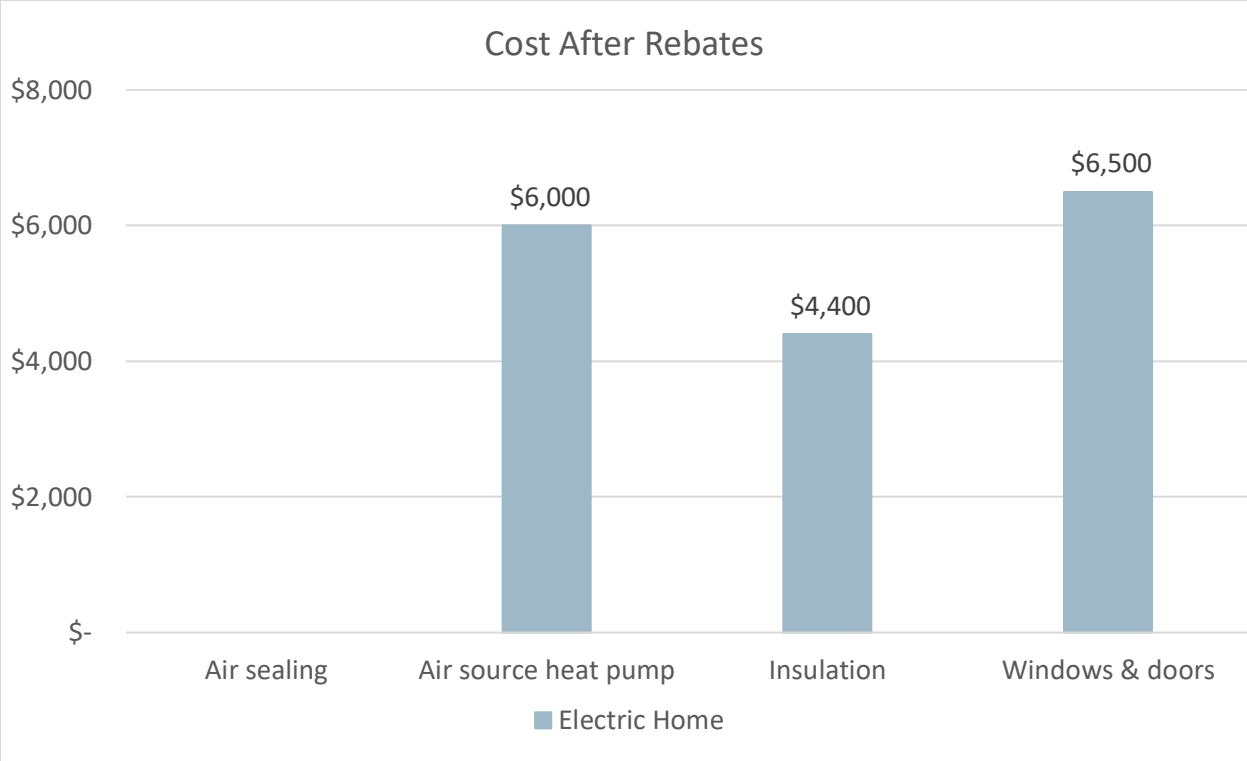
Archetype 8 – Mobile Home

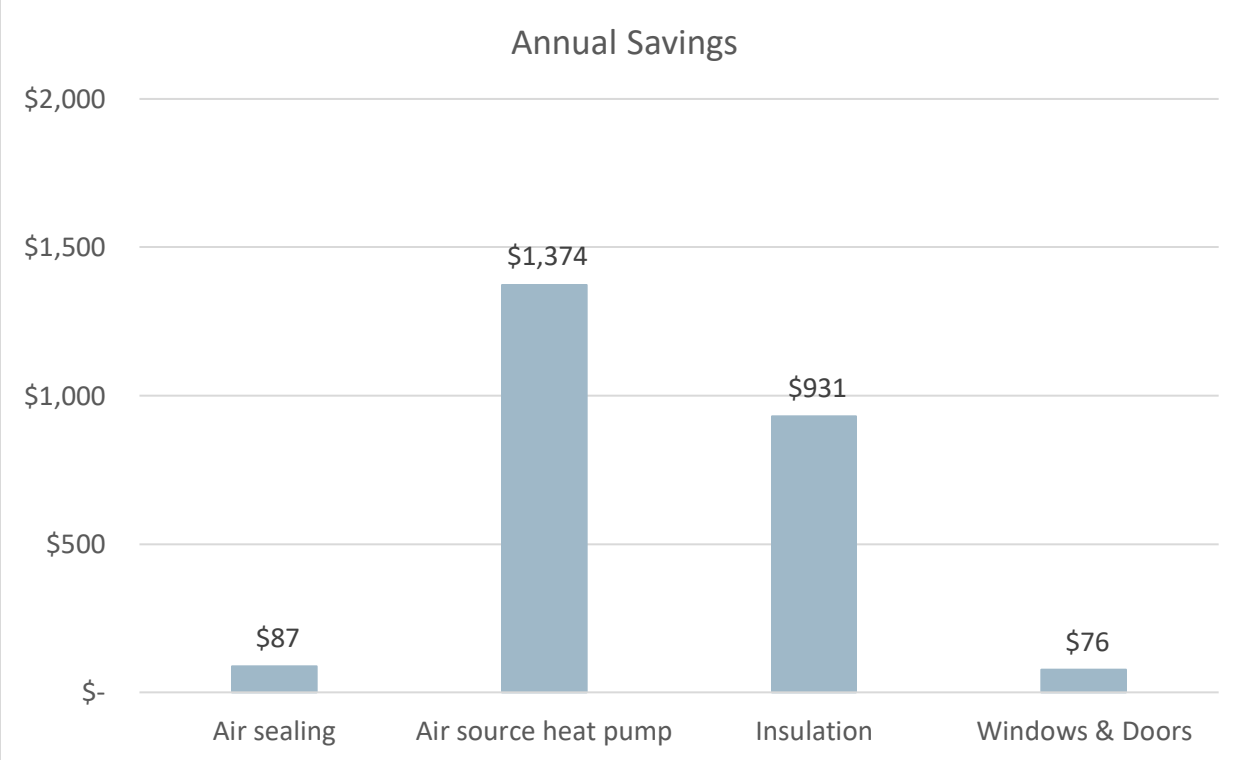
Single-wide mobile home with addition, built in the 1990s. These homes are usually heated by electric baseboards or electric furnaces (therefore, no fossil fuel conversion or GHG estimates are calculated). Generally poor levels of insulation in the attic and walls, and a poor air tightness rating. These homes are good candidates for air source heat pumps, insulation, and air sealing.

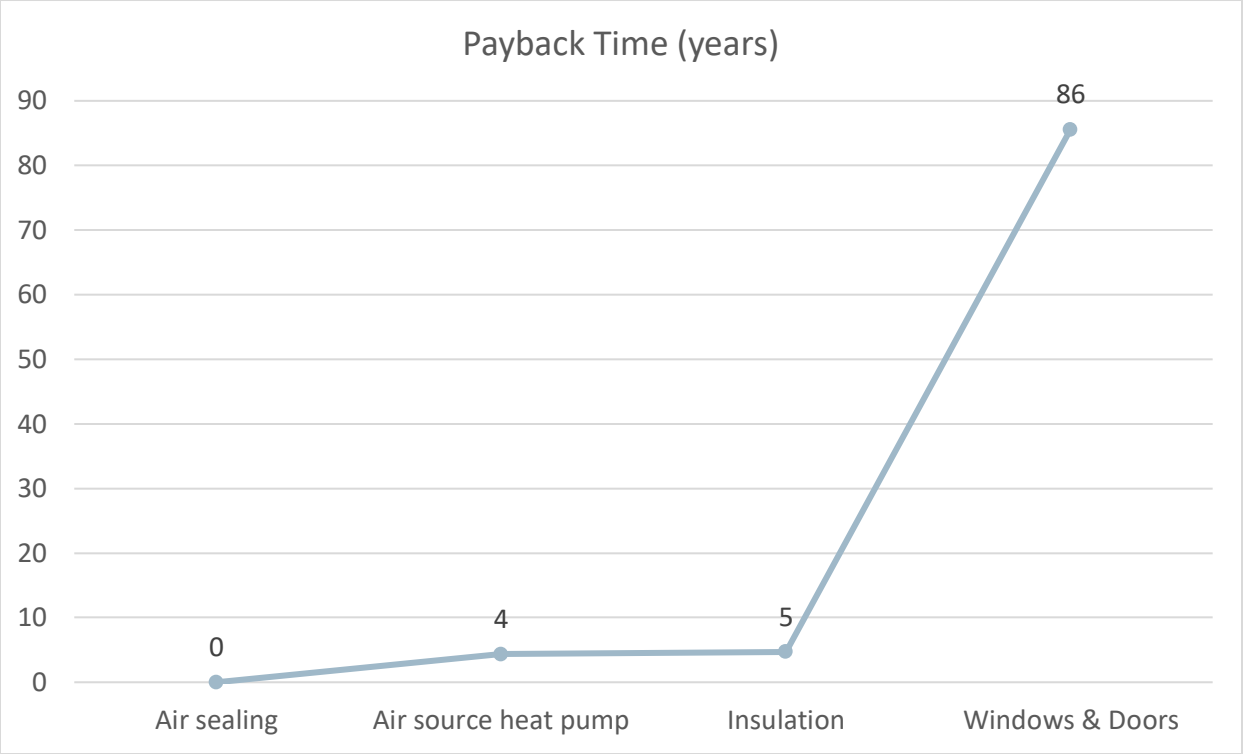
Average annual energy costs: $3,350 electric heated

Annual energy costs after upgrades: $1,650

Variable	**Archetype 8**
Vintage	1990s
Floor area (sf)	1,000
Ventilation type	Bathroom, range fans
Ceiling insulation (R)	12
Wall insulation (R)	12
Foundation insulation (R)	None
Windows	Double pane, vinyl
Doors	Steel, polystyrene core
Air Tightness (ACH50)	12.4
Energy consumption – electrically heated (GJ)	93


Cost After Rebates
$8,000
$6,000
$4,000
$2,000
$-
$6,000
$4,400
$6,500
Air sealing
Air source heat pump
Insulation
Windows & doors
Electric Home


Annual Savings
$2,000
$1,500
$1,000
$500
$-
$87
$1,374
$931
$76
Air sealing
Air source heat pump
Insulation
Windows & Doors


Payback Time (years)
90
80
70
60
50
40
30
20
10
0
0
4
5
86
Air sealing
Air source heat pump
Insulation
Windows & Doors

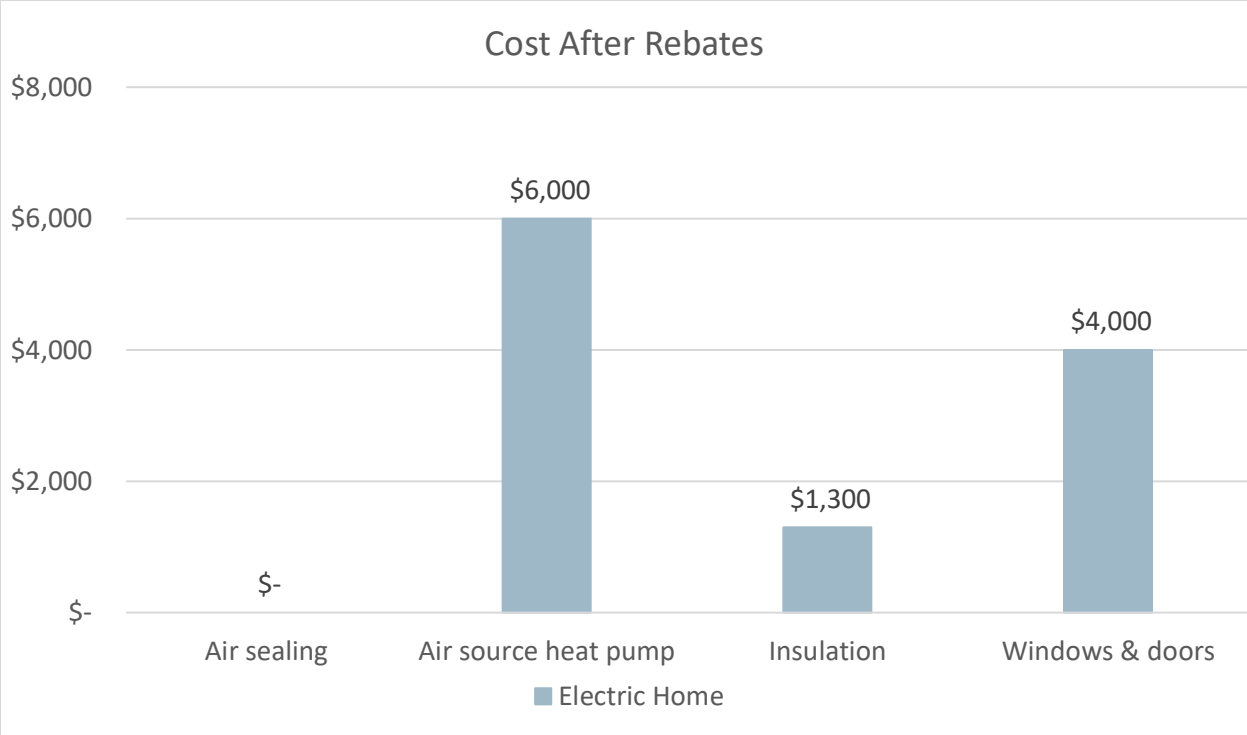
Archetype 9 – Rowhouse

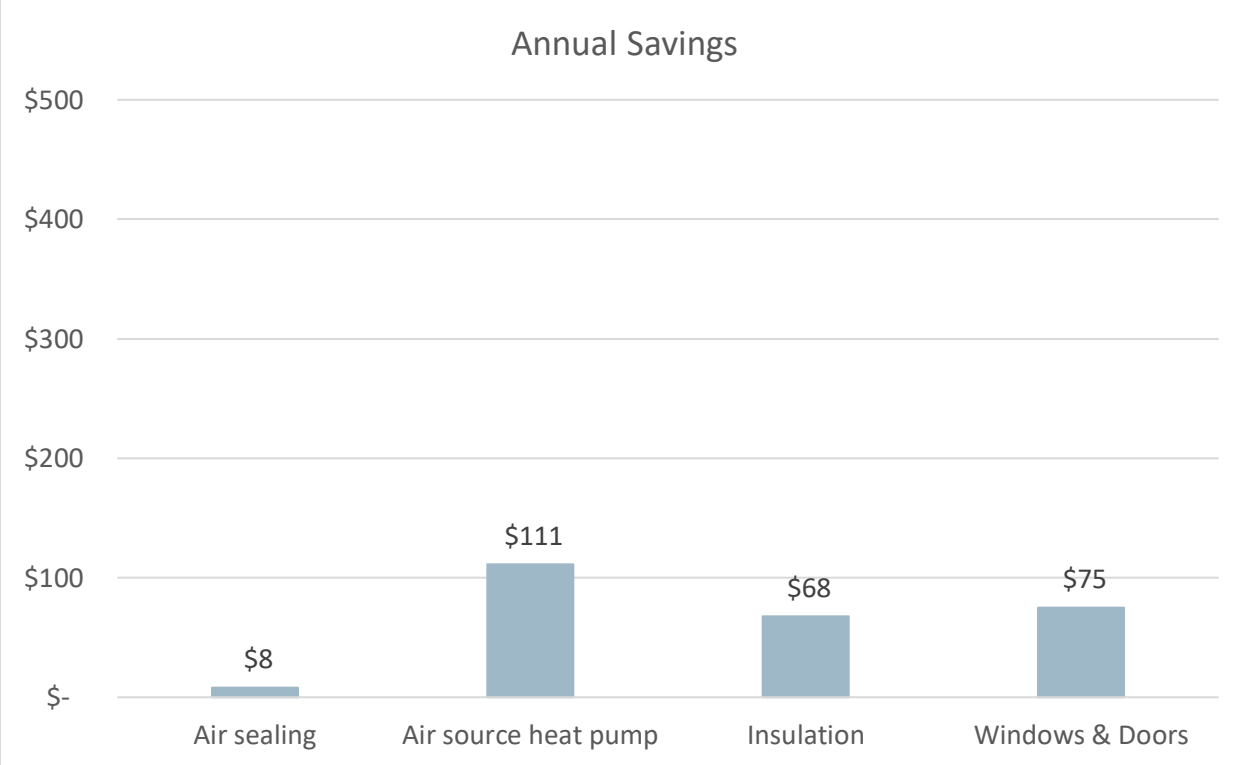
Small, 2-storey rowhouse (townhome) built between 1980 and 2000. These homes are usually heated by electric baseboards or electric furnaces (therefore, no fossil fuel conversion or GHG estimates are calculated). Generally good levels of insulation in the attic, walls and crawlspace, and a moderate air tightness rating. These homes can be prone to overheating, and are good candidates for air source heat pumps due to their ability to provide cooling in the summer and improve ventilation.

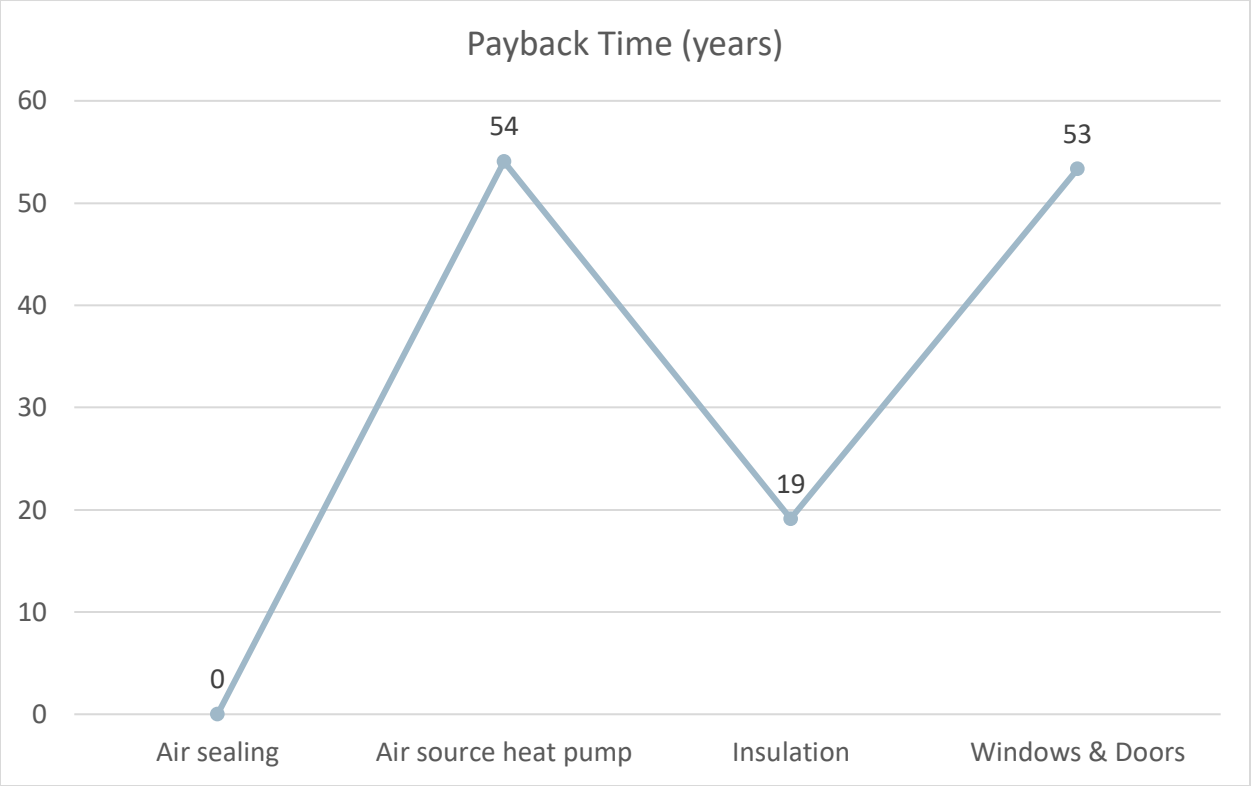
Average annual energy costs: $1,640 electric heated

Annual energy costs after upgrades: $1,480

Variable	**Archetype 9**
Vintage	1990s
Floor area (sf)	950
Ventilation type	Bathroom, range fans
Ceiling insulation (R)	40
Wall insulation (R)	20
Foundation insulation (R)	None
Windows	Double pane, vinyl
Doors	Steel, polystyrene core
Air Tightness (ACH50)	7.65
Energy consumption – electrically heated (GJ)	50


Cost After Rebates
$8,000
$6,000
$4,000
$2,000
$-
$-
$6,000
$1,300
$4,000
Air sealing
Air source heat pump
Insulation
Windows & doors
Electric Home


Annual Savings
$500
$400
$300
$200
$100
$-
$8
$111
$68
$75
Air sealing
Air source heat pump
Insulation
Windows & Doors

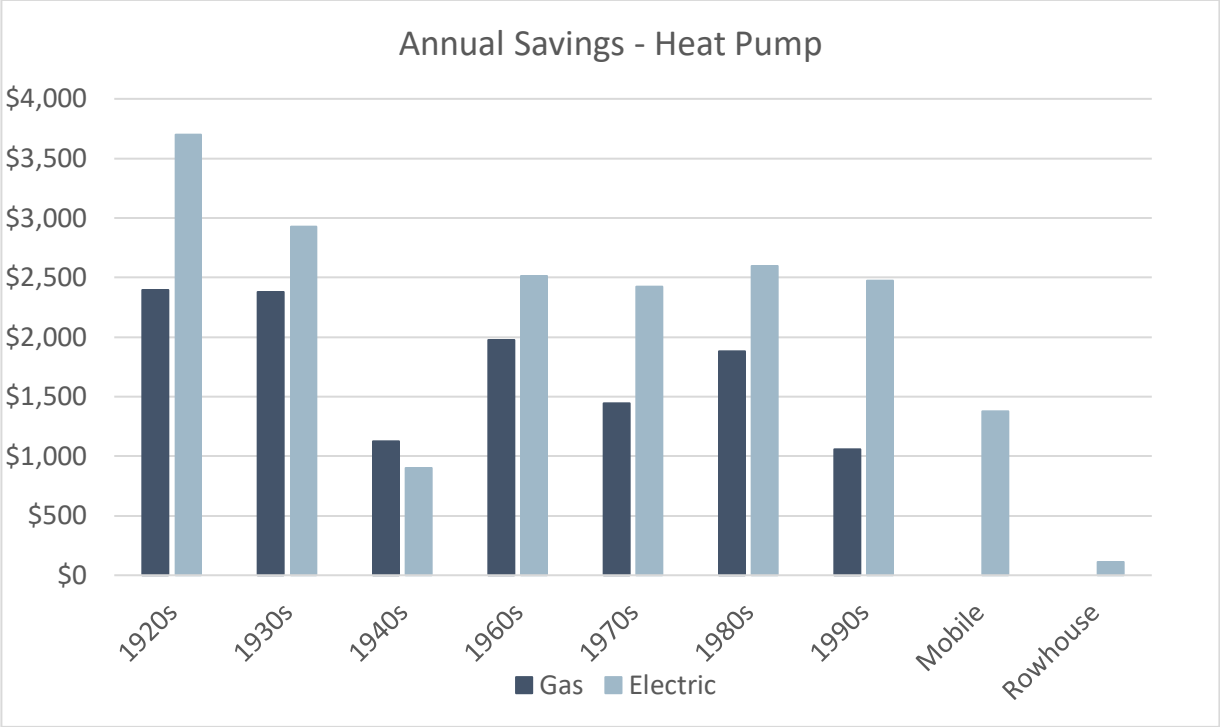

Payback Time (years)
60
50
40
30
20
10
0
54
53
19
0
Air sealing
Air source heat pump
Insulation
Windows & Doors

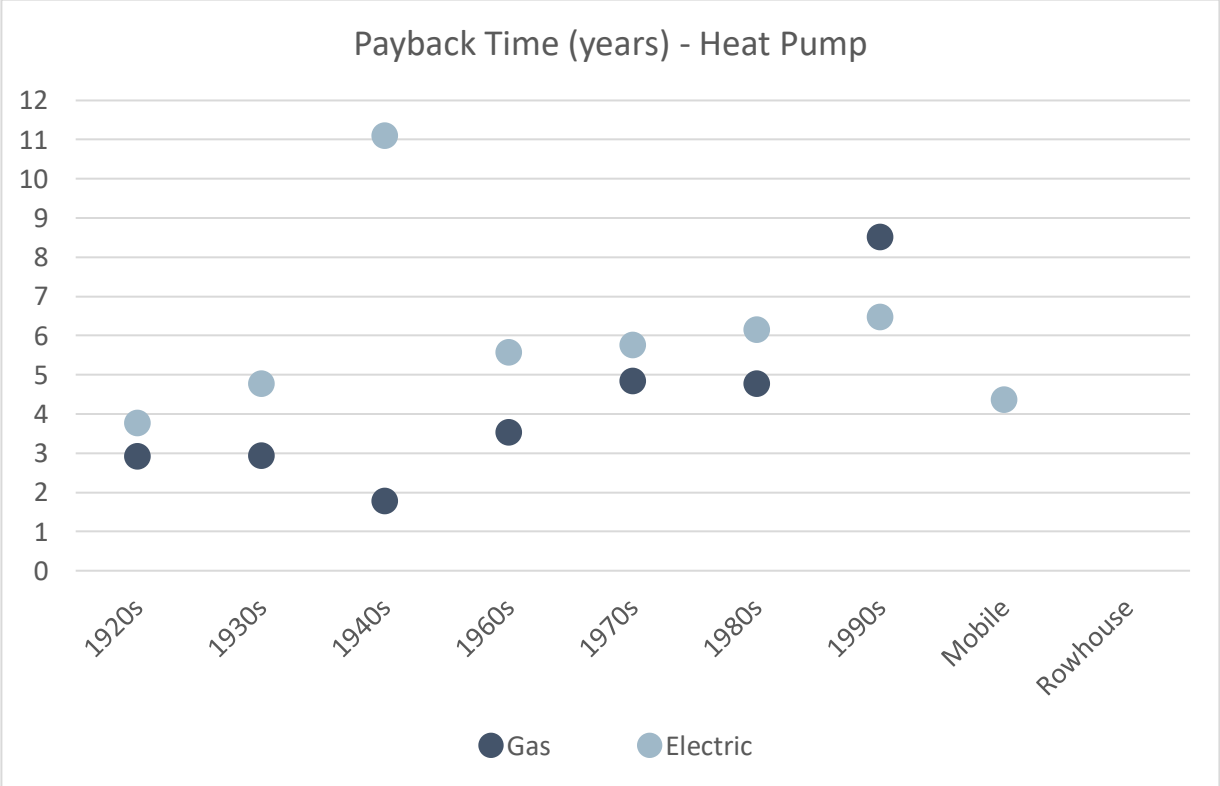
Archetype Upgrade Summaries

The following tables and figures provide a comparison of the opportunity provided by each major type of retrofit for the housing archetypes assessed as part of this study.

Heat Pump Upgrades

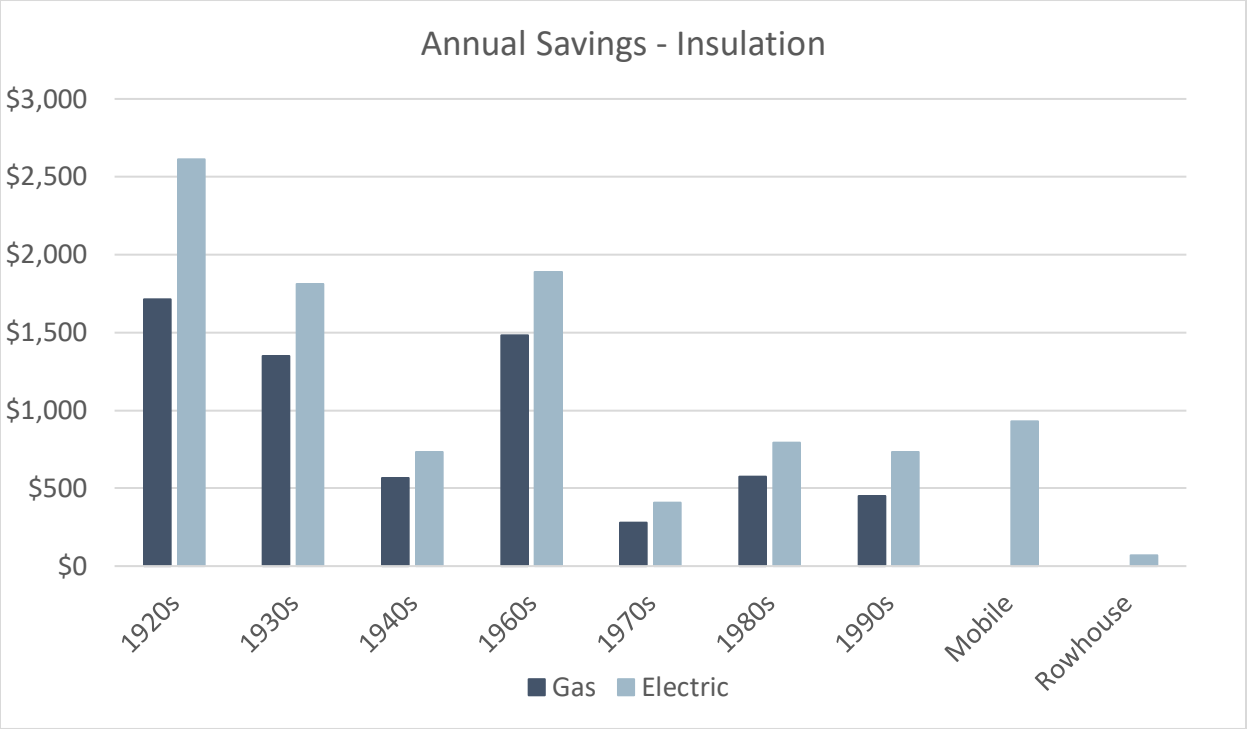
Vintage	Existing heating system	Payback time (years)	Annual savings
1920s	Gas	3	$2,393
1930s	Gas	3	$2,379
1940s	Gas	2	$1,124
1960s	Gas	4	$1,974
1970s	Gas	5	$1,445
1980s	Gas	5	$1,882
1990s	Gas	9	$1,056
1920s	Electric	4	$3,700
1930s	Electric	5	$2,929
1940s	Electric	11	$900
1960s	Electric	6	$2,510
1970s	Electric	6	$2,425
1980s	Electric	6	$2,594
1990s	Electric	6	$2,471
Mobile	Electric	4	$1,374
Rowhouse	Electric	54	$111

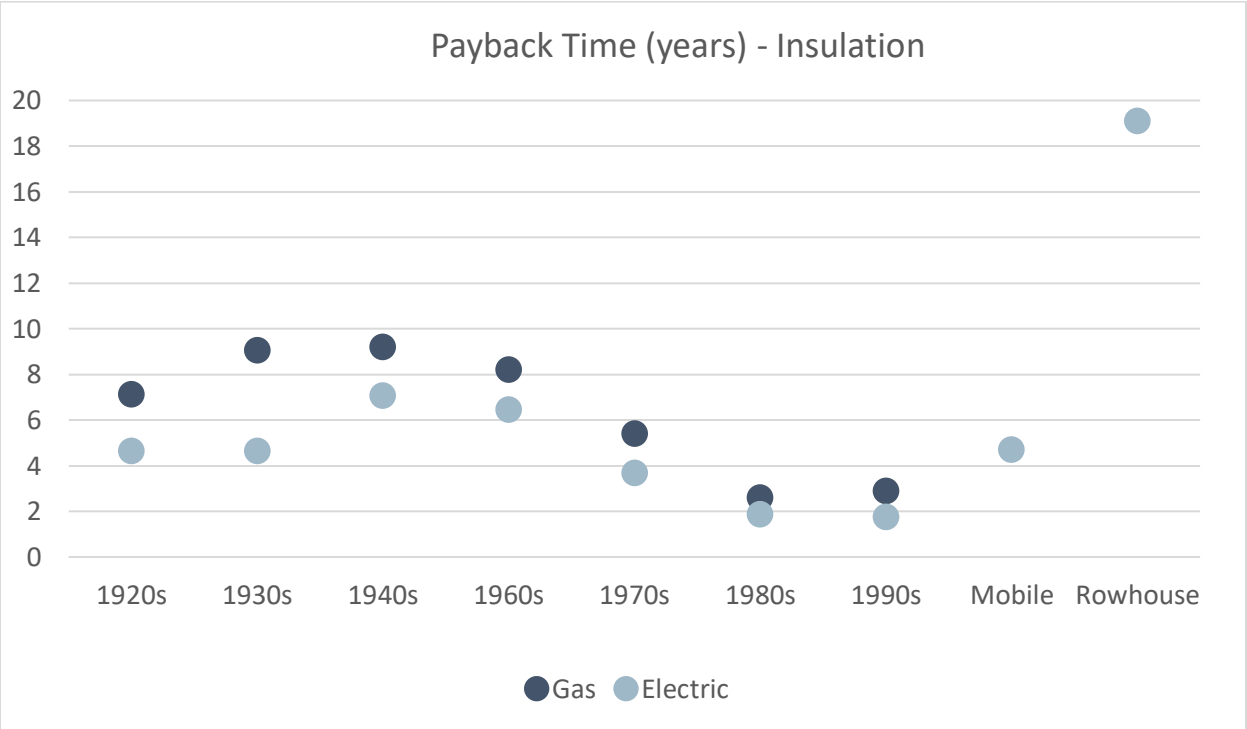

Annual Savings - Heat Pump
$4,000
$3,500
$3,000
$2,500
$2,000
$1,500
$1,000
$500
$0
1920s
1930s
1940s
1960s
1970s
1980s
1990s
Mobile
Rowhouse
Gas
Electric


Payback Time (years) - Heat Pump
12
11
10
9
8
7
6
5
4
3
2
1
0
1920s
1930s
1940s
1960s
1970s
1980s
1990s
Mobile
Rowhouse
Gas
Electric

Insulation upgrades

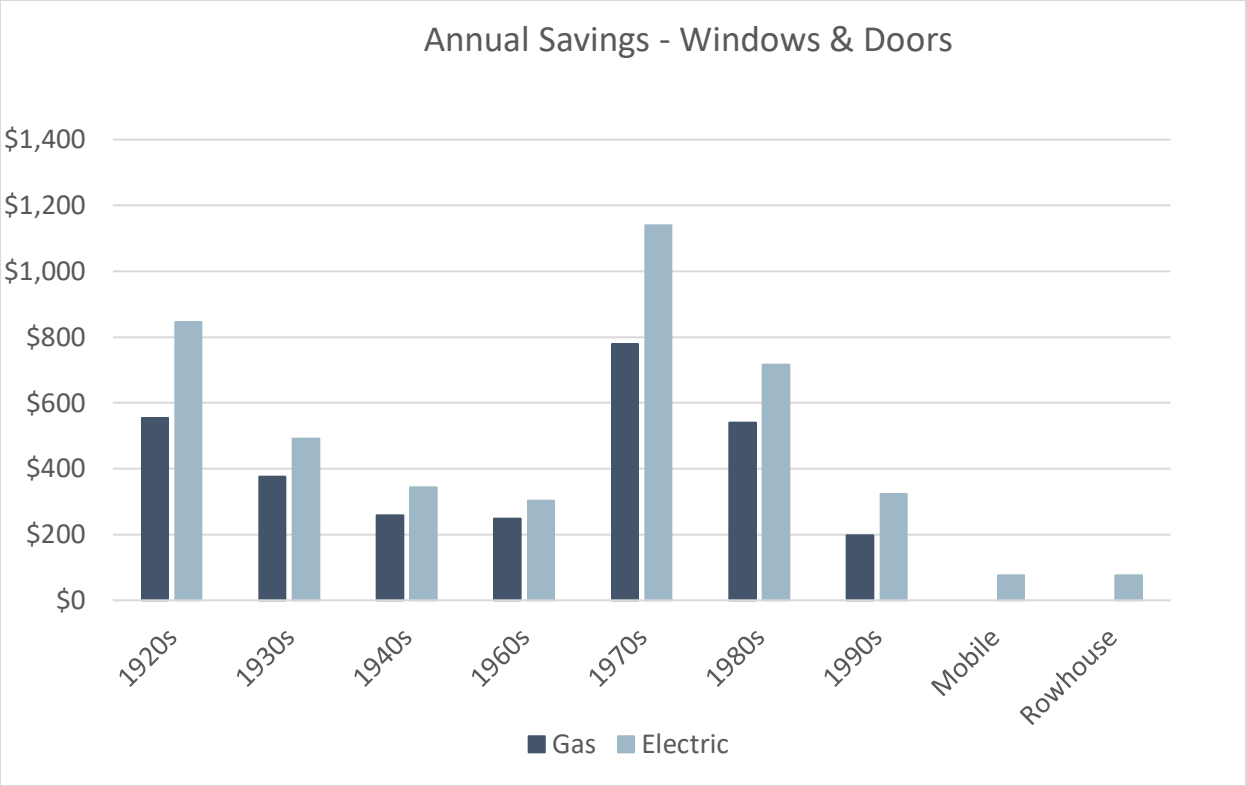
Vintage	Existing heating system	Payback time (years)	Annual savings
1920s	Gas	7	$1,711
1930s	Gas	9	$1,347
1940s	Gas	9	$565
1960s	Gas	8	$1,483
1970s	Gas	5	$277
1980s	Gas	3	$576
1990s	Gas	3	$449
1920s	Electric	5	$2,614
1930s	Electric	5	$1,810
1940s	Electric	7	$733
1960s	Electric	6	$1,887
1970s	Electric	4	$406
1980s	Electric	2	$791
1990s	Electric	2	$734
Mobile	Electric	5	$931
Rowhouse	Electric	19	$68

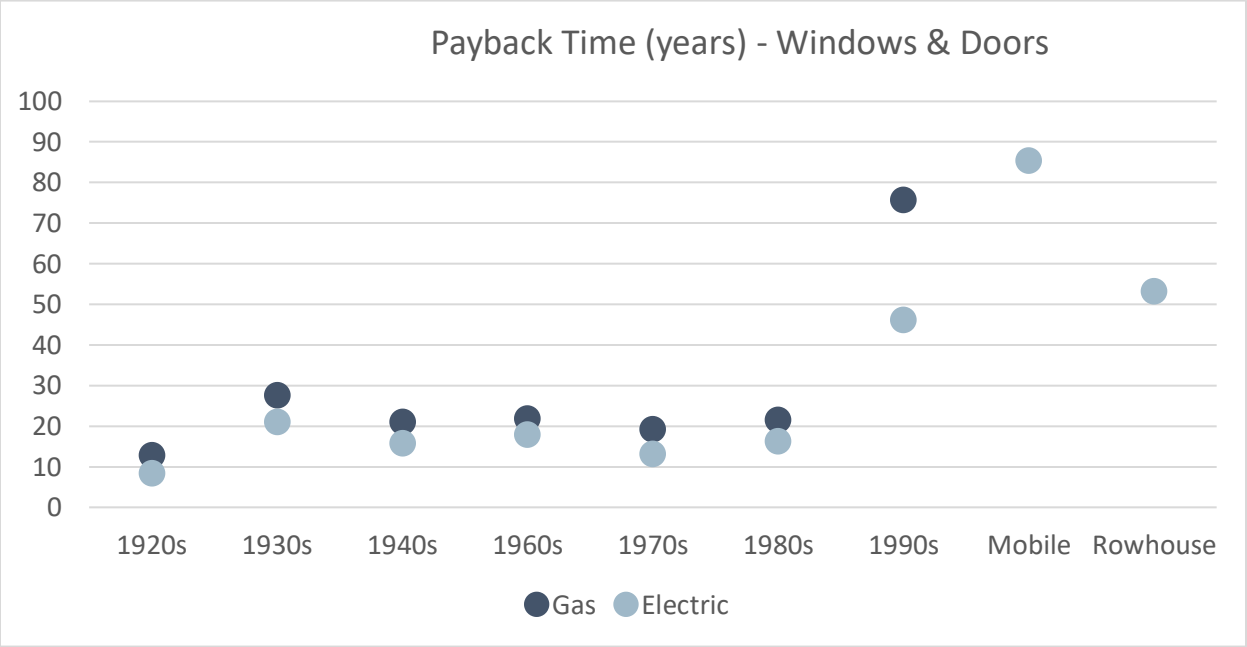

Annual Savings - Insulation
$3,000
$2,500
$2,000
$1,500
$1,000
$500
$0
1920s
1930s
1940s
1960s
1970s
1980s
1990s
Mobile
Rowhouse
Gas
Electric


Payback Time (years) - Insulation
20
18
16
14
12
10
8
6
4
2
0
1920s
1930s
1940s
1960s
1970s
1980s
1990s
Mobile
Rowhouse
Gas
Electric

Window and Door Upgrades

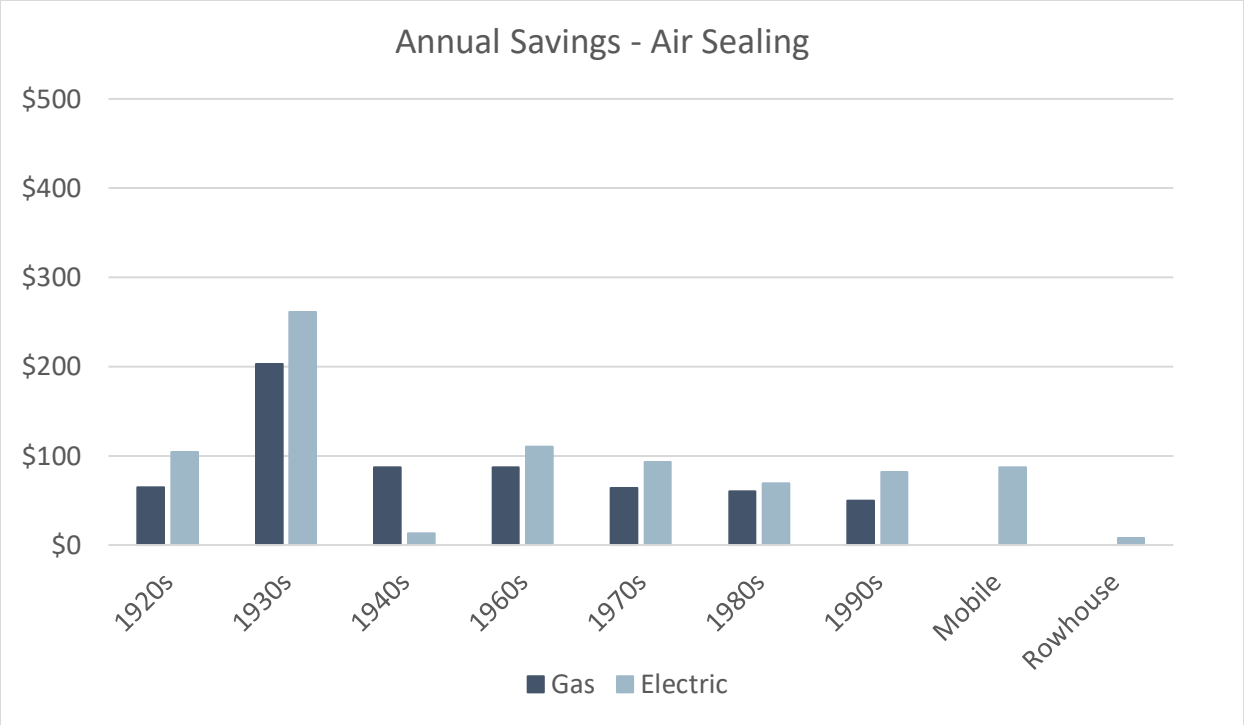
Vintage	Existing heating system	Payback Time	Annual Savings
1920s	Gas	13	$554
1930s	Gas	28	$376
1940s	Gas	21	$259
1960s	Gas	22	$249
1970s	Gas	19	$779
1980s	Gas	22	$540
1990s	Gas	76	$198
1920s	Electric	8	$846
1930s	Electric	21	$492
1940s	Electric	16	$344
1960s	Electric	18	$302
1970s	Electric	13	$1,140
1980s	Electric	16	$716
1990s	Electric	46	$324
Mobile	Electric	86	$76
Rowhouse	Electric	53	$75

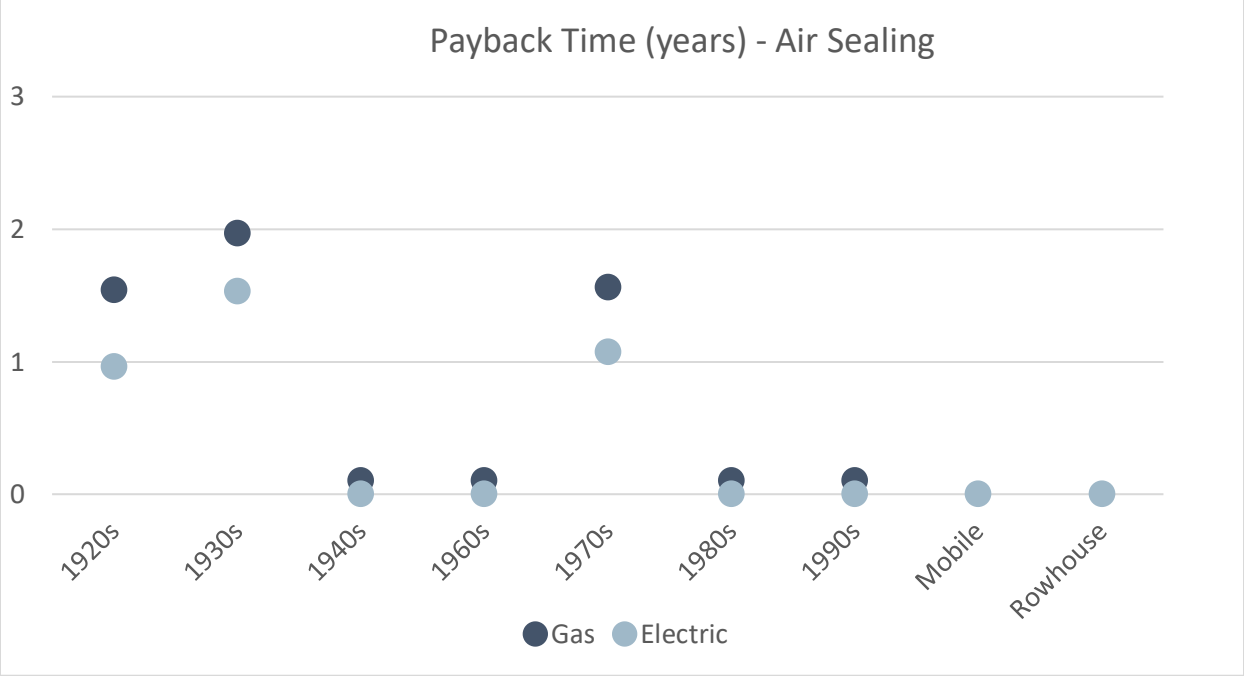

Annual Savings - Windows & Doors
$1,400
$1,200
$1,000
$800
$600
$400
$200
$0
1920s
1930s
1940s
1960s
1970s
1980s
1990s
Mobile
Rowhouse
Gas
Electric


Payback Time (years) - Windows & Doors
100
90
80
70
60
50
40
30
20
10
0
1920s
1930s
1940s
1960s
1970s
1980s
1990s
Mobile
Rowhouse
Gas
Electric

Air Sealing Upgrades

Vintage	Existing heating system	Payback Time – Air Sealing	Annual Savings – Air Sealing
1920s	Gas	2	$65
1930s	Gas	2	$203
1940s	Gas	0	$87
1960s	Gas	0	$87
1970s	Gas	2	$64
1980s	Gas	0	$60
1990s	Gas	0	$50
1920s	Electric	1	$104
1930s	Electric	2	$261
1940s	Electric	0	$13
1960s	Electric	0	$110
1970s	Electric	1	$93
1980s	Electric	0	$69
1990s	Electric	0	$82
Mobile	Electric	0	$87
Rowhouse	Electric	0	$8


Annual Savings - Air Sealing
$500
$400
$300
$200
$100
$0
1920s
1930s
1940s
1960s
1970s
1980s
1990s
Mobile
Rowhouse
Gas
Electric


Payback Time (years) - Air Sealing
3
2
1
0
1920s
1930s
1940s
1960s
1970s
1980s
1990s
Mobile
Rowhouse
Gas
Electric

Appendix B: Engagement list

BC Ministry of Energy, Mines and Low Carbon Innovation – Laura De Carolis, Senior Energy Efficiency Coordinator – Residential

CityGreen Solutions – Teresa Lawson, Acting Executive Director

City of Nelson, BC - Avi Silberstein

City of Prince Rupert:

- Corinne Bomben, Chief Financial Officer
- Myfannwy Pope, Planner
- Paul Vendittelli, Manager of Transportation and Economic Development
- Robert Buchan, City Manager/City Planner
- Gary Proksch, Building Inspector
- Sean Rowse, Building Inspector

CLEAResult (BC Income-Qualified Program delivery agent) – Peter Hunt, Program Manager

Community Energy Association - Tami Rothery, Senior Community Energy Manager

EmpowerMe - Yasmin Abraham

Frosty Refrigeration, the only local heat pump installer currently registered with CleanBC – Shannen Bosco

District of Saanich, BC - Maggie Baynham, Senior Sustainability Planner

Hecate Straight Employment Development Society – Danielle Dalton

Home Hardware – Brian Hunchuk, Owner/General Manager

J&J Construction – Hunter Logan, Owner

Kaien Anti Poverty Society – Colleen Hermanson, Executive Director

Lax Kw'alaams Band - Reginald Sampson, Director of Housing

North Coast Regional District – Daniel Fish, Chief Administrative Officer; Chantal Wentland, Planning/Economic Development Officer

Prince Rupert Chamber of Commerce – Roman Brochu, Executive Director

Prince Rupert Unemployed Action Centre - Paul Lagace, Coordinator/Poverty Law Advocate

Rupert Wood & Steel - Jordan Stromdahl, Construction Manager

Team Morse, RE/MAX Coast Mountains – Nikki Morse, Realtor

Thomson Energy Solutions – Stuart Thomson, Energy Advisor

Town of Bridgewater, NS - Leon de Vreede

Appendix C: Household Survey

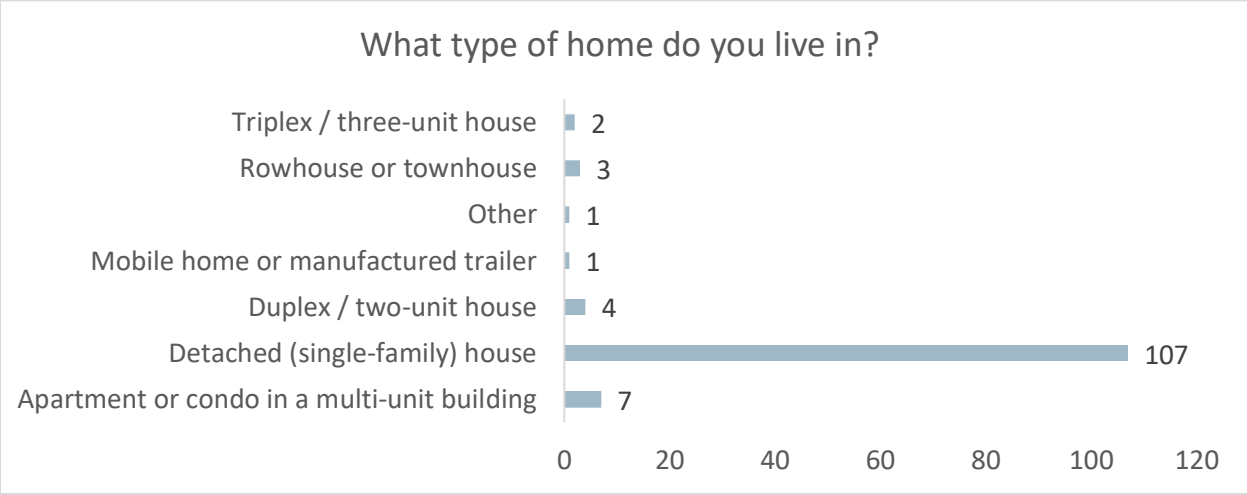
The survey questions and summaries of answers are provided below. Note question wording has been shortened in some cases to fit charts; for full wording please see alt text. There were 125 responses.

1. Do you live in the City of Prince Rupert?

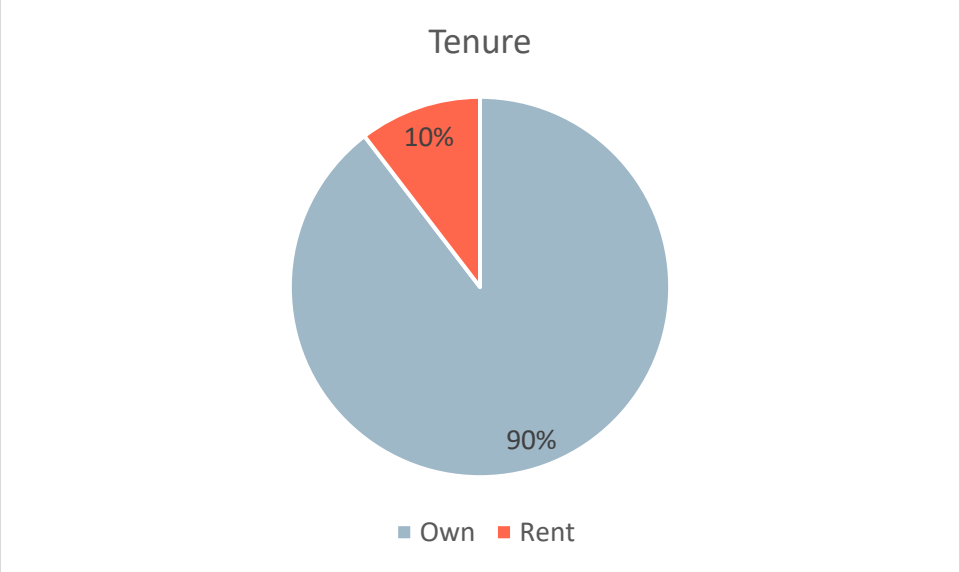
Yes: 124

No: 1 – This respondent lives in the region but outside municipal boundaries.

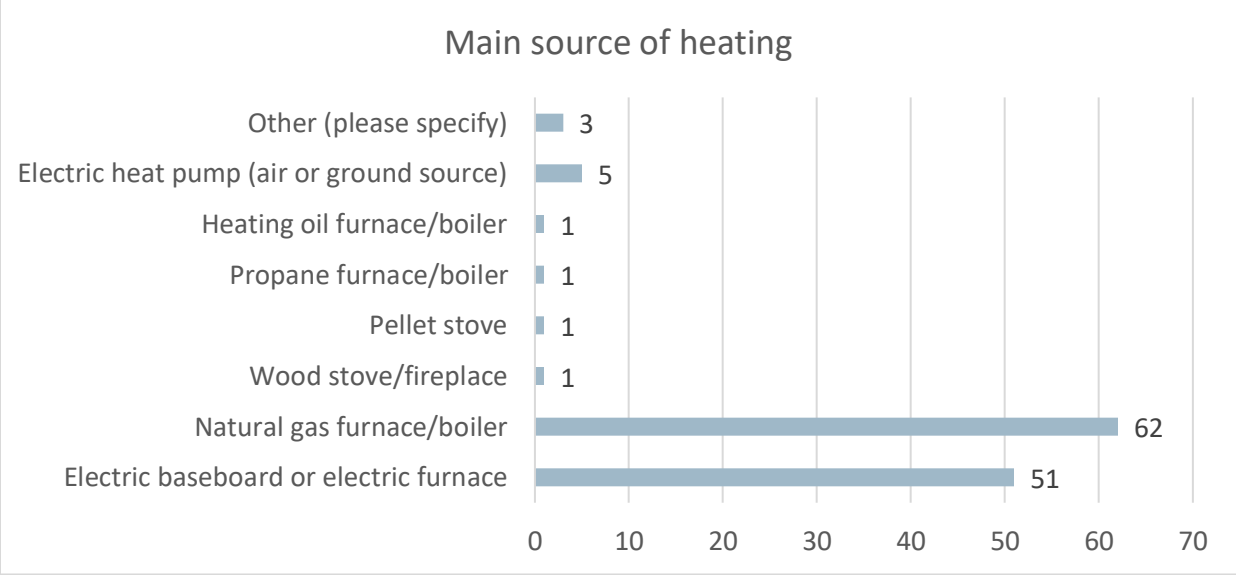
2. What type of home do you live in?



3. Do you rent or own this home?

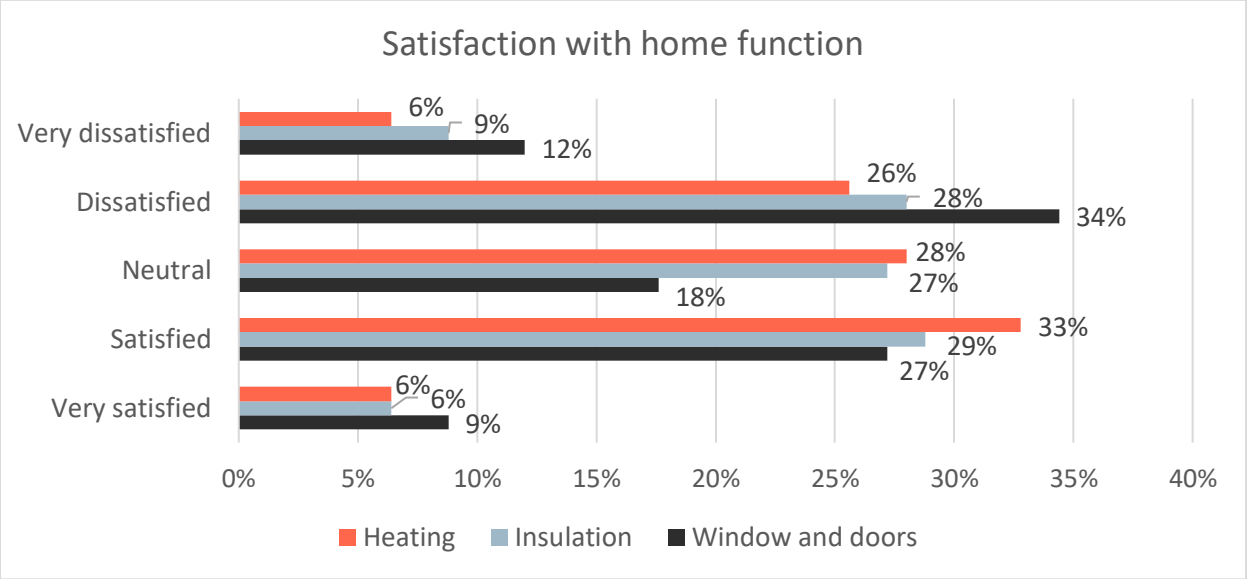


4. What is the main source of heating in your home?

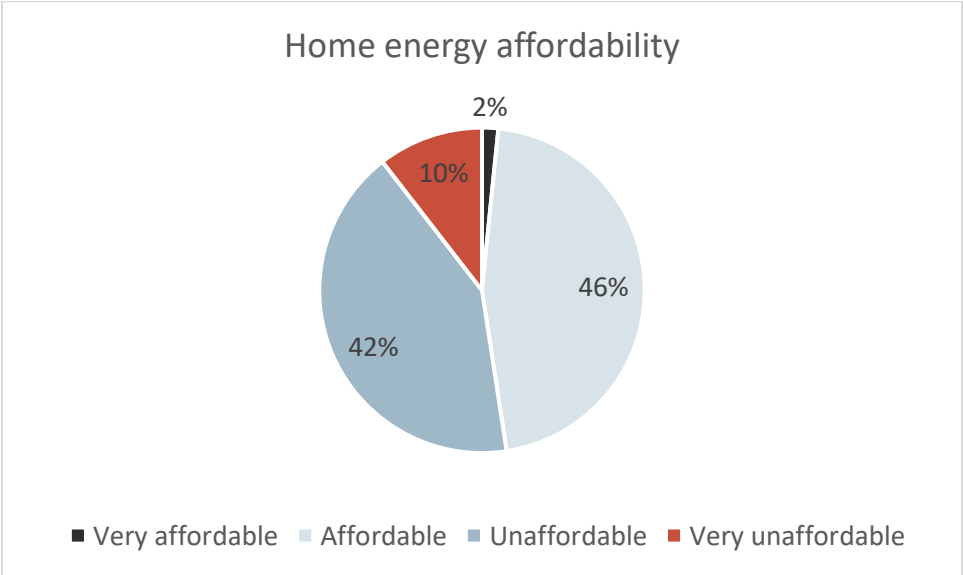


Others: Other natural gas systems (e.g., radiant heating or fireplace); electric wall fan heating

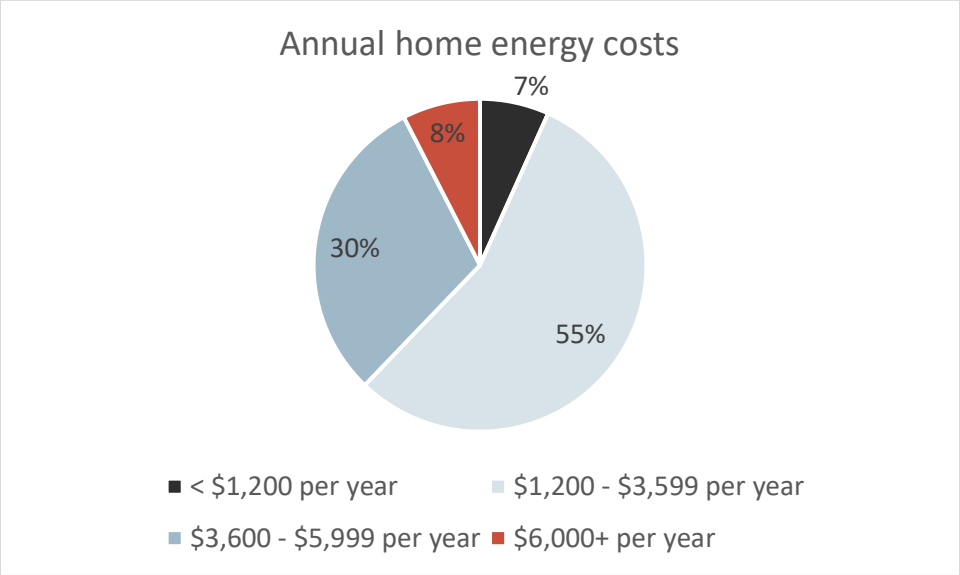
5. Overall, how satisfied are you with the function (warmth, air/water tightness, maintenance) of the following parts of your home?



6. Overall, how affordable have your household energy (electricity, heating, etc.) costs been to you in the past year?

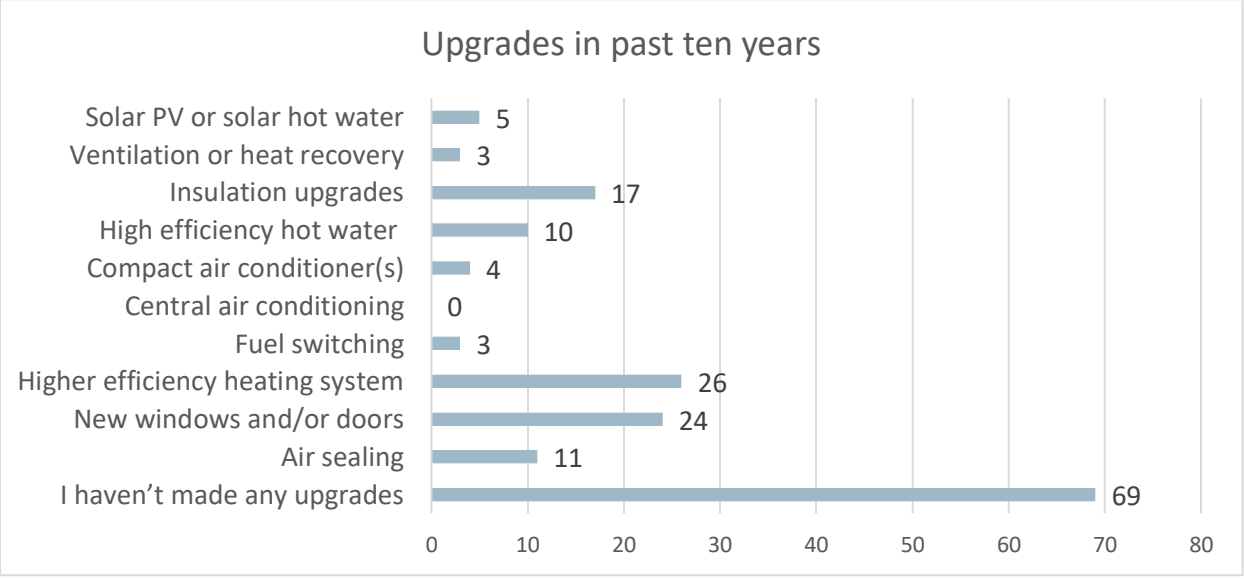


6. What is the average monthly cost of energy for your whole home (electricity, heat, hot water, etc. combined)?



7. Have you made any upgrades to your home's heating system or energy efficiency in the past 10 years?

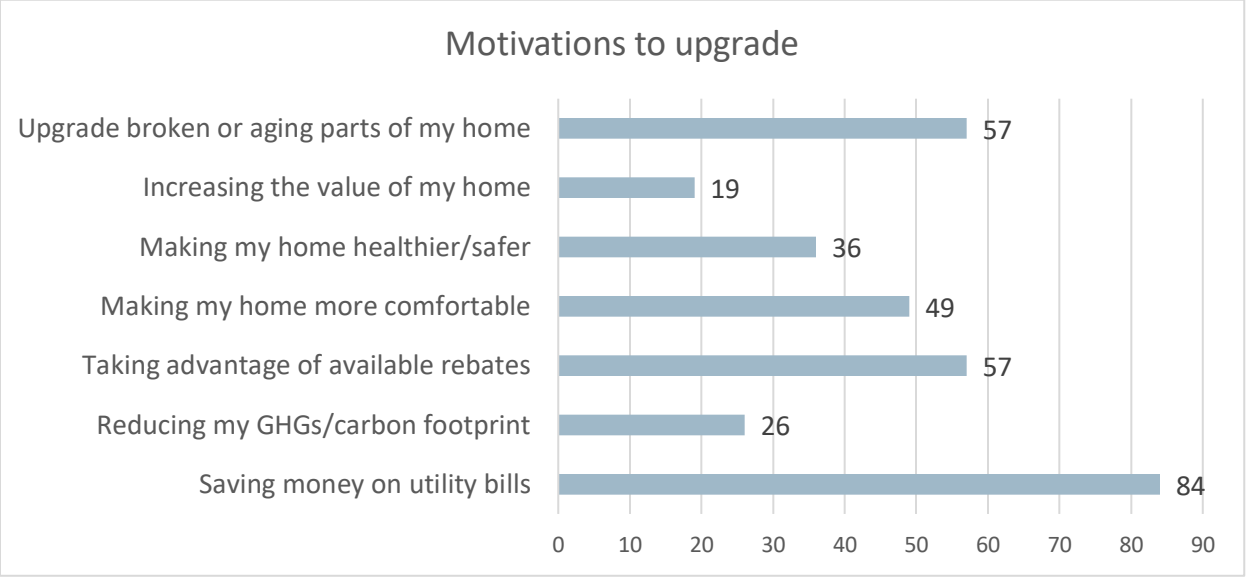
(select all that apply)



Other: Thermostat upgrades, basement flooring upgrades

8. What results would most motivate you to make your home more energy efficient - even if you're not currently able to?

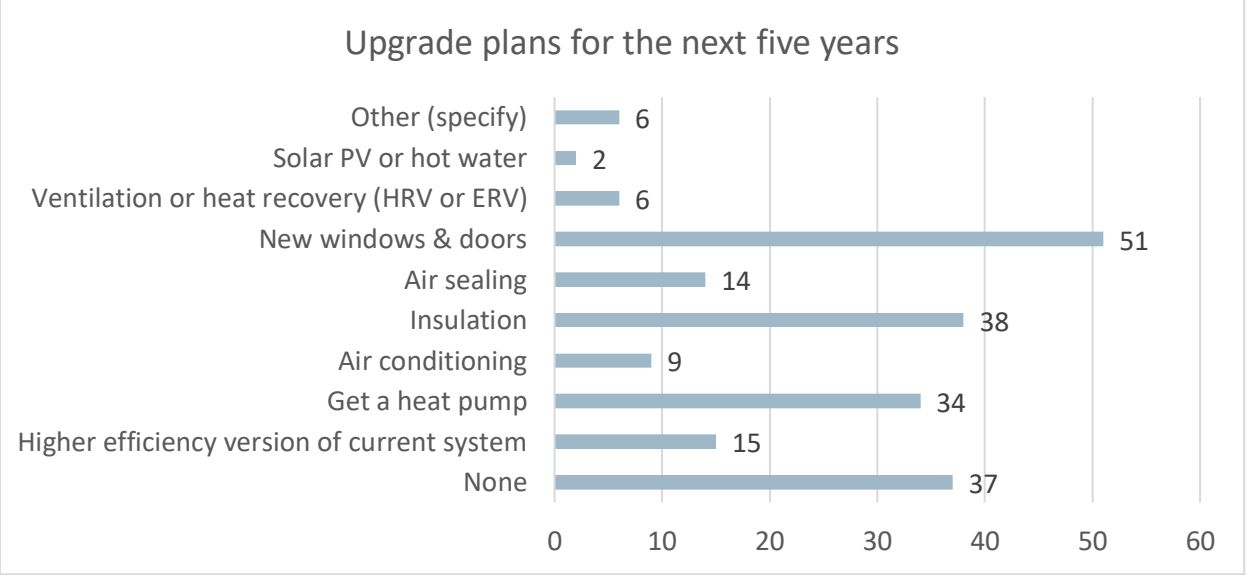
(Select those most motivating for you; maximum 3)



Other: More financial support, availability of contractors

9. Do you plan to make any of the following upgrades to your home in the next 5 years?

(check all that apply)

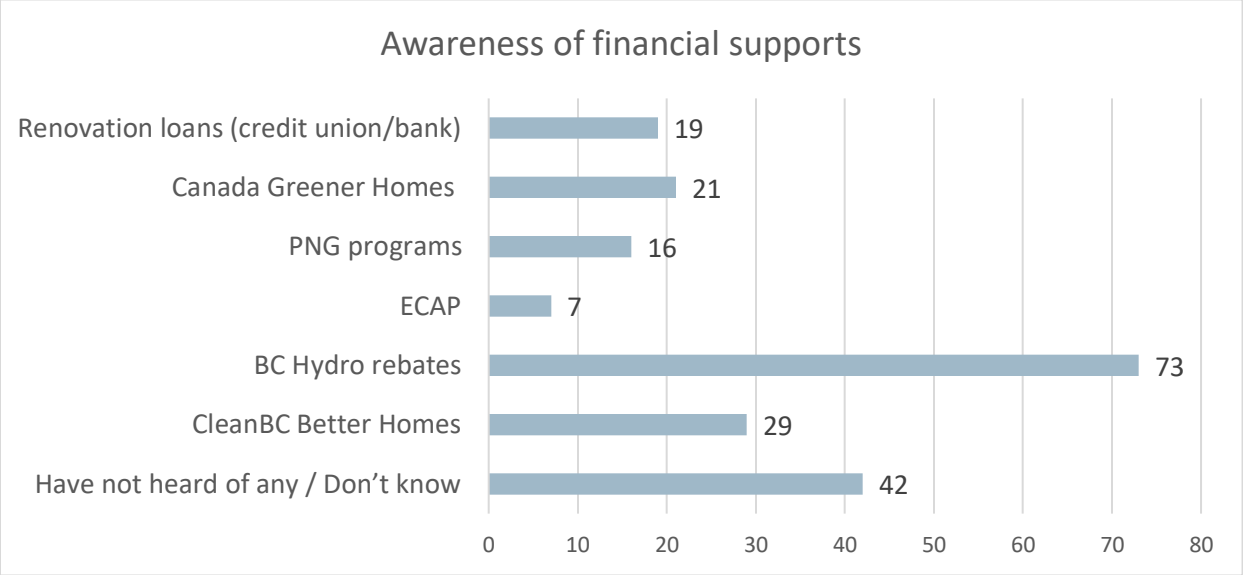


Other: Roof, siding

Of the 12 respondents looking to get a higher efficiency version of their current system (and who did not also indicate plans to get a heat pump), ten (83%, or 8% of all survey respondents) were currently using natural gas heating, while two were using electric heating.

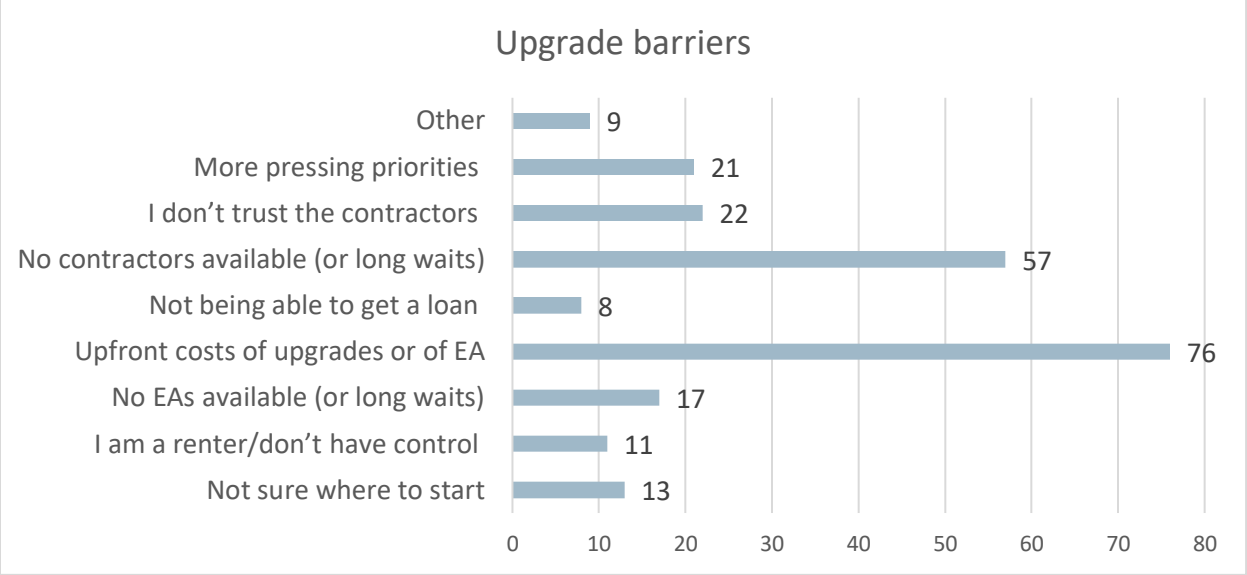
10. Have you heard of any of the following programs that offer financial support for home energy upgrades?

(check all that apply)



11. What is most likely to keep you from making home energy renovations?

(Select those most important for you; maximum 3)



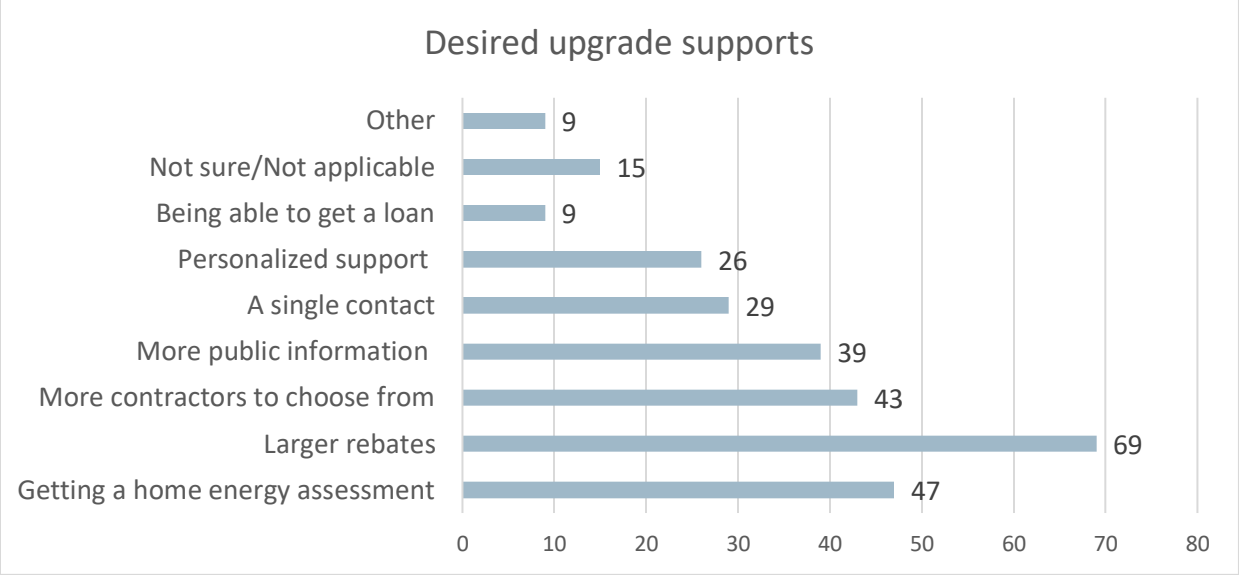
Other: Not being able to access grants if doing the work yourself; high interest rates; inflation; City taxing upgrades (property taxes); costs/affordability in general

12. Do you have any comments about barriers that make home energy renovations challenging?

(Written answers - integrated in report findings, not reproduced here to protect the privacy of respondents.)

13. What would help you to improve the energy efficiency of your home?

(Select those most important for you; maximum 3)

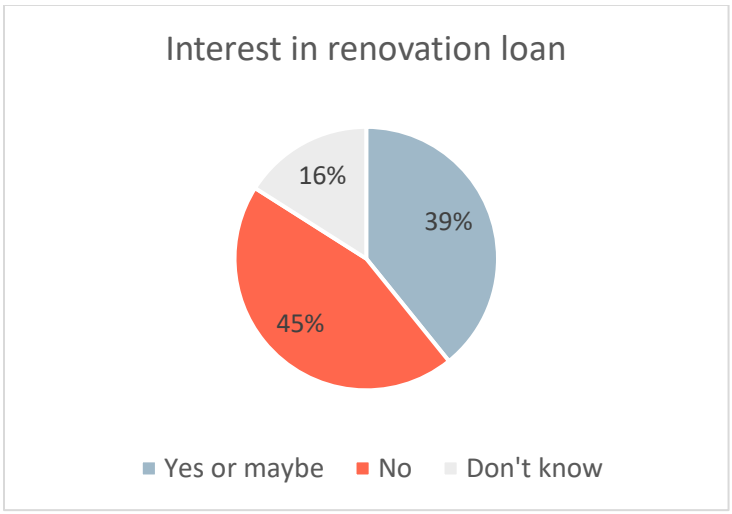


Other: Rebate access/eligibility; lower BC Hydro rates; lower cost of goods/shipping/gas; lower city taxes and utilities

14. Do you have any comments or ideas about possible supports to make upgrades easier?

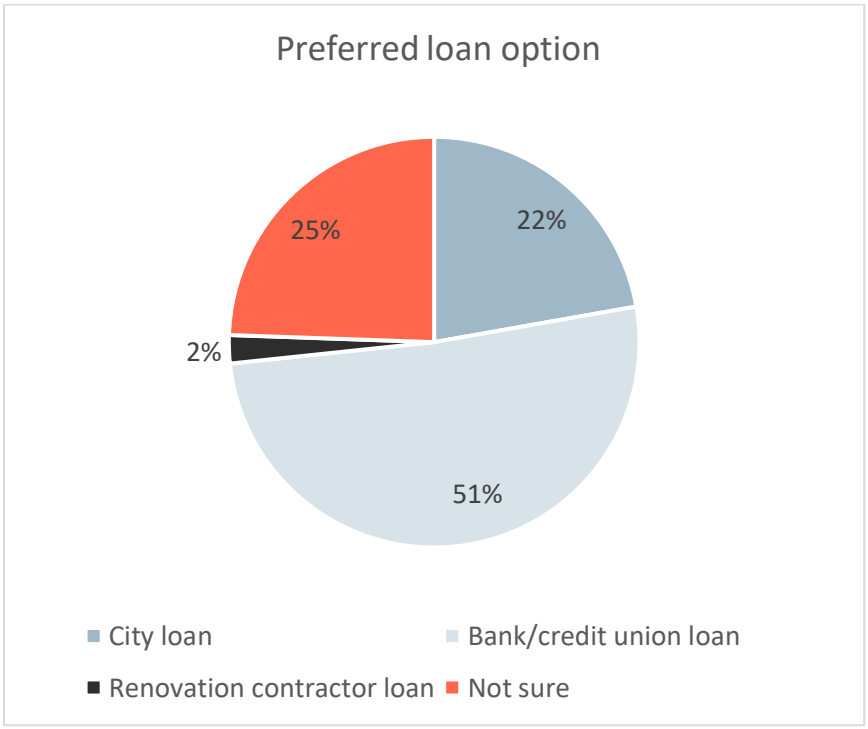
(Written answers - integrated in report findings, not reproduced here to protect the privacy of respondents.)

15. Would you take out a loan to finance a home energy renovation?



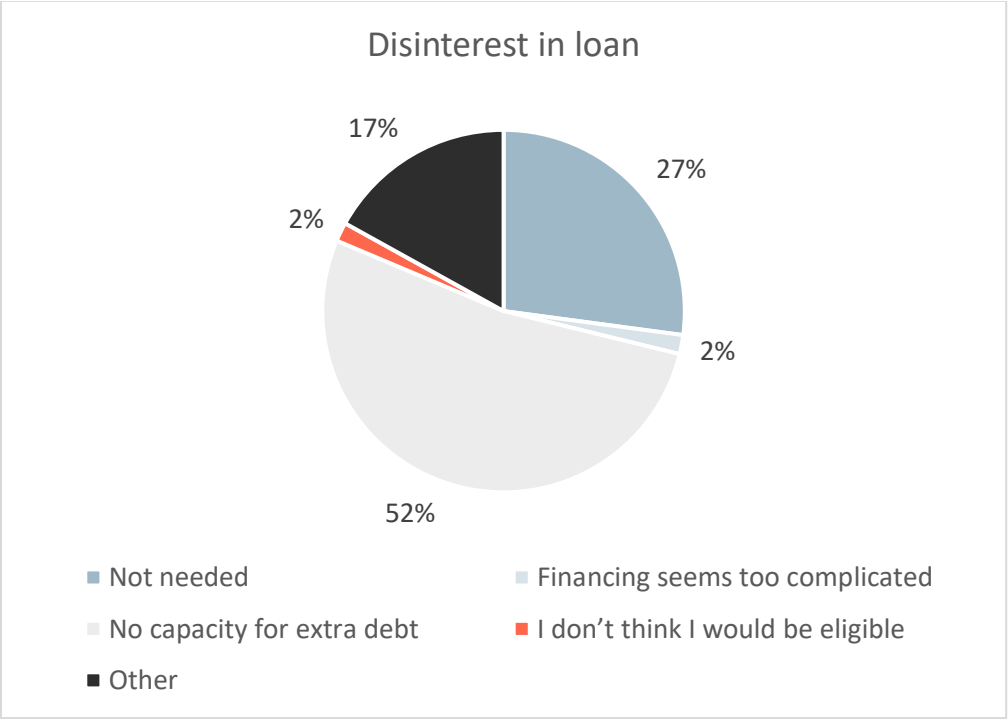
16. Which loan option would you prefer? (Note, not all currently exist)

(Shown only to respondents who answered Yes or Maybe to previous question.)



17. The reason you would not take out a loan is:

(Select all that apply.) *(Shown only to respondents who answered No to question 15.)*



Other: Being a senior or a renter, interest rates, preference for saving up

18. Please share if you have any final thoughts or comments before ending the survey.

(Written answers - integrated in report findings, not reproduced here to protect the privacy of respondents.)

Appendix D: Sources of Funding

Economic Development

PacifiCan Community Economic Development and Diversification funds economic development initiatives Governments, non-profits and other public/publicly funded organizations can apply on ongoing basis through local PacifiCan offices.

The Northern Development Initiative Trust's Economic Development Capacity Building program funds local government economic development planning and implementation, including sector development, business expansion, and economic development staff wages. Funding is up to $50,000 each calendar year, with an annual intake Nov. 1 through Mar. 31.

The Rural Economic Diversification and Infrastructure Program (REDIP) supports rural economic development projects, and opened a new intake on July 4th, 2023. Its Economic Diversification stream could may be applicable, funding projects that promote economic diversification and development, in small rural communities with populations of less than 25,000, and in Indigenous communities and organizations. It covers up to 80% of project costs up to a maximum of $100,000 for development projects, or $1 Million for implementation projects.

Energy Efficiency

The Local Government Climate Action Program (LGCAP) is offered by the government of British Columbia to support local governments that are signatories to the B.C. Climate Action Charter and Modern Treaty Nations in their efforts to reduce emissions and adapt to the impacts of climate change. LGCAP provides funding to plan and implement climate action initiatives that create clean economy opportunities, meet urban and rural needs, enable robust reporting, and foster knowledge sharing across the province.

BC Hydro's Sustainable Communities program funds "a wide range of projects and programs to support action on reducing greenhouse gas emissions." Unfortunately, Prince Rupert does not currently meet the minimum population threshold of 20,000.

Energy Efficiency in MURBs and affordable housing

BC Hydro's Social Housing Retrofit Support Program is available at the building level for those with BC Housing operating agreements. Funding available includes rebates, energy study funding up to $5,000, and implementation support funding up to $7,000.

Funding of up to $100,000 is available from BC Housing to cover gaps between rebates and total cost, and complete additional small-scale retrofits such as light fixtures and boilers.

The Federation of Canadian Municipalities also offers retrofit funding/financing via its Sustainable Affordable Housing Capital Projects stream. Financing (a combination of a grant and loan) is available for up to 80% of total eligible project costs up to a combined maximum of $10 million. Grants are available for 25–50% of total financing, and grant and loan proportions are based on anticipated energy performance (e.g., a 35% energy reduction would result in a 35% grant).

The Canada Mortgage and Housing Corporation (CMHC)'s National Housing Co-Investment Fund offers long term, low-interest loans to help revitalize affordable housing, including environmental and accessibility repairs.

The CMHC Preservation Funding for community housing can be used to fund energy audits and the Residential Rehabilitation Assistance Program (RRAP) can be used to fund major health and safety repairs in on-reserve housing if safety issues need to be addressed prior to retrofitting.

The newly launched Canada Greener Affordable Housing program helps affordable housing providers complete deep energy retrofits on existing multi-unit residential buildings. It offers pre-retrofit funding for activities like energy audits, energy modelling studies and building condition assessment reports, and retrofit funding for deep energy retrofits that will reduce rental buildings energy consumption and greenhouse gas emissions.

For Indigenous organizations/communities

The CleanBC Indigenous Community Heat Pump Incentive supports Indigenous communities wanting to take advantage of the CleanBC Indigenous Community Heat Pump Incentive and related energy efficiency offers. Up to $12,000 for residential homes OR up to $200,000 is available for community buildings installing heat pumps.

The Indigenous Communities Conservation Program offers free energy-saving products, as well as training and salary support to hire community members for product installation.

Wah-ila-toos (Clean Energy in Indigenous, rural and remote communities) funds capacity building projects (among others) on an ongoing basis until 2027.

The CMHC Housing Internship for Indigenous Youth program offers wage subsidies to Indigenous organizations/employers internships to address housing needs, including renovation and trades apprenticeships.

The Skills and Partnership Fund for skills development and training-to-employment for Indigenous people is currently closed.

For Businesses

The prime resource for retrofit contractors in BC is the Home Performance Contractor Network (HPCN). Registering with the HPCN allows contractors to offer rebate-eligible work and benefit from free or subsidized trainings as well as networking and other resources.

Businesses can receive $5,000 via Careerlauncher to hire a first-year apprentice ($10,000 if the apprentice is equity-deserving) in one of 39 Red Seal construction or manufacturing trades, until Mar. 31, 2024.

For Individuals

Home energy efficiency upgrades

CleanBC Better Homes (provincial):

- Home Renovation Rebate Program
- Northern top-up offer applies
- Income-Qualified Program
- Low-Interest Financing Program (cannot be combined with BC rebates)

Canada Greener Homes Initiative (federal):

- Canada Greener Homes Grant
- Canada Greener Homes Loan
- Oil to Heat Pump Affordability Program (income-qualified)

Nisga'a Urban Housing Renovation Grant (for Nisga’a citizens)

Other:

- The CMHC Eco Plus Program insurance premium refund on CMHC home insurance
- The Sagen Energy Efficient Housing Program mortgage insurance refund

- Federal and Provincial GST/HST New Housing Rebate

Skills training and education

Funding is available for individuals interested in training and education to join the home energy improvement industry, or to gain additional energy efficiency knowledge.

BC Centre for Women in the Trades (BCCWITT) offers a variety of trades training and employment supports for female-identifying individuals.

The Skilled Trades Employment Program (STEP) provides support for individuals looking to working in construction.

For Indigenous individuals: Tribal Resources Investment Corporation (TRICORP) provides general employment skills, and Nisga'a Employment, Skills & Training (NEST) provides supports for Nisga'a citizens.

Further information can be found on https://skilledtradesbc.ca/

ecotrust canada

Vancouver Office

225 West 8th Avenue, Suite #300
Vancouver, BC V5Y 1N3

Prince Rupert Office

425-309 2nd Avenue West
Prince Rupert, BC V8J 3T1

ecotrust.ca