Nanaimo Region Deep Energy Retrofits

Feasibility Study | March 2024

Prepared for:

CITY OF NANAIMO
THE HARBOUR CITY

The City of Nanaimo

Submitted to:

City of Nanaimo

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Executive Summary

The Regional District of Nanaimo (RDN) and its members - including the City of Nanaimo – are considering a local retrofit financing program to help accelerate low-carbon home retrofits in support of local energy and emission reduction goals. The purpose of this study was to assess the context, feasibility and potential impacts of a local initiative. Project approach included the development of a community energy and emissions inventory (CEEI) for low-rise housing, representative residential archetypes and retrofit packages, engagement with local community organizations and industry partners to identify barriers and opportunities, and a feasibility and impact analysis to evaluate financing options.

The Community Energy and Emissions Inventory and housing characterization reveal significant opportunities for energy and GHG reductions from heating electrification and energy efficiency retrofits in the region's low-density (Part 9) residential sector. Total estimated emissions across the entire RDN from low-density homes were 101,668 tCO_2e, concentrated mostly in small (40,545 tCO_2e, 40% of emissions) and medium (34,560 tCO_2e, 34% of emissions) SFDs and duplexes (9,634 tCO_2e, 9.5% of emissions). One-third (33%) of homes are reliant on carbon-intensive fossil fuels for primary space heating and they are responsible for 82% of GHG emissions from low-density homes in the RDN. Most (65%) homes were built >30 years ago to no or significantly less efficient building/energy codes.

The "technical reduction potential" (what could theoretically be achieved) from space heating retrofits to low-density homes in the study region is estimated between 62% (62,542 tCO_2e, heat pump only retrofits) to 63% (63,845 tCO_2e, heat pump + insulation retrofits) of calculated low-density residential GHG emissions. These reductions would contribute 44% - 45% of residential emission reductions needed to achieve the RDN's target of 80% reductions from the built environment by 2050 from a 2007 baseline (specific to total residential building emissions). In the City, reductions could be around 63% (37,422 tCO_2e, heat pump-only retrofits) to 64% (38,182 tCO_2e, heat pump + insulation retrofits). This could contribute 67% - 68% of reductions needed to achieve 50% GHG reductions of the residential building sector by 2030 in the City and 33 – 34% of the reductions needed to achieve 100% reductions by 2050 (both against a 2010 baseline).

Targeted engagement with homeowners, industry and local community organizations confirms favourable local context and conditions for a well-designed financing program. Local households and industry also appear ready to act. Strong uptake of an RDN-wide pilot energy concierge service, the Home Energy Navigator (HEN), indicates household interest in retrofits and a need for associated supports. There is adequate capacity in the local retrofit workforce to support anticipated program demand and the region has experienced significant growth in heat pump contractors and energy advisors in recent years. The HEN would be perfectly positioned to support households and local industry in a future financing program and is considered a critical success factor for program feasibility, uptake and impact.

Financial barriers and risks are top of mind for surveyed households, community and industry organizations. Residents and community groups cited household debt, a lack of available cash, and other financial priorities as important barriers, while community and industry organizations emphasized the need to improve financial literacy to reduce risks of participating in a financing program. Community organizations emphasized the need to

reduce participant risk of unrealized energy and bill savings and high-pressure contractor sales tactics via a mindful lending approach with strong participant safeguards.

A local financing program could drive local energy and emissions reductions and complement GHG policies and regulations while proactively addressing rising fossil fuel energy costs. The potential uptake and impact of a local financing program was estimated for the study region and City of Nanaimo across a selection of 10 key retrofit packages targeted at the largest and/or most carbon-intensive segments of existing low-density homes. Anticipated energy reductions are primarily achieved through solar PV retrofits, which increase local climate resilience and reduce peak demand, and retrofits to homes using inefficient electric resistance heating. Conversely, GHG reductions are driven by retrofits to oil and natural gas heated homes. Over the five-year program period modeled for this analysis, a local financing program could reach between ~540 – 1,570 households in the study region and drive annual GHG emission reductions of between 240 - 670 tCO_2e. Cumulative reductions over five years are estimated to be between 1,210 – 3,335 tCO_2e and between 6,660 – 18,650 tCO_2e over 20-year retrofit lifespans. These reductions could help the RDN achieve 0.5% of its target (specific to residential building emissions) to reduce annual GHG emissions from the built environment by 80% by 2050.

At the same time, a local program could enable more equitable access to healthy, comfortable and energy efficient homes and help overcome retrofit barriers and reduce risks of participation. The program could offer accessible and low-cost financing for energy upgrades, strength energy and financial literacy in the community, and reduce risk for vulnerable households faced with high pressure contractor sales tactics combined with outsourced contractor financing. This can be achieved through customized energy concierge services, risk mitigation measures (e.g., contractor vetting, consumer protection measures), simplified underwriting criteria, and collaboration with local community groups who have built connections and trust with local communities vulnerable to program risks.

Through the Community Efficiency Financing (CEF) initiative, FCM offers funding to local governments that establish a program to finance home energy upgrades. The RDN and City would need to act quickly to benefit fully from the time-limited program expected to sunset in 2026. Three types of financing program model are eligible for CEF funding, and the feasibility and success factors of each in both the RDN and the City of Nanaimo was explored.

- **Property Assessed Clean Energy (PACE):** PACE financing is typically provided as a loan from a government (e.g., municipality) or third-party program partner. The loan is affixed to the property (rather than the individual) and transferred with property ownership. Loans are repaid via property tax bills. PACE financing often provides access to low-cost and long-term financing with a fixed interest rates.
- **Direct Lending:** A private lender offers an unsecured consumer loan for home energy upgrades. Local governments help de-risk investments using credit enhancement tools (e.g., loan loss reserves) to secure preferential lending terms (below-market interest rates, expanded underwriting criteria) and enable broader uptake.
- **Utility On-Bill Programs:** Utility-led programs where financing is repaid via customer utility bills. Capital is provided by either the utility, with underwriting based on customer payment history (on-bill financing), or by a third-party lender loaning directly to participants, after which payments are collected by the utility (on-bill repayment).

Following detailed feasibility and alignment analysis of the above models, three financing products were developed and modeled to understand program costs, impacts and critical success factors. These included two Direct Lending models (a 2-year bridge loan and 5-year personal loan), ideally implemented across the study region by the RDN, and a 10-year PACE loan most easily implemented by the City based on legislative and implementation conditions and precedent. On-bill programs were considered non-feasible due to firm lack of interest by key provincial utilities. See section 4.4 for detailed findings.

The following recommendations and considerations are provided for the RDN and City of Nanaimo based on the results of the study.

Note that the Home Energy Navigator (HEN) is considered a critical success factor to any local financing program. In the absence of the HEN, a local financing program is considered significantly less viable.

Regional District of Nanaimo

A Direct Lending program implemented by the RDN across the study region, in conjunction with the Home Energy Navigator, is feasible and broadly aligned with households needs and program objectives. Capital is provided by the lending partner and program administration is distributed among program partners, so resource needs from local government are greatly reduced. Critical program success factors include:

- **Preferential lending terms:** Securing preferential lending terms (e.g., below-market interest rates) and expanded underwriting criteria is critical to program success. Ideally, the RDN would leverage credit enhancements (e.g., a loan loss reserve; interest rate buydowns) that minimize risk to the lending partner to enable broader and more equitable uptake; otherwise, even more significant focus and effort should be put on lender negotiations and establishment of program lending terms.
- **Investigation into legislative context for credit enhancement features:** As noted above, a successful Direct Lending program requires preferential lending terms. Credit enhancements help achieve such terms. The RDN should seek internal and external legal consultation, as well as liaise with the CEF, regarding the use of these features in the RDN.
- **Regional program:** Provides standardization for households and local industry and increases potential program uptake and impact.
- **Strategic eligibility criteria:** To add value above and beyond existing financing offers, a local program should allow additional measures beyond heat pumps, participation by electrically heated homes and combining financing with existing incentives.

City of Nanaimo

If the RDN introduces a regional Direct Lending program, it is recommended that the City participates in the program and collaborates with the RDN on program development, implementation and marketing. If the RDN chooses not to move ahead with a Direct Lending program across the region, the City of Nanaimo could implement either a City-scale Direct Lending program or a PACE program. *Success factors for a Direct Lending program are broadly the same as for the RDN, while success factors for PACE are summarized below.*

- **Dedicated municipal reserve funds:** Options to capitalize a PACE program are constrained by MFA and Community Charter restrictions on long-term borrowing. The success of a local program to deliver financing at the scale needed to stimulate home energy retrofits relies on dedicating municipal reserve funds for program capital.
- **Preferential lending terms and expanded underwriting:** Local governments have more control and influence over financing terms in a PACE program and the ability to design financing specifically for vulnerable households to support more equitable uptake (e.g., Income-Qualified stream). To overcome barriers to traditional financing associated with credit checks, property tax standing can be used to underwrite loans.
- **Collaboration with the Districts of Saanich and Central Saanich:** To understand key design features, mitigate challenges and risks, and benefit from significant time and resource efficiencies by leveraging existing program materials (e.g., bylaws, forms).

With program feasibility confirmed, local government staff can begin the program design process. To fund this effort, the RDN and/or City may submit a grant application to FCM's CEF initiative. It's important to note that the CEF initiative is expected to sunset in 2026, so the RDN/City will need to advance through the application phases within this timeframe to take advantage of the opportunity. While this is underway, the RDN/City should continue to advance initiatives and other key actions related to home energy retrofits. These include:

- **Commit resources to the continuation of the Home Energy Navigator and related services.** The HEN is currently being piloted for a limited time in the RDN. Dunsky recommends that the RDN (or City) continue offering the HEN. Without the HEN, there would be significant challenges to deliver an effective and impactful financing program, regardless of chosen model. The HEN offers critical added value to a financial partner within a Direct Lending program and reduces staff impacts under a PACE model. In both models, the HEN provides key supports and helps raise awareness of the program. The HEN would be well-positioned to support a future financing program.
- **Continue offering and promoting local government top-ups.** The RDN and City should continue (and/or expand) their offerings of municipal top-up rebates for heat pumps, electrical upgrades, home energy assessments and renewable energy systems. To help alleviate contractor and homeowner uncertainty, the RDN and City should consider increasing the budget for these rebates to facilitate an accelerated pace of retrofits and higher confidence in access. Given the large potential market for rooftop solar installations, the City should consider introducing a renewable energy rebate.
- **Engage with industry groups and contractors on key technologies,** such as load shedding and/or load-sharing devices. These technologies support electrification retrofits by reducing or avoiding costs from electrical panel upgrades. Increased awareness and training benefits project economics in favour of deeper retrofits and better payback.
- **Engage proactively with the Province on provincial PACE.** In all scenarios, but especially if designing a PACE-style program, the RDN and City should liaise frequently with the Province, monitor developments and prepare for consultation as needed.

Glossary of Key Terms

Archetype: Representative examples of segments of the existing housing stock, each with an average profile including area, heating type, energy consumption and GHG emissions. This profile is applied to every dwelling in that archetype.

Community Efficiency Financing (CEF) Initiative: The CEF initiative is part of FCM's Green Municipal Fund and offers funding to communities undertaking steps to implement a local financing program for home energy upgrades.

Community Energy and Emissions Inventory: Provides an analysis of energy consumption and greenhouse gas (GHG) emissions of select sectors and sources within a set boundary.

Credit Enhancement: Financing program design tools intended to improve the credit risk profile for lenders to provide loans and provide greater assurance that their products will realize an adequate financial return to justify their investment. In turn, credit enhancement can improve financing terms for homeowners (e.g., lower interest rate, longer repayment timelines) and/or enable financing for homeowners that would otherwise not have access. Credit enhancements include loan loss reserves and interest rate buydowns.

- **Loan loss reserve (LLR):** Within this structure, a reserve fund is established to cover a portion of losses incurred by private lenders due to borrower defaults. A sum in proportion of the overall loan value is thus placed in an escrow fund and held until the loan is repaid by the homeowner. In cases of default, lenders can apply to the LLR.
- **Interest rate buydowns (IRB):** In this intervention, the local government pays the lender to provide a reduced interest rate. In the method applied in this assessment, an upfront payment is made by the local government (e.g., RDN) to the lender that is equivalent to the difference in interest payments between the standard lending rate and the preferential program rate over the lifetime of the loan. IRBs are flexible and can be customized by amount, term, qualifying borrowers, and project type. They can be applied in a targeted manner to support equity deserving groups, such as to improve low-to-moderate income access to lower-interest loans.

Direct Lending: A financing program in which a private lender offers eligible participants an unsecured consumer loan product for home energy upgrades. Local governments can help de-risk these investments to secure preferential lending terms for participants and enable broader uptake via credit enhancement. Preferential terms include below-market interest rates, extended repayment terms more closely aligned with the average lifespan of installed measures, larger loan amounts, and expanded underwriting criteria to enable participation by households with lower credit scores. A local government can offer credit enhancement in the form of a loan loss reserve to a private lender for partial coverage for losses on, for instance, 10% or 20% of the total loan portfolio (i.e. a leverage ratio of 10:1 or 5:1).

Energy Concierge Service: Energy concierge services are intended to facilitate the customer journey from the homeowner's perspective. Program officers are made available to walk homeowners through the retrofit process, offering guidance, support and education to simplify each step, connect them with existing offerings, and provide expert advice. The RDN's Home Energy Navigator is a pilot energy concierge service offer in the region.

Home Energy Retrofit: Upgrades to a building's energy systems to improve its energy performance. This can include energy measures such as heat pumps and insulation upgrades.

Property Assessed Clean Energy (PACE): PACE financing programs are typically provided as loans from a government (e.g., municipality) or third-party program partner. The loan is affixed to the property (rather than the individual) and transferred with property ownership. Loans are repaid via property tax bills. PACE financing often provides access to low-cost and long-term financing with fixed interest rates.

Utility On-Bill Programs: Utility-led financing programs, where financing is repaid via customer utility bills. Capital is provided by either the utility, with underwriting based on customer payment history (on-bill financing), or by a third-party lender loaning directly to participants, after which payments are collected by the utility (on-bill repayment).

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1. Introduction

1.1 Climate Goals in the Region of Nanaimo

The Regional District of Nanaimo and City of Nanaimo have both committed to reducing emissions and increasing resilience by collaboratively supporting home energy retrofits.

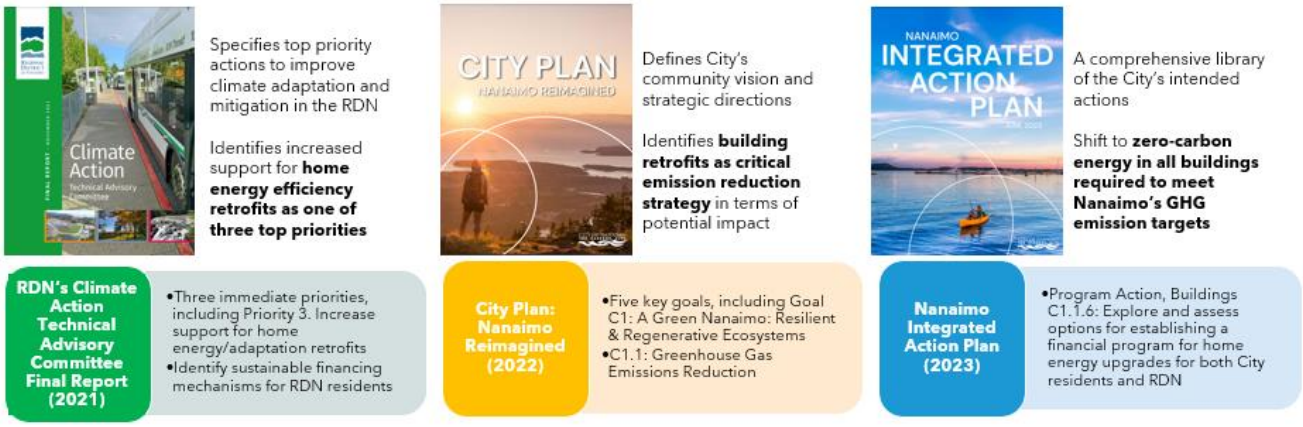
The Regional District of Nanaimo (RDN) is committed to being a leader in climate change mitigation and adaptation. The RDN's 2013 Community Energy and Emissions Plan targets 80% emission reductions from the built environment by 2050. To achieve this, the Plan aims for 50% of homes in the RDN to meet EnerGuide 80 by 2030 (~10% more efficient than current code-built home) and 50% of dwellings in the RDN to use non-fossil fuel sources for home energy demands. Currently, residential buildings are the second largest source of emissions in the study region after on-road transportation, contributing 13.4% of community emissions in 2021[1]. The RDN has been working with its member municipalities and Electoral Areas[2] to advance efforts to reduce energy use and GHG emissions across the region, with specific policies and actions incorporated into the Regional Growth Strategy (updated version anticipated for 2024[3]) and the Electoral Area Official Community Plans (OCPs). Home energy and adaptation retrofits are a top priority. The RDN's Climate Action Technical Advisory Committee (CATAC) provides recommendations to the RDN on emerging climate issues. In 2021, the CATAC Final Report identified expanded support for climate adaptive home retrofits as one of its top three priorities for immediate action in the region - including the identification and preparation of a home efficiency financing mechanism[4]. Critically, the CATAC emphasized the need for an equitable approach to all climate work.

The City of Nanaimo (the City) is equally committed to impactful municipal climate action and is aiming to become a 100% renewable city by 2050. In 2019, the City declared a climate emergency and committed to reducing community GHG emissions by 50 – 58% by 2030 (from a 2010 baseline) and between 94 – 107% by 2050[5]. Residential buildings are the third largest source of GHG emissions in the City after on-road transportation and manufacturing industries & construction. They contributed 12.3% of total City emissions in 2021 – and represent 59% of the RDN's total residential building emissions[6]. The City recently adopted a new city plan and complementary integrated action plan (IAP), each of which prioritize GHG reductions – and, specifically, building retrofits. The IAP includes a priority action to, "complete an inventory of energy use and Greenhouse Gas emissions of all community buildings, to identify building energy upgrade opportunities and challenges by

[1] Stantec (2023). Regional District of Nanaimo 2021 GPC BASIC+ Community Greenhouse Gas (GHG) Emissions Inventory Report. October 2023.
[2] RDN includes Nanaimo, Parksville, town of Qualicum Beach, district municipality of Lantzville and seven electoral areas (A: Cassidy/Cedar, B: Gabriola Island, C: Arrowsmith/Benson, E: Nanoose Bay, F: Alberni Highway, G: Mid-Oceanside, and H: Lighthouse Country).
[3] RDN (2023). Regional Growth Strategy: Shaping Our Future 2040. Draft – May 10, 2023. May 2023.
[4] RDN (2021). Climate Action Technical Advisory Committee: Final Report. November 2021.
[5] City of Nanaimo. (2019). Merged Agenda – Regular Council Meeting. April 2019.
[6] Stantec (2023). Regional District of Nanaimo 2021 GPC BASIC+ Community Greenhouse Gas (GHG) Emissions Inventory Report. October 2023.

building type, and immediately develop a financing and rebate program to accelerate the replacement of high-carbon energy systems with low-carbon energy systems (C1.1.18)".

Figure 1: Project context within Regional District of Nanaimo and City of Nanaimo strategic plans[7,8,9]



The RDN launched a home energy concierge service, the Home Energy Navigator (HEN), in Fall 2023. The HEN is currently a limited time pilot program offered free to residents of duplexes, townhouses, and single-family homes – segments aligned with those investigated for this study. Energy concierge services play a vital role in the awareness, uptake and participant satisfaction of local financing programs. The HEN is included as a critical success factor and value-add service within the program models investigated for this study.

The RDN and City's plans were developed within the current context of provincial plans and policies. Most significantly, BC adopted the Climate Change Accountability Act, which legislated targets to reduce GHG emissions by 40% below 2007 levels by 2030, 60% by 2040, and 80% by 2050. Buildings and communities are targeted to reduce emissions by 59 – 64% below 2007 levels by 2030[10]. Effectively eliminating fossil fuel consumption for residential heating via electrification will be key to meeting RDN and City GHG reduction goals. The City has already taken bold steps towards decarbonizing new construction in the residential sector, with Council voting in October 2023 to adopt the highest levels of the Provincial Zero Carbon Step Code by July 1, 2024 – six years ahead of BC's 2030 schedule[11]. The decision means that new buildings will, broadly, need to use low-carbon energy (i.e., non-fossil fuel) for primary space and water heating needs. Parallel ambition is needed for existing buildings.

The RDN and its members - including the City of Nanaimo specifically – are interested in identifying opportunities to reduce energy use and associated emissions through a building retrofit financing program. The purpose of this study is to assess the feasibility and potential impact of a local initiative that would help to accelerate the decarbonization of the existing housing stock. A retrofit financing program, alongside a suite of other policies, regulations and initiatives, is needed to meet regional and City retrofit, renewable energy, and emission reduction goals.

[7] City of Nanaimo (2022). City Plan: Nanaimo Relmagined. July 2022.
[8] City of Nanaimo (2023). Nanaimo Integrated Action Plan. June 2023.
[9] RDN (2021). Climate Action Technical Advisory Committee: Final Report. November 2021.
[10] Government of BC (2021). Sectoral emission targets. March 2021.
[11] City of Nanaimo (2023). Implementation of the Zero Carbon Step Code. August 2023.

1.2 A Window of Funding Opportunity

Through the Community Efficiency Financing (CEF) initiative, FCM offers up to $5M in grants and up to either $10M in capital loans or $2M in credit enhancement to municipalities that establish a local program to finance home energy upgrades[12]. The RDN and City would need to act quickly to benefit fully from the time-limited program.

The RDN and City are interested in applying to the CEF program and would need to act quickly to fully benefit from this opportunity, which is currently expected to sunset in 2026. This study targets the low-rise residential sector in part to align with the CEF initiative.

This initiative supports municipalities and partner organizations in implementing a local financing program for home energy upgrades. FCM offers substantial grants to complete feasibility, program design and evaluation studies, as well as to start up and operate a program for up to four years. It also offers low-interest loans to provide capital for on-lending to homeowners, as well as loan loss reserve funds as a backstop to cover any losses from homeowner loan defaults or delinquencies. Three types of financing program model are eligible for CEF funding: 1) Property Assessed Clean Energy (PACE)/local improvement charge (LIC), 2) third-party lending via financial institution and 3) utility on-bill financing. All three of these models are explored in this study.

1.3 Study Objectives

The objective of this study is to assess the feasibility of a local home energy retrofit program in the RDN and/or City and recommend an approach, considering homeowner and community needs, industry capacity, potential impact, and different financing mechanisms and delivery models.

A local government championed program could offer lower-cost financing to residents to help them undertake energy improvements to their homes. This feasibility study aimed to determine whether the RDN and/or City should proceed with the design of a home retrofit financing program and, if so, recommend a financing model to pursue. The success of any such program depends on four central questions, which the study aimed to answer.

1. **What is the unique local context regarding the challenges and opportunities for home energy retrofit financing in the study region**? What are the current low-rise housing stock and energy use profiles? Would the local renovation industry have the capacity to meet increased demand for energy efficiency and renewable energy measures if a local government were to bring this kind of new program to market?
2. **What are the costs and benefits of deep energy efficiency retrofits in Nanaimo?** What depth and type of retrofit could feasibly be supported, considering costs, potential savings, homeowner preferences and socio-economic conditions?
3. **How large is the potential market for a retrofit financing program**? What financing support is needed to overcome barriers to home energy retrofits and reduce risks of participation to allow the program to meet local energy and emissions reductions targets through equitable delivery?

[12] GMF (2023). Community Efficiency Financing: Application Guide. Updated 2023.

4. **What financing mechanisms and program delivery models are feasible**? Which options are best suited to meet the objectives of the program partners and the needs of the community, in the context of the current efficiency financing landscape? What are the success factors critical to each program model?

A note on study scope and use of study region, RDN and City of Nanaimo

The scope of this study was the entire Regional District of Nanaimo, including the City of Nanaimo. This geographical region will be referred to as the "study region" throughout the report. Where data, results or recommendations apply only to the City of Nanaimo – either geographically or as a local government – they will be identified as "City" or "City of Nanaimo". Similarly, where data, results or recommendations apply only to the RDN, they will be identified as either "rest of RDN" (if excluding City) or "the RDN" (local government).

1.4 Approach

This study included development of a low-rise housing energy and emissions inventory, representative residential archetypes and retrofit packages, engagement with local community organizations and industry partners to identify barriers and opportunities, and a feasibility and impact analysis to evaluate financing options.

This study evaluated the feasibility of a local government-championed financing program for home energy upgrades. A summary of the approach is provided below.

1. **Targeted Community Energy and Emissions Inventory (CEEI).** In partnership with Climative.ai, Dunsky characterized the low-rise housing stock and associated energy and emissions in the study region in a targeted Community Energy and Emissions Inventory. This analysis was supported by data from NRCan, StatsCan, BC Hydro, BC Assessment (BCA), and MLS listings in the region.
2. **Archetype analysis and retrofit package development.** Dunsky developed residential archetypes for all low-rise home (single family dwelling, duplex, row/townhouse, quadplex, manufactured home) and energy (electricity, gas, heating oil) types in the region to establish energy and emissions baseline. To inform program feasibility and impact evaluation, retrofit packages were then developed for key archetypes. These packages modeled potential retrofit costs and energy and GHG savings associated with two types of retrofit: 1) air source heat pump (ASHP) only and 2) a deeper retrofit package that included an ASHP and efficiency measures (insulation, windows, and doors).
3. **Focused engagement and barrier identification.** Dunsky led several engagement activities with a view to gather perspectives on home energy retrofit financing and to identify potential models, program partners and collaborators. This helped to establish the market need, industry capacity, and program rationale, as well as to identify key barriers, risks and opportunities that different models present. The following topics were explored:
    - **Diversity, equity and inclusion.** Dunsky partnered with Kambo Energy Group to gather important perspectives on barriers, risks, and program recommendations from five organizations serving local, equity-deserving populations. These organizations

serve a diversity of communities in the region including low- and moderate-households, renters, Indigenous community members, new Canadians and racialized communities, unhoused communities and those living in transitional and/or precarious housing, people who identify as members of the transgender community, domestic violence survivors, seniors, and families.

- **Target market needs and preferences.** In partnership with Mainstreet Marketing, Dunsky conducted a survey to gain preliminary insights on home energy profiles, the current state of energy efficiency upgrades, and homeowner perspectives on financing programs and several potential program design features. The survey received 1,058 responses. Of these responses, 53% were received via web and 47% were received by phone while 82% were from City residents and 18% were from rest of RDN.
- **Workforce capacity.** Dunsky researched the type, number, and qualifications of contractors and energy advisors in the region and led a targeted discussion with City Green Solutions, the program administrator of the region's retrofit concierge program (Home Energy Navigator), to contextualize and expand industry insights and identify any existing or anticipated barriers to program participation.
- **Regional and provincial collaboration.** Dunsky led an in-person discussion with Sustainability and Finance staff from the City and RDN to explore the development and impact of a regional program and understand internal capacity and interest in potential financing models. Dunsky also led a discussion with BC's Municipal Finance Authority (MFA) to understand the current legislative landscape and explore the feasibility of innovative program structures.
- **Program capital.** Dunsky routinely meets with financial institutions to explore interest in lending for home energy retrofit programs, as well as high-level potential borrowing terms and conditions. This helped to gauge interest in potential alternative sources of capital to the CEF initiative and uncover key considerations for long-term program planning.

4. **Financing options and community benefits**. An exploration of different program models and delivery partnerships shed light on which financing and administration options are feasible in the local context, considering their alignment with RDN and City goals and priorities, their implications for municipal staffing and resources, and factors influencing their potential uptake. Once preferred models were identified, Dunsky modeled potential program uptake (e.g. number of projects, capital required) and local benefits (e.g. energy and GHG savings, cost savings), as well as program start up and operating costs. The three general financing models investigated for this study were:

    - **Direct Lending:** In this model, a private lender offers eligible participants an unsecured consumer loan product for home energy upgrades. The municipality can help de-risk these investments using credit enhancement tools (e.g., loan loss reserves) to secure preferential lending terms for participants, including below-market interest rates and expanded underwriting criteria to enable broader participation.

    - **Property Assessed Clean Energy (PACE):** PACE financing is typically provided as a loan from a government (e.g., municipality) or third-party program partner. Under this model, the loan is affixed to the property (rather than the individual) and transferred

with property ownership. Loans are repaid over a set term (typically 10+ years) via a special charge on the homeowner's property tax bill. PACE financing often provides access to low-cost and long-term financing with a fixed interest rates.

- **On-Bill Financing/Repayment:** As a utility-led initiative, on-bill programs provide financing that is repaid through customer utility bills. Capital is provided by either the utility, with underwriting based on customer payment history (on-bill financing), or by a third-party lender (e.g. bank or credit union) that provides program capital or loans directly to participants, with payments then collected by the utility (on-bill repayment).

A local program could be designed to expand moderate to deep home energy retrofits and enable broader participation in the community. It would first target owners of low-rise homes (Part 9), as this segment of the market is expected to deliver the greatest impact in the community given that much of the residential stock is comprised of single-detached dwellings, townhouses and duplexes. This also positions the RDN and City to access funds from the CEF initiative to mitigate their risks, test innovative design and delivery elements, and build local capacity and experience internally and within the industry more generally.

A note on study applicability in the evolving landscape of home energy retrofits

This study was conducted in late 2023 and is reflective of the market, legislative, and existing program conditions at that time. The home energy retrofit landscape is evolving quickly in both BC and Canada. There are numerous anticipated changes to legislation, codes and standards, and existing incentive and financing programs that could impact program feasibility.

Legislatively, the Province's actions on PACE-enabling legislation would have significant impact. Changes to codes and standards that would impact existing building retrofits include the Alterations to Existing Buildings code (at the national and provincial level) and BC's proposed Highest Efficiency Equipment Standards. Incentives and financing offered by governments, utilities and financial institutions are introduced, altered and ended frequently and on short timeframes. The Canada Greener Homes program is an important example of an existing offer whose future status would likely impact the conditions of a local program.

As the RDN and City move forward on home energy retrofit financing, it will be important to monitor changes to these and other areas and consider how they impact the feasibility and design of a local financing program. The information presented in this study will facilitate that assessment by helping staff in each government to understand potential program options, including their success factors and limitations, and ultimately recognize opportunities and challenges as they emerge.

2. Community Energy and Emissions Inventory and Local Context

Summary of Findings

1. **There are significant energy and GHG reduction opportunities in the study region's low-density residential sector**. One third (33%) of homes in the study region are reliant on carbon intensive fossil fuel for home heating, and 65% of homes in the study region were built over 30 years ago. The Community Energy and Emissions Inventory (CEEI) estimates total emissions in the study region from low-density homes at 101,668 tCO_2e, concentrated mostly in small single-family dwellings (40,545 tCO_2e, 40% of emissions), medium single-family dwellings (34,560 tCO_2e, 34% of emissions) and duplexes (9,634 tCO_2e, 9.5% of emissions).

   The total decarbonization opportunity from space heating and efficiency retrofits to electric, natural gas and oil-heated low-density homes in the study region is estimated between 62% (62,542 tCO_2e, from heat pump only retrofits) to 63% (63,845 tCO_2e, heat pump + insulation retrofits) of CEEI-calculated emissions. In the City, GHG reductions could be around 63% (37,422 tCO_2e, heat pump only retrofits) to 64% (38,182 tCO_2e, heat pump + insulation retrofits) of City low-density GHG emissions.

   These reductions would contribute 44% - 45% of reductions needed to achieve the RDN's target of 80% GHG reductions from the built environment by 2050 from a 2007 baseline (specific to total residential building emissions[13]). For the City, these reductions would contribute 67% - 68% of reductions needed to achieve 50% GHG reductions of the residential building sector by 2030 and 36% of the reductions needed to achieve 100% reductions by 2050, both from a 2010 baseline.

2. **Financial barriers and risks are top of mind for surveyed households, community and industry organizations.** Homeowners and community groups cited household debt, a lack of available cash, and other financial priorities as important barriers, while community and industry organizations emphasized the need to improve financial literacy to reduce unintended risks of participating in a financing program. Community organizations consulted for DEI perspectives emphasized the need to reduce participant risk of unrealized energy and bill savings and high-pressure contractor sales tactics via a mindful lending approach with strong participant safeguards.

3. **There is adequate capacity in the local retrofit workforce to support anticipated program demand.** The study region has experienced significant growth in the home retrofit industry in recent years, especially – and notably – in heat pump contractors and energy advisors (EAs). All areas of the study region have access to a wide selection of NRCan registered and CleanBC Program Qualified EAs, as well as contractors specializing in a range of retrofits. This growth has been driven in part by

[13] Stantec (2023). Regional District of Nanaimo 2021 GPC BASIC+ Community Greenhouse Gas (GHG) Emissions Inventory Report. October 2023.

the Canada Greener Homes offers and would likely be impacted by future changes to this program.

4. **Strong uptake of the Home Energy Navigator Program indicates interest in retrofits and need for associated supports.** The pilot program is expected to be fully subscribed only a few months after launch, with equal participation from residents of the City and rest of RDN. The Home Energy Navigator would be perfectly positioned to support a future financing program in the region and is considered a critical value-add service and success factor for program feasibility, uptake and impact.

These insights are further described in the section below, which expands on the study region's housing and demographic composition, homeowner preferences and behaviours, and local workforce capacity and key regional initiatives.

2.1 Community Energy and Emissions Inventory

There is significant opportunity for GHG emission reductions in the region's low-density homes through electrification of fossil fuel heating systems and energy efficiency measures. Roughly 68% of low-density homes in the study region are single-family homes, consuming 74% of energy (4,325,707 GJ) and generating 75% of emissions (76,688 tCO_2e). One third of all homes are primarily heated with carbon-intensive fossil fuels and generate 82% of the region's emissions, while inefficient electric baseboard heating could be used in as many as 18,980 (30%) homes in the region.

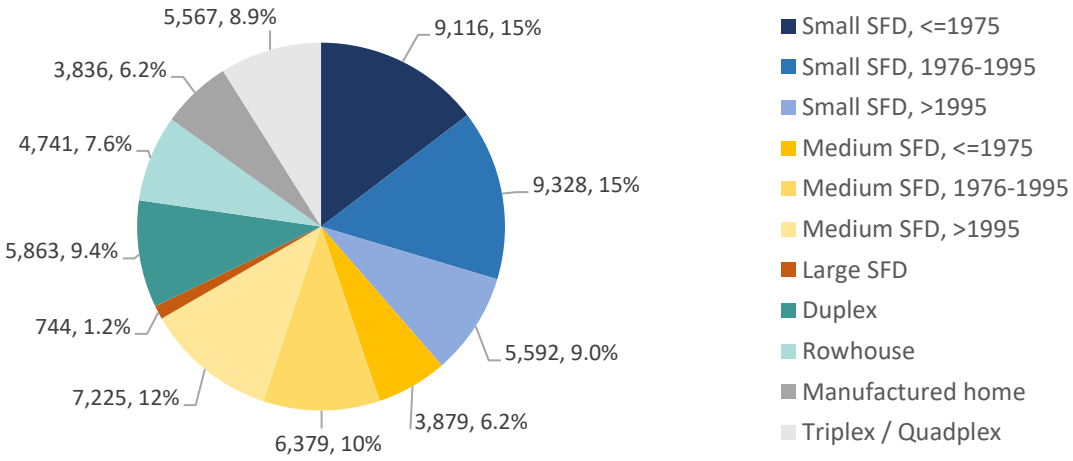
The following section is based on a Community Energy and Emissions Inventory (CEEI) and housing characterization of low-density (Part 9) buildings completed for this project[14]. For this study, low-density (Part 9) buildings include single-family dwellings (single detached, semi-detached, and other single-attached houses), rowhouses, duplexes, manufactured homes and triplexes/quadplexes. Housing characteristics (e.g., age, housing type, heating source) were used to develop representative archetypes for the region. **Details of methodologies and assumptions used for the CEEI and key archetypes are presented in Appendix A.**

2.1.1 Housing Characterization

Single-family dwellings (SFD) make up 68% of low-density homes in the study region, overwhelmingly small (<2,050 ft^2, 39% of total homes) and medium (<3,940 ft^2, 28%) sized. Large SFDs account for only 1.2% of homes. Duplexes and rowhouses contribute 17% of homes, while triplexes and quadplexes – the majority condos – account for 8.9% of homes. The portion of manufactured homes in the region is significant, at 5.2% of low-density homes.

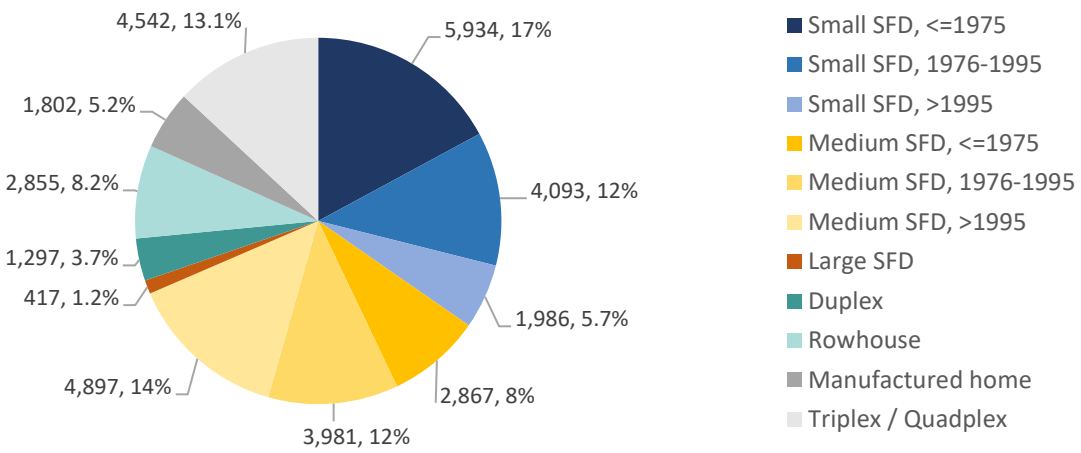
Figure 2: Proportion of low-density homes by key archetype (# homes, % homes)

a) Study region



[14] This analysis combined data from BC Hydro, BC Assessment, NRCan and MLS listings to determine the number of low-density dwellings in the study region and City of Nanaimo by market segment (e.g., single-family dwelling), size (e.g., medium SFD), vintage (e.g., pre-1976) and primary heating energy type (e.g., natural gas). Details of the CEEI and characterization are presented in Appendix A.

b) City of Nanaimo



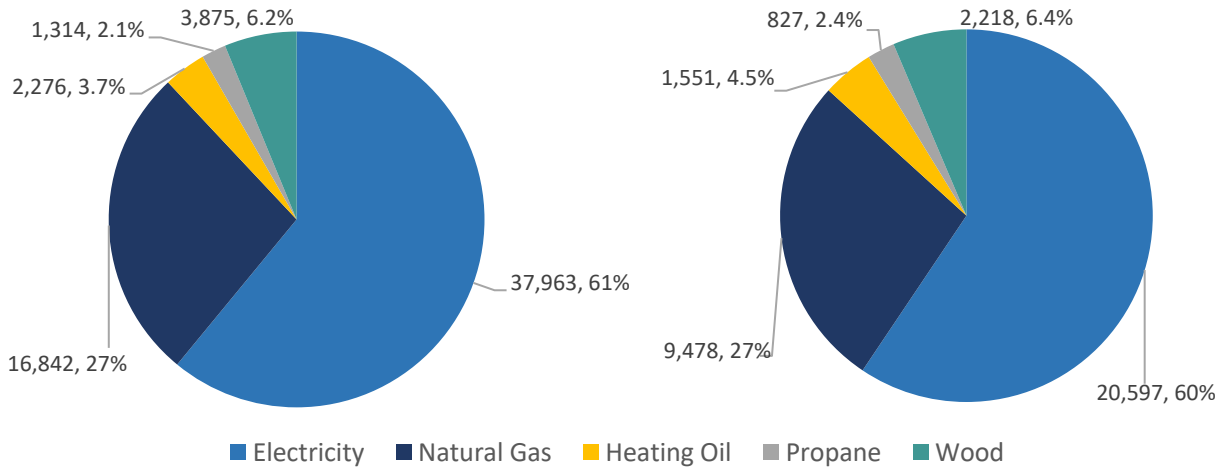
In the City, small and medium SFDs account for just under 70% of low-density homes. The City has a higher share of small SFDs built before 1975 than the region, a large proportion of manufactured homes (5.2%) and 82% of the region's triplexes and quadplexes. Newer SFDs in the City are much more likely to be medium-sized. In both the study region and City, the largest potential market share for a financing program is in small and medium SFDs.

One third (33%) of homes in the study region are primarily heated using fossil fuels[15]. About 61% of homes in the study region are primarily heated with electricity, while 27% are heated with natural gas, 3.7% with heating oil, and 2.1% with propane. Home heating proportions by fuel type are very similar in the City, though the overall share of fossil fuel heating is slightly higher (34%) due to larger shares of wood, heating oil and propane.

Figure 3: Proportion of low-density homes by primary home heating energy type (# homes, % of homes)

a) Study region

b) City of Nanaimo



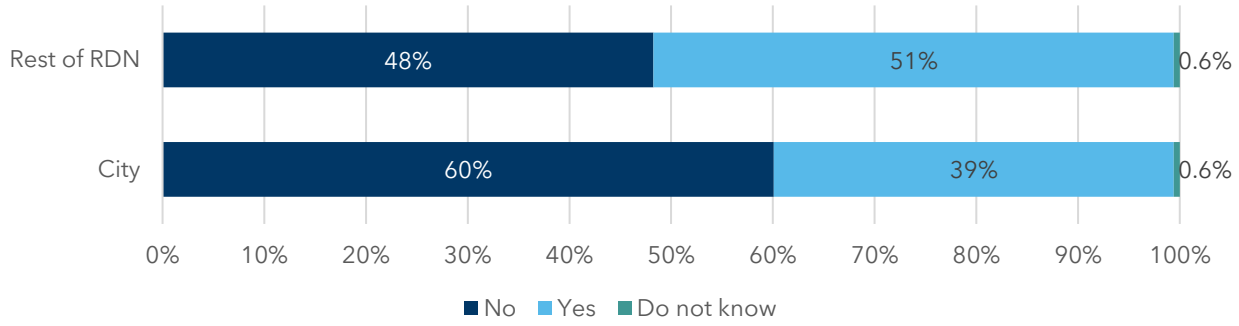
[15] Primary home energy type, estimated and assigned to homes as part of the CEEI, refers to energy used for space heating. See Appendix A for full details on CEEI methodologies.

Many electrically heated homes use inefficient electric baseboard heating and would realize significant cost and energy savings by switching to a heat pump. A survey of regional homeowners (see Section 2.3) revealed that the share of inefficient electric baseboard heating in the region's electrically heated homes is likely significant. Of the 57% of survey respondents living in electric heated homes, there was an even split between electric baseboards (50%) and electric heat pumps (50%). If the same split is applied region-wide, there could be as many as 18,980 homes using electric baseboard heating – with 10,300 homes in the City alone. Heat pumps are efficient and can use up to 65% less energy than baseboards[16]. As a result, and critical to the business case for these homes, anyone switching from baseboards to heat pumps would realize immediate and substantial savings on their home energy bills, as well as significant energy reductions.

Just over 6% of homes in both the study region and City are heated with wood, considered a biomass fuel type. However, some homes use multiple energy sources for heating – and electric and wood is a particularly common combination – and as a result the share of wood-heated homes is likely conservatively overestimated based on available data.

Survey results also revealed that air conditioning is more prevalent outside the City (51%) than in the City (39%). Emphasizing the cooling benefits of heat pumps to City residents specifically may be a valuable approach.

Figure 4: Presence of air conditioning in existing homes, survey respondents

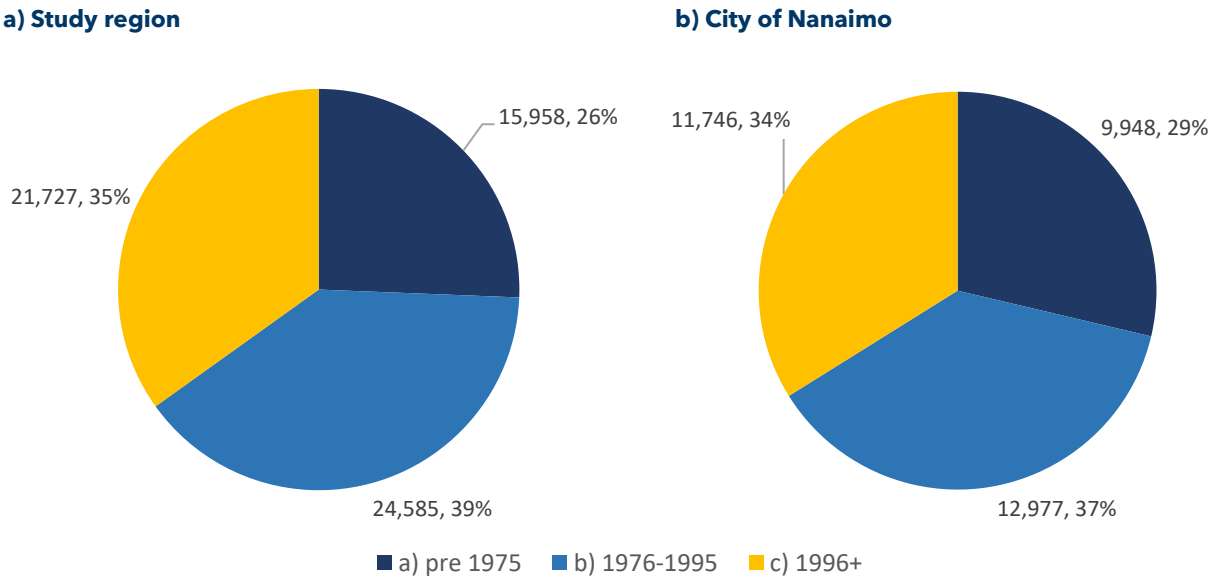


The region's large share of older homes are good candidates for energy retrofits that include fuel switching and energy efficiency improvements, with potential to generate significant energy and GHG savings. Of the 62,270 low-density homes in the study region considered for this analysis, two thirds (65%, or 40,543 homes) were built prior to 1996 and 26% (15,958 dwellings) were built prior to 1976. The share of homes built before 1976 is slightly higher in the City (29%). This means that many homes in the study region and City were built before BC's Building Code was introduced in 1973 – and many more were originally constructed before it included any energy efficiency requirements[17].

[16] Canadian Climate Institute (2023). Heat Pumps Pay Off: Unlocking lower-cost heating and cooling in Canada. September 2023.

[17] Prior to 1973, local governments adopted their own building codes under local bylaws. Energy efficiency was first introduced as a BC Building Code Objective in 2008 and the code was amended to include Part 10, which set energy efficiency requirements for new Part 9 and Part 3 buildings. The BC Energy Step Code was introduced in 2017.

Figure 5: Proportion of low-density homes by vintage (# homes, % of homes)



Given the share and number of older and fossil fuel-heated homes, electrification represents a significant opportunity for residential building decarbonization in the study region. Importantly, the large portion of homes using electric baseboard heating could also increase efficiency and significantly reduce electric consumption – and utility bills – by switching to an electric heat pump. Regardless of the heating source, most homes – especially older homes – stand to benefit from insulation and envelope improvements.

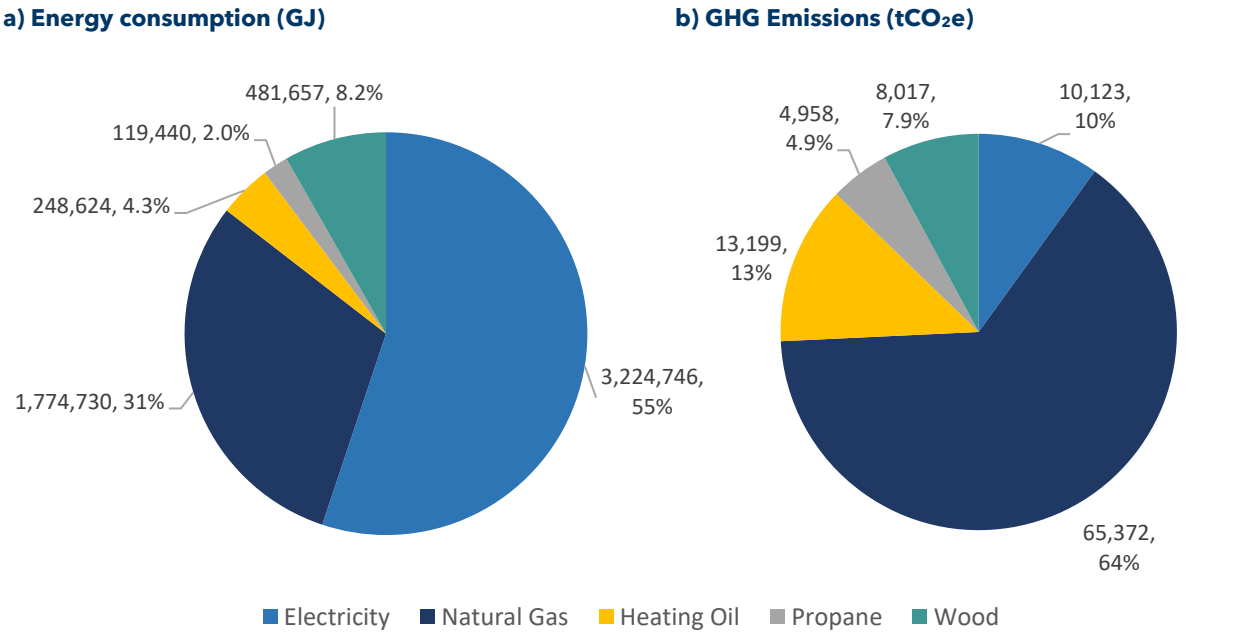
2.1.2 Community Energy and Emissions Inventory

Low-density existing residential buildings in the study region consumed 5,849,196 GJ of energy and produced 101,668 tCO_2e of GHG emissions in 2023. This includes energy consumption and resulting emissions from home space heating, hot water heating and lights & appliances. Most of the emissions are generated from carbon dioxide. *It is important to note that carbon dioxide emissions produced from the burning of wood fuel are biogenic in origin. They are generally considered part of the short-term carbon cycle rather than additive from the release of long-term stored carbon emissions (i.e., burning fossil fuels). As such, and per best practice, they have not been included in GHG emissions for wood-heated homes.*

Electricity accounts for over 50% of energy consumption in both the study region and City but contributes minimally to emissions (<10%), while fossil fuel consumption generates around 82% of GHG emissions in both jurisdictions. Due to the low carbon intensity of BC's grid electricity, electricity consumption contributes only 10% (10,123 tCO_2e) of total emissions even though it accounts for 55% (3,224,746 GJ) of total energy consumption. Conversely, natural gas accounts for 31% of energy consumption (1,774,730 GJ) but 64% of total emissions (65,372 tCO_2e). Based on their share of energy consumption, wood (8.2% energy) and heating oil (4.3% energy) also contribute an outsized share of emissions at 8% (8,017 tCO_2e) and 13% (13,199 tCO_2e) respectively. Propane contributes 2.1% of energy consumption and 4.9% of emissions in the study region. Aggregately, fossil fuels – which does not include wood – generate 82% (83,528 tCO_2e) of regional emissions from 37% (2,142,794 GJ) of overall energy consumption.

Home energy retrofits targeted at reducing the consumption of fossil fuels via electrification and energy efficiency upgrades are critical to decarbonizing existing low-density homes. Conversion of electric baseboard heating systems to heat pumps and installing renewable energy systems (e.g., rooftop solar PV) will significantly reduce electricity consumption.

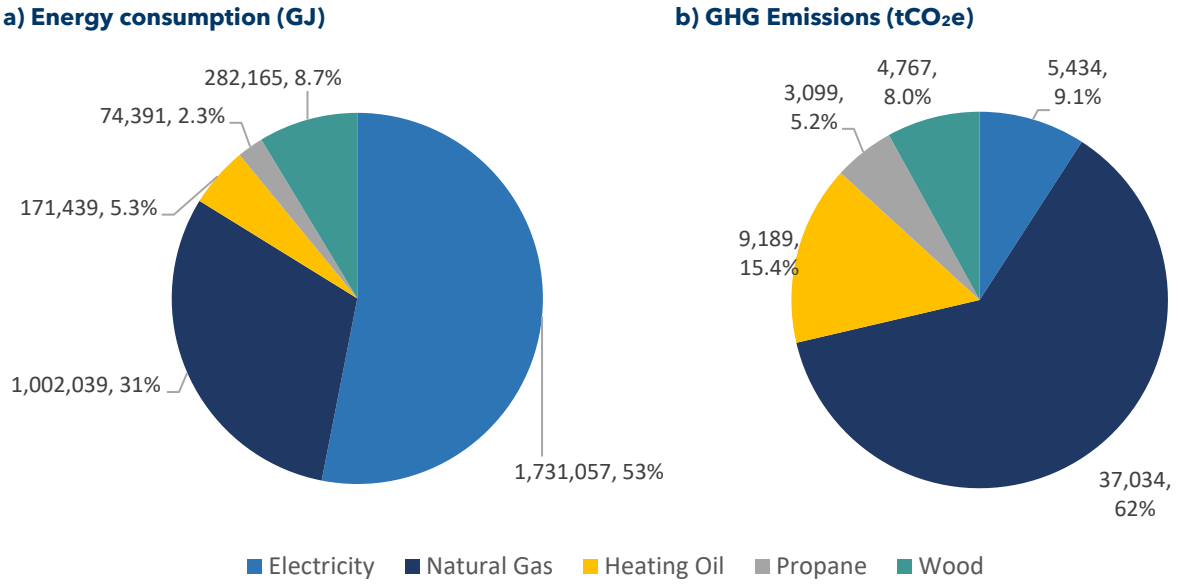
Figure 6: Energy consumption and GHG emissions per year by fuel type, low-density homes, study region



Low-density homes in the City of Nanaimo consume 56% of the energy (3,261,091 GJ) and produced 59% (59,523 tCO_2e) of the GHG emissions from the study region's low-density homes. Of the various BC Assessment regions in the RDN, the City of Nanaimo is the largest single consumer of energy and generates the largest share of emissions. This aligns with expectations when considering the population distribution in the region, whereby 59% of the RDN's 170,367 residents live in the City[18].

In the City, 53% of energy consumed is electricity, which generates only 9.1% of emissions. Natural gas is 31% of energy consumed but generates 62% of emissions. Aggregately, consumption of fossil fuels (which does not include wood) in low-density homes generates 49,322 tCO_2e annually, equivalent to 83% of the City's emissions from low-density housing.

Figure 7: Energy consumption and GHG emissions per year by fuel type, low density homes, City of Nanaimo



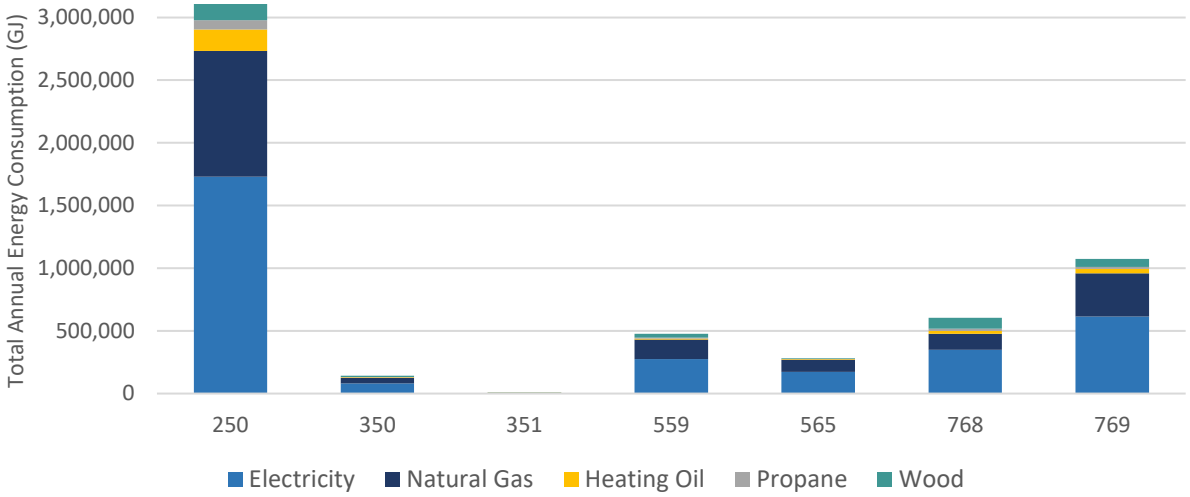
The below figures show a breakdown of energy consumption and GHG emissions by BCA region code in the study region[19]. The City of Nanaimo is region code 250 and consumes the most energy and generates the most GHG emissions of any single region code in the RDN. This is to be expected given the share of the regional population who lives in the city. Region codes 769 and 768 (Rural Nanaimo) contribute significantly to energy consumption and emissions in the RDN, while regions codes 351 and 350 account for very little of regional energy and GHG emissions. In all region codes, electricity consumption represents that largest share of energy consumption while natural gas contributes the largest share of GHG emissions.

[18] Statistics Canada (2023). Census Profile. 2021 Census of Population. November 2023.
[19] Per BC Assessment: 250 = City of Nanaimo, District of Lantzville (SD68) = 350, District of Lantzville (SD69) = 351, 559 = Parksville, Town of Qualicum Beach = 565, 768/769 = Rural Nanaimo

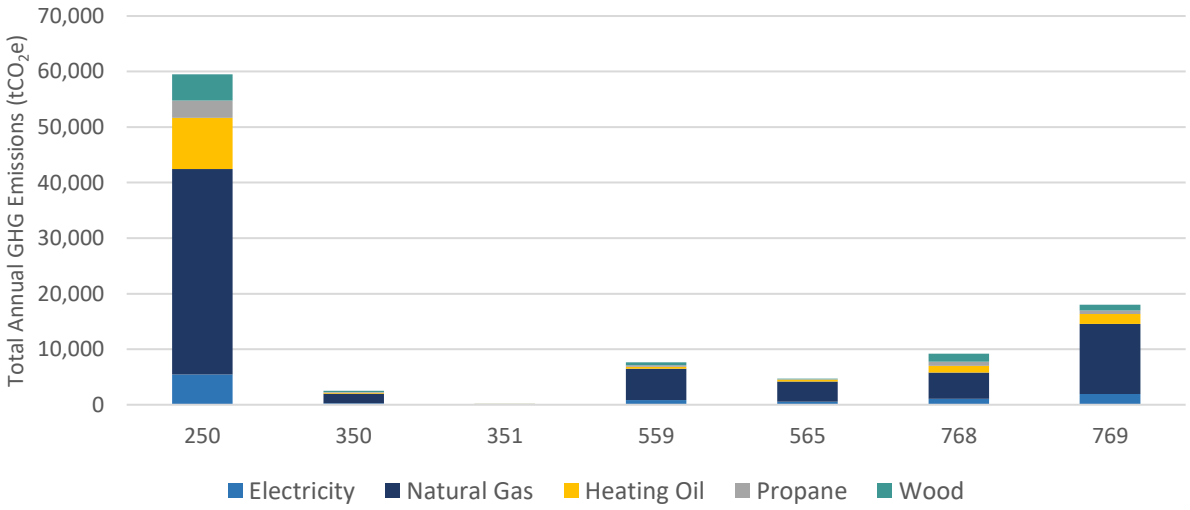
Figure 8: Energy consumption and GHG emissions per year by BCA region code, low-density homes, study region

250 = City of Nanaimo, District of Lantzville (SD68) = 350, District of Lantzville (SD69) = 351, 559 = Parksville, Town of Qualicum Beach = 565, 768/769 = Rural Nanaimo

a) Energy consumption (GJ)



b) GHG Emissions (tCO_2e)



Energy intensity (GJ/home) and emissions intensity (tCO_2e/home) are highest for medium single-family dwellings built before or during 1975 and large single family dwellings. While these homes do not represent the largest shares of total energy and emissions, they have large individual energy and emissions footprints. Conversely, triplexes and quadplexes have the lowest energy and emissions profiles per home, at 50 GJ/home and 0.8 tCO_2e/home. The average energy use per home in the RDN is 94 GJ/home, driven by the large share of small SFD built between 1976 – 1995 (93 GJ/home) that make up the regional housing stock. Unsurprisingly, newer SFDs (>1995) use significantly less energy per home than older SFDs. This trend is investigated in more detail in Figure 11.

Figure 9: Energy consumption (total and average/home (GJ)) per year by archetype, low-density homes, study region

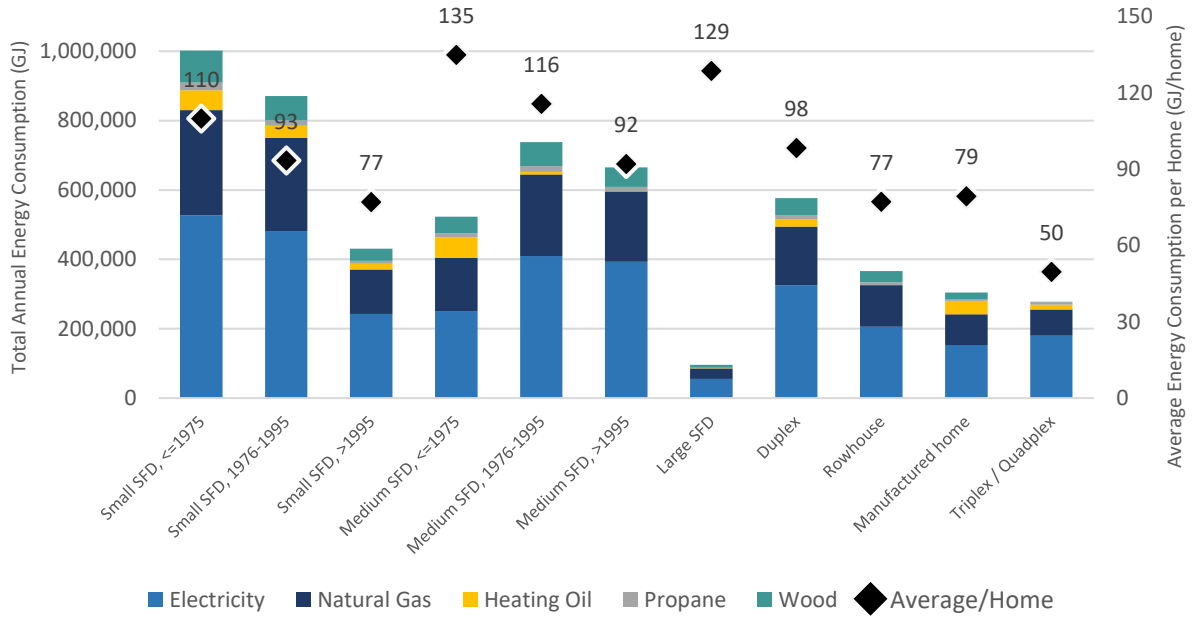
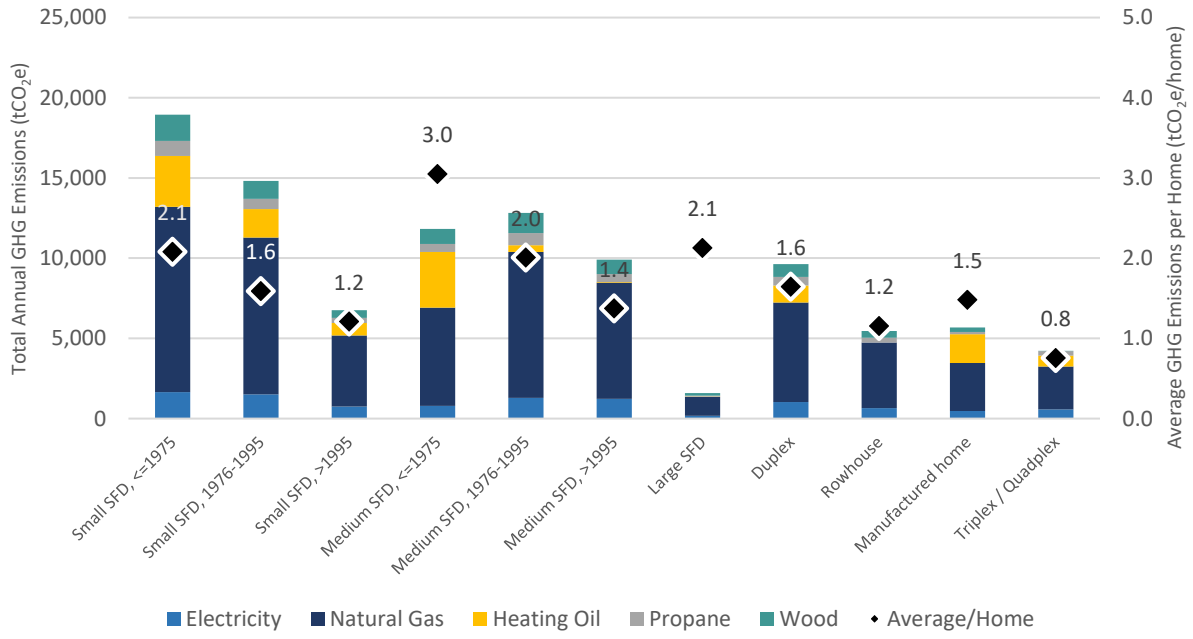


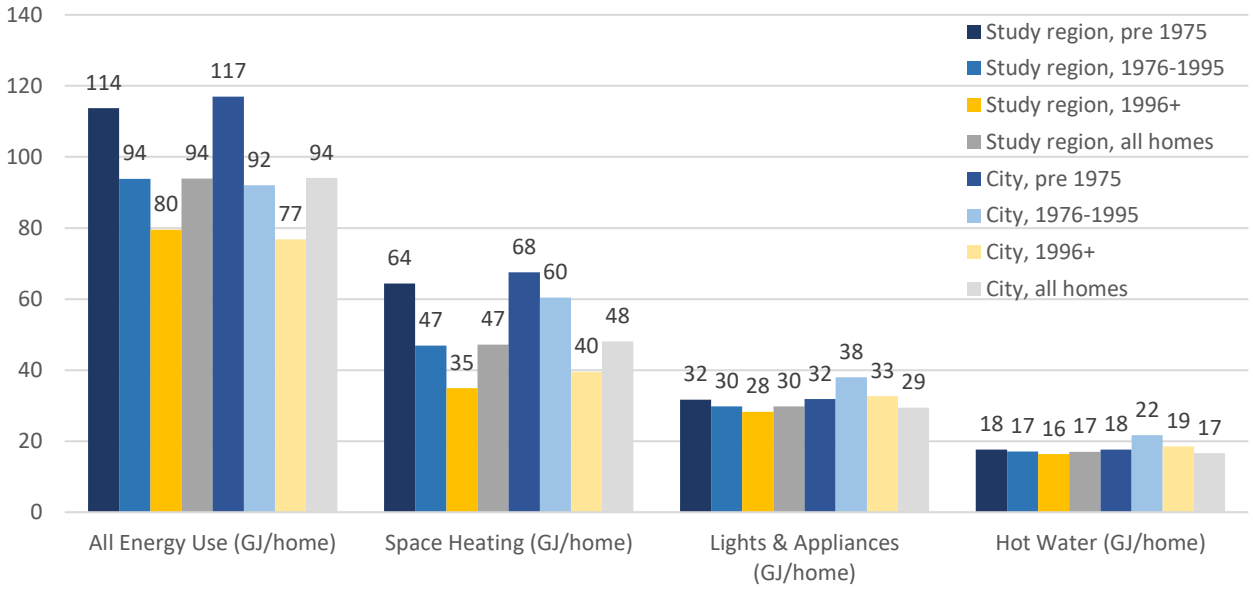
Figure 10: GHG emissions (total and average/home (tCO_2e)) per year by archetype, low-density homes, study region



In both the study region and the City, average energy consumption per home is higher in older homes. As shown below, this is driven almost entirely by energy use for space heating. On average in the study region, the oldest homes (pre-1975) consume 83% more energy for space heating than newer homes (>1995), while homes built between 1975 – 1996 consume 34% more energy than newer homes. Space heating also accounts for the majority

of overall home energy consumption regardless of home vintage, at 44% of energy consumption in newer (>1995) homes and 57% of consumption in older (<1975) homes. A local financing program would therefore maximize impact by targeting fuel switching and efficiency upgrades that reduce space heating consumption (i.e., heat pumps, insulation, windows and doors), particularly in older homes. Newer homes can also benefit from retrofits, particularly from the installation of rooftop solar PV, space and water heating electrification, and replacement of inefficient electric baseboard heating with electric heat pumps.

Figure 11: Average energy consumption per home by end energy use type (GJ/home) per year, low-density homes, study region and City of Nanaimo



2.1.3 Technical Energy and Emissions Reductions Potential

Home energy retrofits targeting fuel switching and energy efficiency measures have the potential to generate significant energy and GHG reductions in the region. As part of this study, the overall technical potential of home energy retrofits was investigated to understand how retrofits to this sector can contribute to overall energy and GHG reductions targets. Technical potential refers to the total savings that could be generated if all electric, natural gas and heating oil-heated homes in each region undertook the defined retrofits. *Note that these estimates were derived using archetypes (Appendix A) and retrofit packages (Section 3.5 and Appendix D). Retrofit projects, and resulting impacts to individual homes, will vary.*

For this analysis, two categories of retrofit were considered for all electric, natural gas and oil heated homes: 1) heat pump only (fuel switching from fossil fuels or conversion of inefficient electric baseboard heat) and 2) heat pump and efficiency measures (insulation, windows and doors). This analysis was conducted using the key archetypes developed for this study (see Appendix A). A portion of electrically heated homes were removed from the analysis to account for homes that have already installed a heat pump. Analysis of survey responses from phone participants indicated that this was around 44% of homes. The table below summarizes total technical potential from these retrofits in the study region and City.

Heat pump only retrofits to electric, natural gas and oil heated homes in the region could reduce energy consumption by 24% (1,419,940 GJ) and GHG emissions by 62% (62,542 tCO_2e). In the City, energy reductions could be around 25% (828,031 GJ) and GHG reductions around 63% (37,422 tCO_2e) of City low-density residential GHG totals. Note that energy consumption and GHG emissions from electricity actually increase in natural gas and oil heated homes as a result of these retrofits, but there is a net reduction due to decreases in fossil fuel energy consumption and GHG emissions.

As expected, energy and emissions reductions would be even higher for retrofits combining heat pumps with energy efficiency measures, specifically insulation improvements and more efficient doors and windows. These retrofits to electric, natural gas and oil heated homes in the region could reduce energy consumption by 31% (an additional 415,208 GJ) and GHG emissions by 63% (an additional 1,303 tCO_2e). In the City, energy reductions could be around 33% (an additional 242,123 GJ) and GHG reductions around 64% (an additional 760 tCO_2e).

Table 1: Total technical potential in the study region and City of home energy retrofits to electric, natural gas and oil heated low-density homes for two retrofit packages: heat pump only vs. heat pump + insulation

Retrofit Package	RDN (study region)	City of Nanaimo
Package 1: Heat Pump Only		
Energy Savings (GJ), total	**1,419,940 GJ**	**828,031 GJ**
Savings (% of each's CEEI total)	**24%**	**25%**
Electricity	260,810	141,205
Natural Gas	1,002,952	576,225
Heating Oil	156,179	110,601
GHG Savings (tCO_2e), total	**62,542 tCO_2e**	**37,422 tCO_2e**
Savings (% of each's CEEI total)	**62%**	**63%**
Electricity	819	443
Natural Gas	50,370	28,939
Heating Oil	11,353	8,040
Package 2: Heat Pump + Insulation, Windows and Doors		
Energy Savings (GJ), total	**1,835,148 GJ**	**1,070,154 GJ**
Savings (% of each's CEEI total)	**31%**	**33%**
Electricity	676,018	383,328
Natural Gas	1,002,952	576,225
Heating Oil	156,179	110,601
GHG Savings (tCO_2e), total	**63,845 tCO_2e**	**38,182 tCO_2e**
Savings (% of each's CEEI total)	**63%**	**64%**
Electricity	2,122	1,203
Natural Gas	50,370	28,939
Heating Oil	11,353	8,040

Note that this analysis does not include the impact of retrofits to wood or propane heated homes in the region, as these were not included in the key archetypes developed for this project. These homes account for roughly 8% of homes in the study region, and therefore total potential energy and emissions reductions from space heating and energy efficiency retrofits are likely even higher.

2.2 Nanaimo Demographics

Most study region households are homeowners. Reaching this group will nevertheless require tailored solutions, as residents generally earn less than the provincial average, constraining their ability and willingness to finance home energy upgrades.

Demographic data helps define the size of the market opportunity, as well as identify the key audiences the local program will cater to. The following section is based on 2021 census data and RDN and City reports.

Most households in the study region are owners (73%), rather than renters – the target audience for a local program. Home ownership is slightly lower in the City, at 67%[20]. One quarter of City residents and 38% of residents in the rest of the RDN are seniors (aged 65+). At the same time, over half of the region's residents (57% City and 48% rest of RDN) fall within the working age bracket of 20 to 64 years old – the population most likely to buy an existing home. As home buyers often participate in home improvement projects within the initial years following their purchase,[21] reaching this audience can represent an opportunity to influence planned renovations in favour of measures that result in GHG and energy savings and a multitude of other co-benefits.

On average, household income in the study region is less than the provincial average. In the study region, the average before-tax annual household income in 2020 was $92,500, with a median of $76,000. In the City, the average before-tax annual household income in 2020 was $91,600, with a median of $75,500. Average household income in both the study region and City is lower than the provincial average of $108,600. Sixty five percent of private households in the study region and in the City earn less than $100,000 annually – and 38% in each earn less than $60,000. Only 15% in each earned $150,000 or more in 2020[22]. While the large proportion of seniors in the study region likely contributes to lower incomes, these individuals and households also represent important target audiences for home energy retrofits. Unemployment in Nanaimo dropped significantly from the pandemic-era to 3.6% in 2022 – lower than rates for the broader Vancouver Island Coast, the province of BC and Canada.

Although the majority (73% in the study region and 67% in the City) of households are homeowners, those that fall within the low to moderate income (LMI) market segment[23] are less likely to be able to afford and undertake basic home repairs, let alone costly home energy upgrades.

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[20] City of Nanaimo (2023). 2023 State of the Nanaimo Economy.
[21] Home Improvement Research Institute. (2022). 4 Trends in Home Buying and Renovations from 2022.
[22] Statistics Canada (2023). Census Profile. 2021 Census of Population. November 2023.
[23] BC Housing defines low and moderate income as a) for residential units with less than two bedrooms, a gross household income that does not exceed the median income for couples without children in BC, equal to $84,780 in 2024, and b) for residential units with two or more bedrooms, a gross household income that does not exceed the median income for families with children in BC, equal to $134,140 in 2024.

2.3 Community and Homeowner Preferences and Insights

Financial priorities and considerations are top of mind for homeowners and vulnerable households in the decision on whether to undertake retrofit projects. Over one third of homeowners surveyed expressed a willingness to undertake moderate retrofits and an interest in a local government financing program.

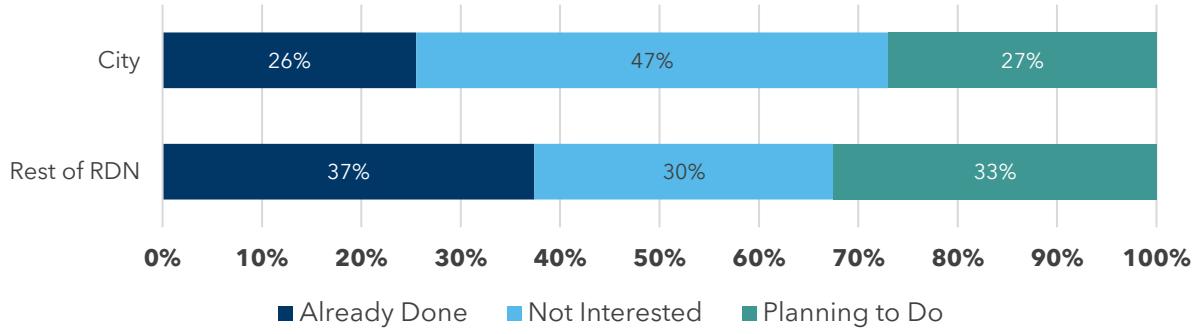
A phone and web survey of study region residents was conducted in early fall 2023 as part of this project to gain insights on homeowner preferences, experiences and perspectives around home energy retrofits and financing. Most survey respondents are residents of the City (82%), live in detached or semi-detached homes (85%), and are 55 years of age or older (64%). These demographics are therefore overrepresented compared to the overall population of the study region, comprised of 60% City residents, around 70% single-family dwelling residents, and 46% residents 55+ in age.

Targeted diversity, equity and inclusion consultations were also held with five community organizations representing a diversity of vulnerable communities in the region to gain perspectives and insights into diversity, equity and inclusiveness (DEI)[24]. The focus of these conversations was to understand potential regional-specific challenges from participating fully in a home energy efficiency retrofit financing program and recommend solutions for a more inclusive loan program.

The following section summarizes the answers from over 1,050 respondents to the survey and key insights and considerations from DEI discussions with local community groups.

Households have already started making home energy improvements. Over a quarter of total respondents (28%) have already installed a ground or air source heat pump. Interestingly, respondents outside of the City may be more interested in heat pumps right now. Over one third (37%) of rest of RDN respondents have already installed a heat pump and 33% are planning to, compared to 26% and 27% of City respondents.

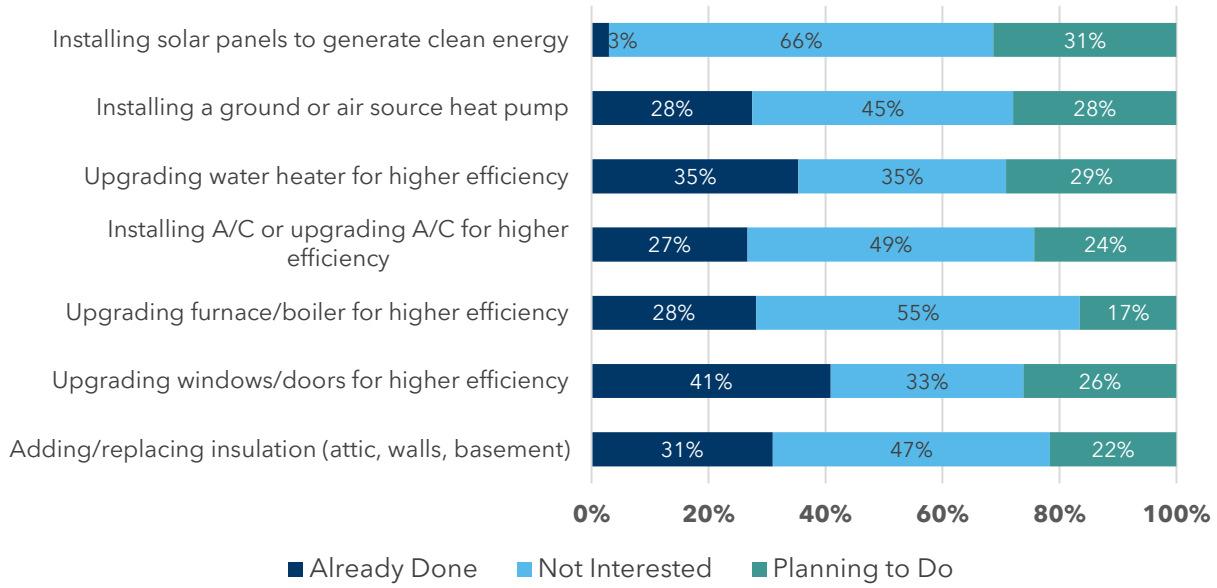
Figure 12: Heat pump retrofits completed or planned over the past 5 years, City vs. rest of RDN



[24] The community organizations represented communities including renters, low and modest-income households, and families; Indigenous communities; New Canadians and racialized communities; unhoused communities and those living in transitional and precarious housing; seniors; people who identify as members of the transgender community; and survivors of domestic violence.

The three most common energy upgrades respondents to the survey have completed are upgrading to more efficient windows and doors (41%), upgrading to a higher efficiency water heater (35%) and adding or replacing insulation (31%) (Figure 13).

Figure 13: Energy improvements completed or planned over the past 5 years, all survey respondents



There was a potential missed opportunity for fuel-switching in homes that upgraded to higher efficiency furnaces or boilers, underlining the need for immediate home energy retrofit supports and programs. While 28% of respondents have already installed a heat pump, the same proportion upgraded their furnace or boiler to a higher efficiency model instead. Encouragingly, there may be a shift in decision-making away from upgrading a furnace or boiler (only 17% planning – the least planned retrofit). There is an opportunity for heat pump retrofits in the 24% of respondents planning on installing or upgrading A/C, given their dual heating and cooling capabilities.

While only 3% of respondents have already installed solar panels, by far the least common upgrade, it is the top retrofit that respondents are planning (31%). There is significant potential for financing or other program supports to encourage solar PV installation in the region. The other top planned retrofits are upgrading to a more efficient water heater (29%), installing a ground or air source heat pump (28%) and upgrading to more efficient windows and doors (26%). The retrofit packages developed for this project and used to forecast program uptake and impact take these preferences into account and include a standalone solar PV retrofit, air source heat pump retrofits, and upgrades to windows and doors.

Over one third of respondents have an interest in existing retrofit financing programs and a willingness for modest home retrofit improvement. Of survey respondents, 38% indicated an interest in applying to existing loan, rebate, or incentive programs while 26% had already applied or were in the process of applying, indicating an interest in residential home energy retrofit financing broadly.

Respondents have an appetite for more moderate retrofits, with 38% of respondents willing to invest up to $20,000 and the larger share interested in a retrofit investment below $10,000. Only 8% indicated a willingness to invest over $30,000. Rest of RDN respondents generally showed more willingness to invest – only 8% are not willing to invest at all (vs. 15% City respondents) and 42% are willing to invest up to $20,000 (vs. 37% City respondents). City respondents showed slightly more willingness to invest in moderate to deep retrofits of $30,000 - $50,000.

Figure 14: Willingness for home retrofit investment, all survey respondents

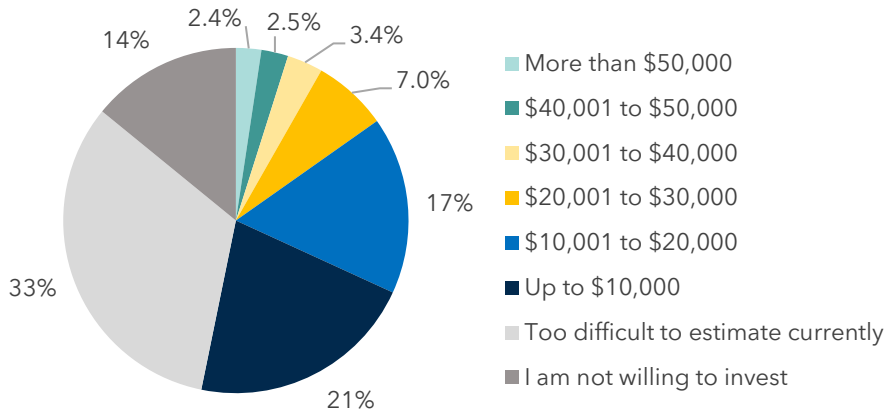
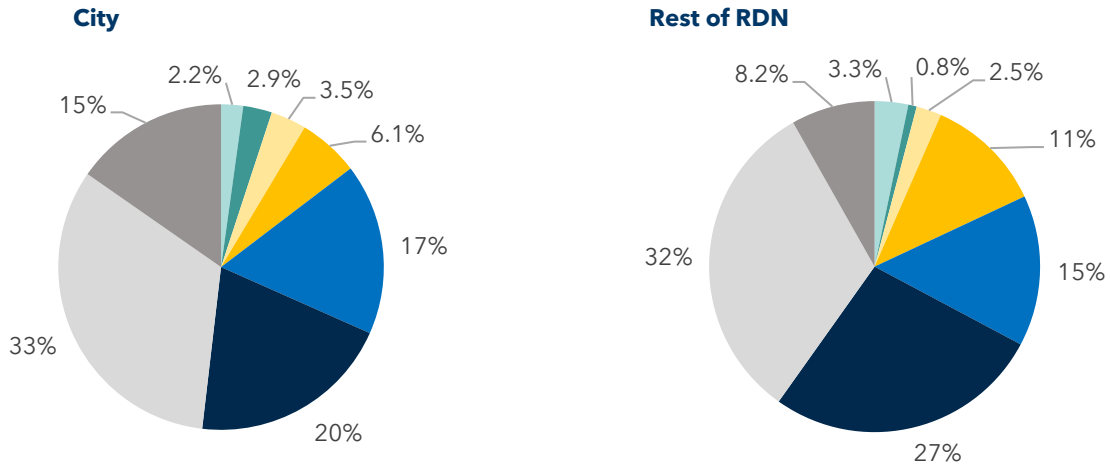
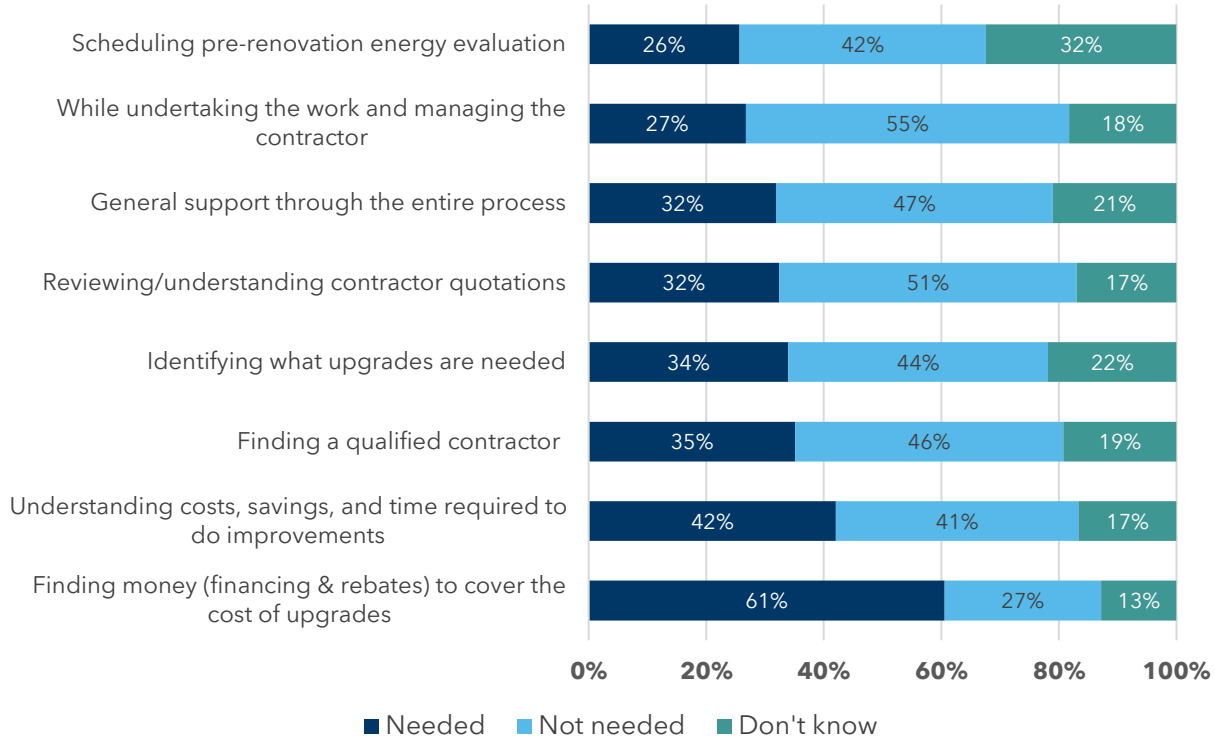


Figure 15: Willingness for home retrofit investment, City vs. Rest of RDN survey respondents



Most residents anticipate needing help during energy retrofits – and support finding retrofit financing topped the list. A full 60% of respondents agreed that they anticipate needing support finding money (including financing and rebates) to cover the cost of upgrades, and an additional 12% weren't sure. Many of the non-financial supports requested align with the goals and services of the region's newly launched Home Energy Navigator. These include understanding costs, savings and time required for home improvements (42%); finding qualified contractors (35%) and reviewing quotes (32%); and identifying needed upgrades (34%).

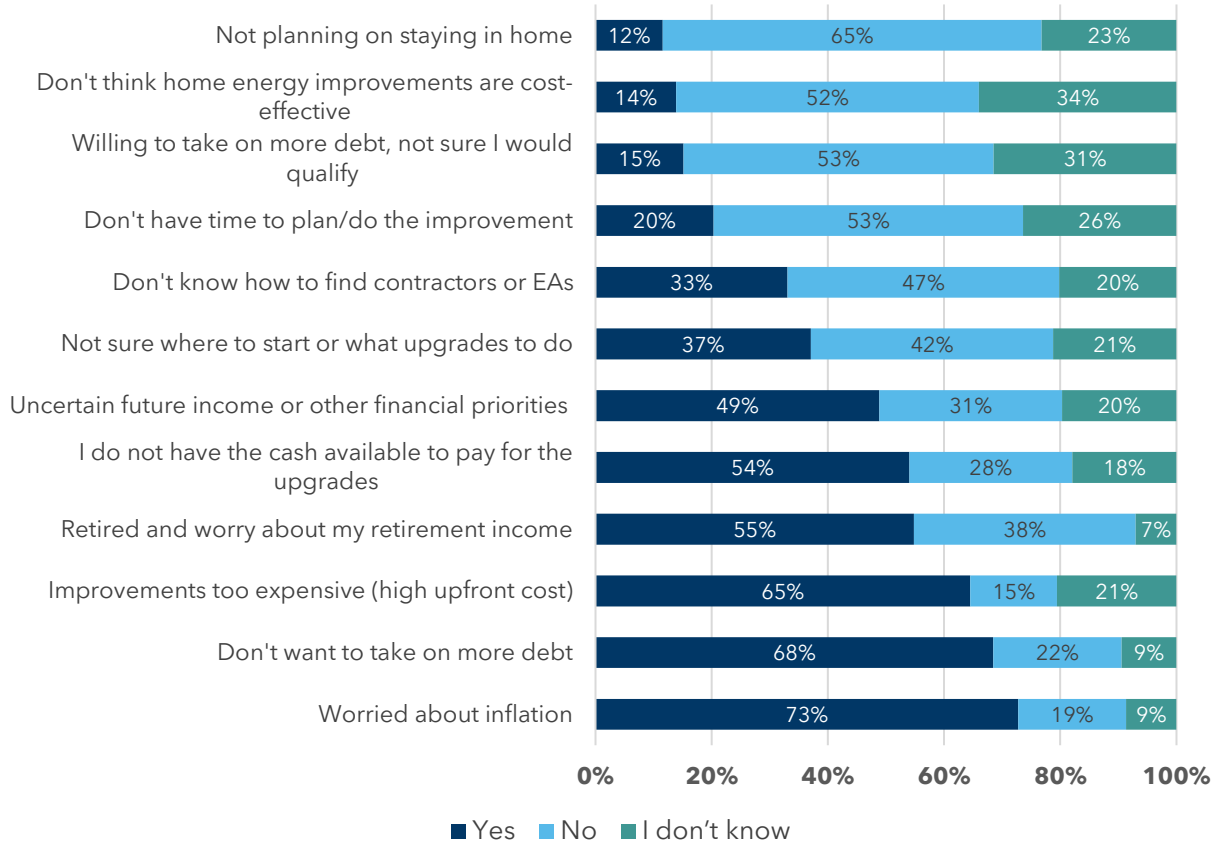
Figure 16: Types of support needed during energy retrofits, survey respondents



Financial factors dominated the factors discouraging homeowners from undertaking retrofit projects. Concerns over the impacts of inflation (which leads to rising prices and interest rates; 73%), reluctance to take on more household debt (68%), and high upfront costs (65%) were most frequently cited by homeowners. Concerns from senior homeowners with fixed retirement income (55%) or residents with uncertain future incomes (e.g., gig workers, precarious employment) or other financial priorities (49%) were also significant.

Survey findings aligned strongly with key barriers identified in the DEI assessment. Energy efficiency is a low priority for many households – especially when weighed against housing, food, and health. Many households in these communities have an inability or reluctance to take on additional debt – a feeling exacerbated by the current twin housing and affordability crises. There is potential opportunity in the 15% of respondents who are willing to take on more debt but are unsure if they would qualify. It should be emphasized that a portion of these respondents may not be in a position to take on more debt. It is encouraging to note that only 14% of respondents do not think that home energy improvements are cost-effective.

Figure 17: Factors discouraging homeowners from undertaking retrofit projects, survey respondents



Over one third of respondents would consider making home energy improvements as part of a local government borrowing program, with a significantly higher proportion in the RDN than the City (49% vs. 31%). Respondents appear relatively indifferent about the mode of loan repayment of such a program, though PACE ranked lower than repayment through a local lender or via utility bill. Since neither the phone nor web survey provided detailed information about PACE, it is possible that lack of familiarity with PACE contributed to this result – especially given the narrow margin of preference between options.

Figure 18: Willingness to make home energy improvements as part of a local government borrowing program, survey respondents

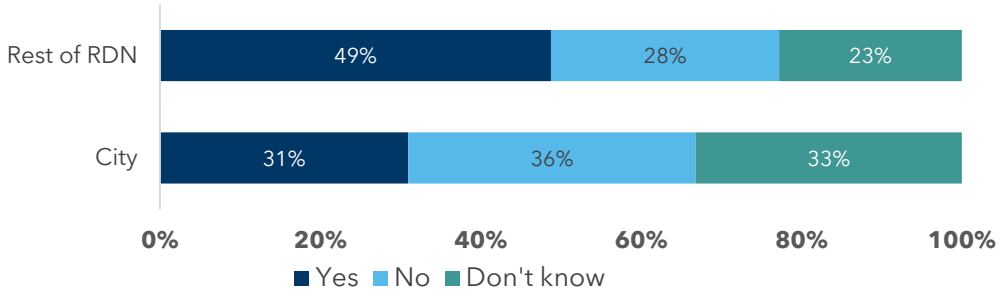
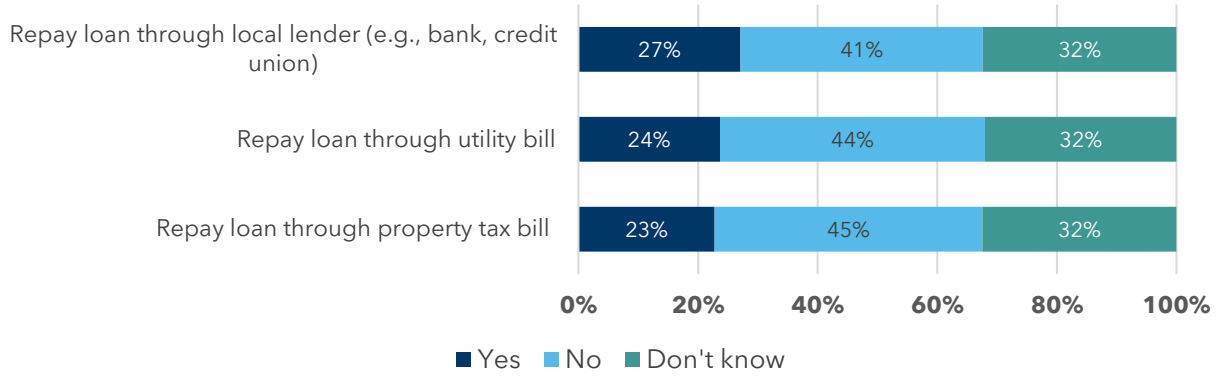
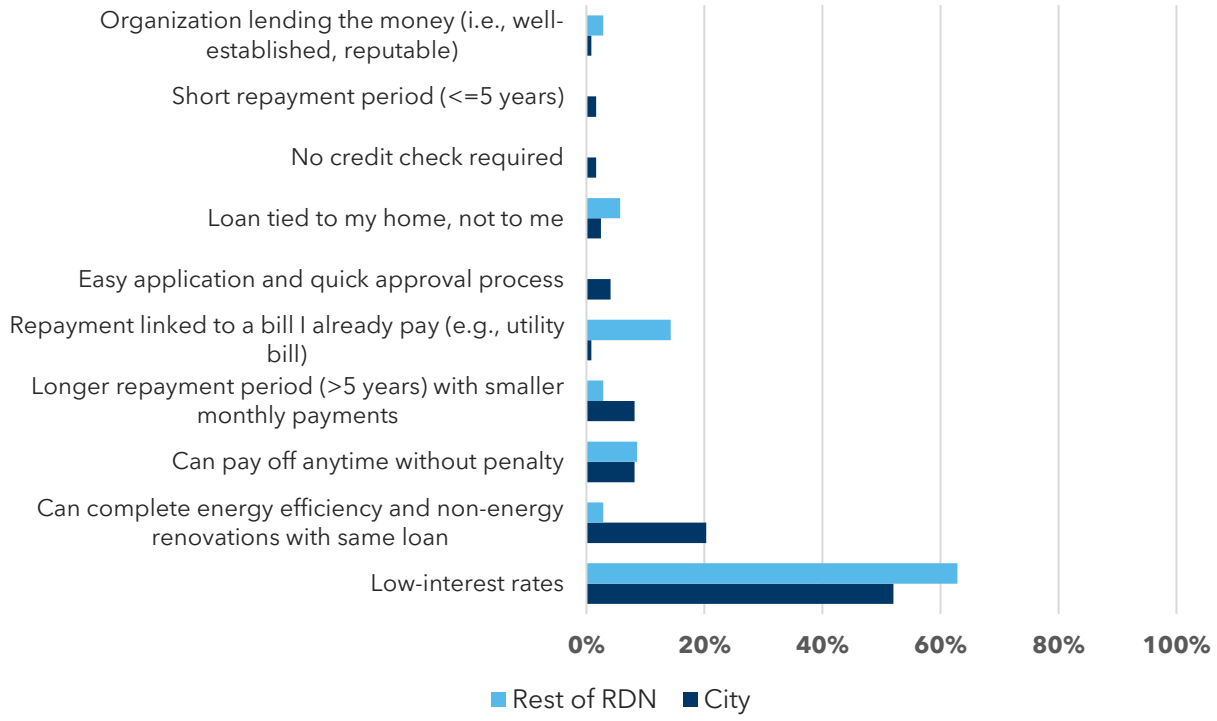


Figure 19: Preferred method of loan repayment, survey respondents



All four of the top program features identified by survey respondents aligned with insights and recommendations from the DEI assessment. Homeowners were most interested in program features that minimized their total loan, such as low interest rates and the absence of prepayment penalties. Community organizations consulted for DEI perspectives also emphasized a mindful, flexible approach to loan payback that is tailored to the needs and risks of each community. Desirable features included the ability to pay off the loan anytime, waive penalties and late fees, and pause payments. **However, as stressed in the DEI assessment, reducing risks associated with participation in home retrofit financing is equally, if not more, important than removing barriers.**

Figure 20: Top program design features, survey respondents

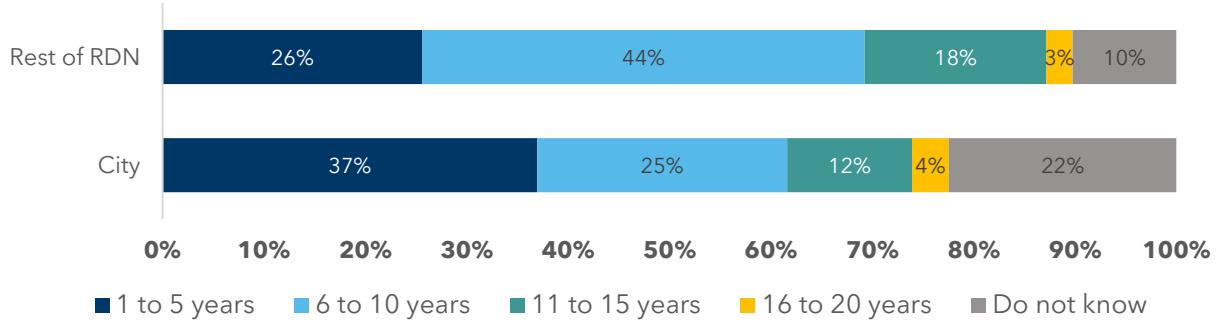


The second most important feature among survey respondents was the ability to complete non-energy renovations using the same loan – a feature that was underlined by community organizations as well. Cited examples included aging-in-place and safety improvements for seniors (e.g., guardrails, anti-skid tiles), health and safety improvements (e.g., lead-based paint and mold removal, asbestos abatement) and home repair.

> "Simply removing barriers to accessing loans without being sensitive to unique financial circumstances and lived experiences of vulnerable community members heightens these risks. **We recommend that lenders prioritize reducing risks of participating in a loan program more than merely removing barriers to accessing the loan**."
>
> - DEI consultations

Preferred loan term among respondents varied, with 35% of respondents preferring a shorter term (0 – 5 years) and 30% of respondents interested in a loan term of 5 – 10 years. Conversely, community organizations representing modest income homes emphasized longer terms, with fixed low monthly payments.

Figure 21: Preferred term of loan repayment, survey respondents



Overall, respondents to the survey showed an interest in home energy retrofits – including heat pumps. There is significant potential for financing or other program supports to encourage solar PV installation in the region, more efficient water heating, ground or air source heat pumps and upgrading to more efficient windows and doors (26%). Respondents show a willingness to undertake moderate retrofits that could drive energy bill savings, and an interest and appetite for retrofit financing – including a local government program. Most residents anticipate needing help during energy retrofits – and support finding retrofit financing topped the list.

Financial factors dominated the factors discouraging homeowners from undertaking retrofit projects. Concerns over the impacts of inflation (which leads to rising prices and interest rates), reluctance to take on more household debt, and high upfront costs were cited by homeowners and DEI community groups. All four of the top program features identified by survey respondents aligned with insights and recommendations from the DEI assessment. There is strong interest in program features that minimize total loan, such as low interest rates and the absence of prepayment penalties. Community organizations consulted for DEI perspectives also emphasized a mindful, flexible approach to loan payback that is tailored to the needs and risks of each community. Desirable features included the ability to pay off the loan anytime, waive penalties and late fees, and pause payments.

2.4 Workforce Capacity to Deliver Energy Retrofits

The capacity of the local workforce to deliver home energy upgrades is critical to meet expected program demand. The green workforce in the Regional District of Nanaimo has grown quickly in recent years and is likely capable of supporting a local program.

The local home renovation ecosystem is key to the success of a local program. While a local program can address key financial barriers pertaining to home energy upgrades, the ability to complete home energy upgrades and benefit from energy cost savings is dependent on the proper design, installation and other work completed through the local retrofit workforce.

Homeowners interested in undertaking home energy upgrades often do not know where or how to begin. They need help effectively identifying and prioritizing energy upgrades suited to their homes and benefit from guidance around engaging skilled contractors, vetting quotes, and ensuring the work has been completed to satisfaction. Robust consumer protections help to ensure that a homeowner's investment in energy upgrades delivers on projected benefits and represents good value. A pool of certified Energy Advisors and skilled retrofit workforce are essential to provide expert advice and deliver quality work.

This section describes existing workforce capacity and ongoing actions that may be needed to support a home retrofit financing program. It was informed by a review of select existing City and RDN resources, targeted discussions with City Green Solutions, web-based research and review of the current database of NRCan service organizations and CleanBC Program Qualified Energy Advisors and program registered contractors.

Energy Advisors (EA) conduct EnerGuide home evaluations, which measure a home's current energy performance and provide a rating. These evaluations also provide recommendations on which energy upgrades to prioritize based on the unique characteristics of the home.

The EnerGuide system operates with comprehensive quality assurance protocols, including quality control checks, frequent evaluations, and redress processes. Currently, EnerGuide evaluations are required for Canada Greener Home Grants and Loans and to access funding through FCM's CEF initiative.

➢ **NRCan Registered Energy Advisors:** The nationally recognized EnerGuide Rating System was developed by NRCan over 25 years ago. To qualify as a registered EA, candidates must pass a rigorous competency test, perform initial assessments with a senior EA, and abide by a code of ethics. They must work with an independent, NRCan-licensed Service Organization (SO).

➢ **NRCan accredited Service Organizations (SO):** SO are independent organizations licensed by NRCan to use the EnerGuide Rating System.

➢ **CleanBC Program Qualified Energy Advisors (PQEAs):** PQEAs are NRCan registered EAs who have completed additional training specific to BC rebate programs. Homeowners must use a PQEA for the EnerGuide home energy evaluations required to access Better Homes and Home Renovation Rebates.

Qualified contractors are needed to meet the local demand for home energy upgrades and related improvements. Specialized training is needed to effectively complete many energy and low-carbon retrofits and ensure proper installation and commissioning to allow homeowners to achieve projected benefits. Contractors also need soft skills to fully support homeowners.

➢ **CleanBC Registered Contractors:** To improve quality, safety and confidence, CleanBC requires the use of registered contractors specific to each program to access most program elements. Registered contractors must have completed building science and best practice training, be registered and in good standing with WorkSafeBC, and maintain an up to date-business license and general liability insurance. They must also agree to a code of conduct to charge reasonable service rates, provide warranties, advise about program rebates, and ensure work is performed safely and meets industry standards. Registered contractors – including specific Income Qualified and Finance program designations – are required to access the CleanBC Better Homes and Home Renovation insulation and heat pump rebates, and Income Qualified and Low-Interest Financing Programs.

2.4.1 Contractor Capacity

Recent growth in contractors specializing in heat pumps has bolstered contractor capacity in the region, and there appears to be sufficient capacity to support a local financing program. In 2021, a local contractor list was created for the RDN's Transition 2050 Residential Retrofit Acceleration Project, which sought to accelerate home retrofit market transformation[25]. Updated research for this project reveals numerous new organizations since then, many of which specialize in heat pumps. This finding was corroborated by City Green Solutions, who confirmed significant growth in heat pump contractors from roughly 30 – 40 a couple years ago to over 70 CleanBC registered heat pump contractors for the Better Homes and Home Renovation Rebate Program. They noted that they consistently receive new contractor names in quotes and communications received while administering the region's Home Energy Navigator program. Insulation, window and door contractors have maintained a steady but sufficient presence in the area over time. There is little to no overlap in contractors providing services in heat pumps and energy efficiency upgrades (insulation, windows, doors), meaning that homeowners need to engage with multiple contractors for deeper retrofit projects. BC Hydro's increased emphasis on HVAC provider training and installation standards is helping improve installation quality in this unregulated industry.

Of the contractors providing services in the region, most have a head office located in one of Nanaimo, Lantzville, Parksville, or Qualicum Beach (i.e., the RDN).

[25] City Green (2024). Transition 2050 Residential Retrofit Acceleration Project: 2018 – 2020. Accessed January 2024.

Table 2: CleanBC registered contractors listed for the Regional District of Nanaimo (including the City)

CleanBC Program	Heat pump contractors	Insulation contractors	Windows/doors contractors
Better Homes and Home Renovation Rebate	73	20	9
Income Qualified Program	61	17	8
Low-Interest Financing	5	-	-

2.4.2 Current Energy Advisor Capacity

There is currently adequate energy advisor (EA) capacity within Nanaimo and surrounding areas to accommodate a local program. There has been a recent boom in EAs servicing Vancouver Island driven largely by the federal Canada Greener Homes program. While this has centered on the Capital Regional District, Nanaimo has also seen an influx over the last couple years. Comparing NRCan's *Find a service provider for existing homes* and CleanBC's *Find an energy advisor* database reveals 26 unique service organizations (SO) providing services in the Regional District of Nanaimo[26,27]. Twenty NRCan-listed organizations provide services to all FSAs in the study region. The two FSAs serviced by the lowest number of SO (V9G and V0R) can still access 19 SOs. See Appendix B for a full list of SOs.

Table 3: CleanBC Program Qualified Energy Advisors (PQEA) listed for the City and Regional District of Nanaimo

Database	Service Organizations	Program Qualified Energy Advisors	
	RDN (including City of Nanaimo)	City of Nanaimo	RDN
CleanBC *Find an energy advisor (Renovating a home)*	21 (with at least one PQEA)	68	65
NRCan *Find a service provider for existing homes*	23	N/A	N/A

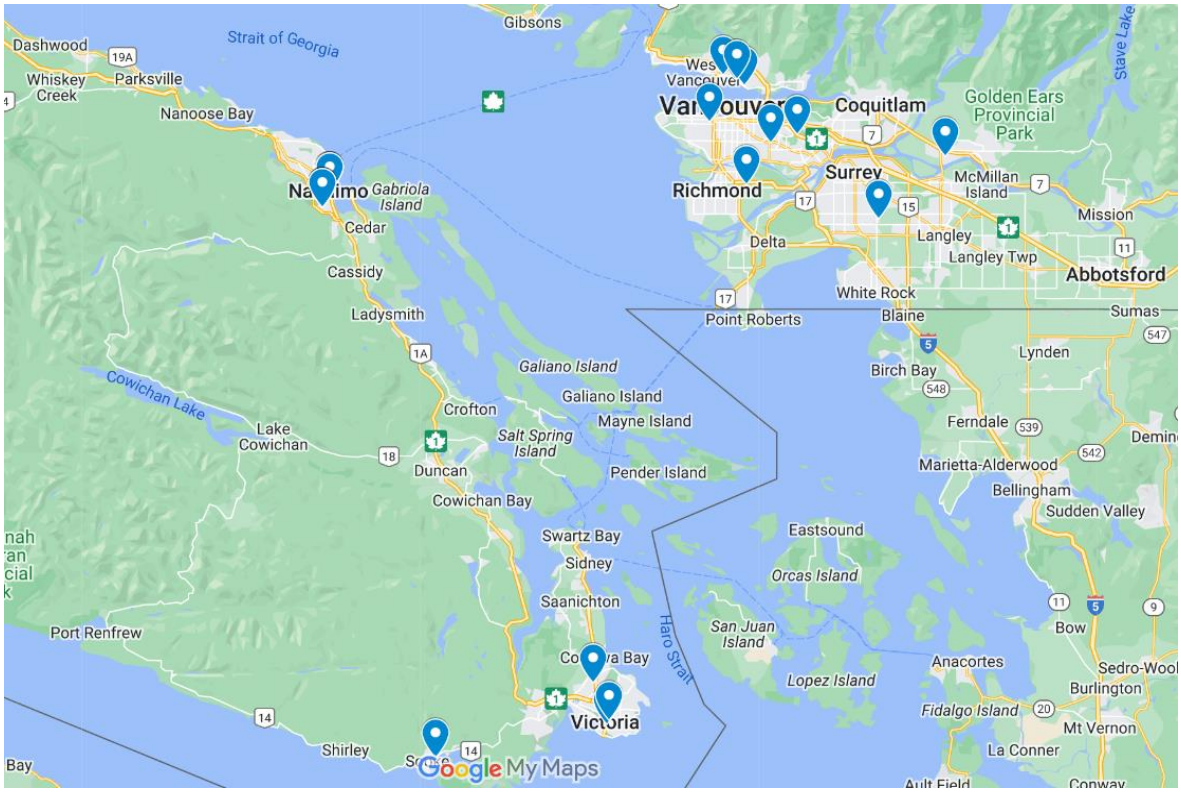
Most of these organizations are physically located outside of the RDN, with the majority being headquartered on the lower mainland around Vancouver. Only five SO (19%) list addresses in the RDN, all of which are in Nanaimo: Acacia Engineering Ltd, CHBA BC Nanaimo, CoEfficient Building Science (BC Island), Enerhome Consulting Ltd (Vancouver Island) and VerdaTech

[26] NRCan's "Find a service provider for existing homes" to identify energy efficiency service providers that serve the Regional District of Nanaimo in December 2023. The FSA codes used for this search are: V9G, V9K, V9P, V9R, V9S, V9T, V9V, V9X, and V0R.
[27] CleanBC's "Find an energy advisor" for renovating a home in the Regional District of Nanaimo

Energy Management and Consulting Inc (British Columbia). City Green Solutions, GETS Energy and Method Engineering and Building Sciences Ltd list addresses in Victoria.

The Canada Greener Homes Grant was closed to applications in February 2024. The program had significant funding for energy advisor costs, and its early closure has created uncertainty for EAs. The Government of Canada simultaneously announced that a new grant program targeting LMI households would be forthcoming. Funding and focus on EAs is presently unknown.

Figure 22: Map of service organizations that service the RDN with known addresses on Vancouver Island or the lower mainland



2.4.3 Expanding Local Capacity

The City and RDN should monitor the growth of EAs and contractors servicing the region and any variation in the cost and quality of work. Local capacity and household satisfaction are both critical to program success. While there is currently sufficient local green workforce capacity to support anticipated program uptake, changes to the retrofit financing landscape – especially the Canada Greener Homes Loan – could impact the number and growth of EAs and specialized contractors. The annual program report from the HEN will include an analysis on measure cost variability from reviewed quotes as well as cost compared to R-value, details that can reveal the scale of cost variation between projects and measures and help focus program support in these areas.

Installation of energy efficient equipment and low-carbon technologies requires contractors with specialized training and skills. While the industry is expected to naturally increase capacity in these areas based on existing provincial and regional plans, policies and incentives, **municipalities can play a role in supporting contractor training and upskilling by promoting available programs and through other enabling strategies.** Coordination and collaboration with local colleges and universities (e.g., Vancouver Island University, Discovery Community College, Sprott-Shaw College, BCIT) can address the need for skills and training in low-carbon and renewable energy technologies, building design and renovation, heating, refrigeration, and air conditioning and fill gaps in the green workforce. Industry and training organizations (e.g., TECA, HRAI, Home Performance Stakeholder Council, Better Homes BC networks) provide support –through advocacy, training, and education. These cover a broad range of subjects such as HVAC systems, insulation, and envelope fundamentals, building controls, passive house design, building re/commissioning, and renovation fundamentals.

2.5 Home Energy Navigator Program

Energy concierge services can play a vital role in supporting and delivering local energy programs and initiatives. The Regional District of Nanaimo's recently launched Home Energy Navigator service is perfectly positioned to support a local government-led financing program.

The Home Energy Navigator (HEN) is a free (to residents) program offered in all RDN communities, the Capital Regional District, and City of Vancouver. In Fall 2023, RDN partnered with program administrator City Green Solutions to offer a limited time pilot program to residents of duplexes, townhouses, and single-family homes – segments well-aligned with those investigated for this study[28].

HEN services available in the RDN pilot include a free virtual home energy consultation and help identifying potential upgrades, free support from a CleanBC Better Homes Energy Coach around rebates and applications and preparing for and reviewing contractor quotes[29]. The service provides unbiased and independent advice on a broad range of home energy upgrades, with an emphasis on fuel-switching from fossil fuel to electric systems.

Initial data for the HEN program indicates a strong start, with significant interest and 48 registrations as of early December 2023, split almost equally between the City and rest of RDN[30]. Outside of the City, residents from Electoral Area B and Lantzville have shown the most interest. While full details weren't available at the time of writing for the start of 2024, it was confirmed that the program was 82% subscribed and expected to be fully subscribed by end of February 2024.

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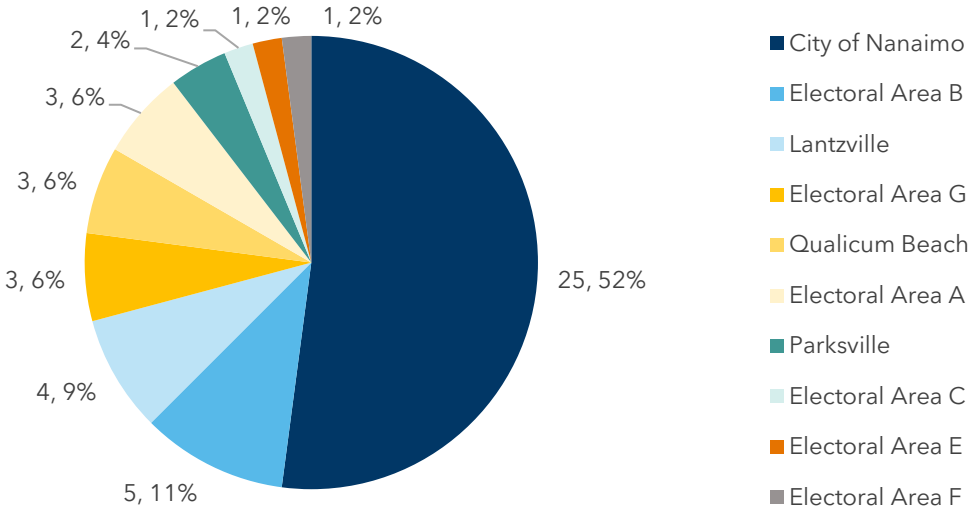
[28] Regional District of Nanaimo (2023). Home Energy Navigator Program Launched to Help Guide RDN Residents Through Home Energy Upgrade Process. September 6, 2023.
[29] Home Energy Navigator (2024). Regional District of Nanaimo. Accessed January 2024.
[30] City Green Solutions (2023). Home Energy Navigator: Interim Report – November 2023. Regional District of Nanaimo. December 2023.

Figure 23: Home Energy Navigator Program registrations by RDN community, Launch to December 2023 (# participants, % participants)



Community events – such as RDN-sponsored, locally hosted DIY air sealing workshops – are currently the primary referral channel (20%) and represent an opportunity for promotion of a future financing program. The process takes, on average, 12 months to complete, with most time spent planning, choosing, and installing upgrades. As of February 2024, most HEN participants are on either *Step 1: Getting started* or *Step 2: Planning & choosing upgrades*.

City Green is currently piloting the Neighbourhood Energy Navigator Offer in the CRD, an alternate pathway in the Home Energy Navigator. The offer is similar to the HEN with a more nuanced and sensitive onboarding process that includes discussions on financial expectations and income-qualification. Participants are referred to a specific group of Energy Advisors who provide reports with breakdowns of different upgrade "packages" and associated rebates. The cost for this new service is currently subsidized by City Green.

3. Program Rationale & Projected Impacts

Summary of Findings

The decarbonization of the study region's residential sector and the achievement of the RDN and City's emissions targets will be unattainable without significantly increasing the number of retrofits within the community. Space heating mechanical retrofits combined with moderate energy efficiency measures can drive 63% emission reductions in existing electric, natural gas and oil-heated low-density homes in the study region. A local program can:

1. **Address financing and delivery gaps in existing interventions**, such as by covering the full upfront cost of energy upgrades, including improvements that may need to be undertaken alongside a home retrofit (e.g. electrical panel/wiring upgrades), and expanding eligible projects to include home safety measures.
2. **Overcome retrofit barriers and reduce risks of participation** faced by homeowners by offering accessible and low-cost financing for energy upgrades, strengthening energy and financial literacy in the community, and reducing risk for vulnerable households faced with high pressure contractor sales tactics combined with outsourced contractor financing.
3. **Drive local energy and emissions reductions and complement GHG policies and regulations while proactively addressing rising fossil fuel energy costs.** Anticipated energy reductions are primarily achieved through solar PV retrofits and retrofits to homes using inefficient baseboard heating. GHG reductions are driven by retrofits to oil and natural gas heated homes. Over the five-year program period modeled for this analysis, a local financing program could reach between ~540 – 1,570 households in the study region and drive annual GHG emission reductions of between 240 - 670 tCO_2e. Under the medium adoption scenario, a local financing program could contribute 0.5% of annual GHG reductions needed by 2050 to achieve 80% reductions from the residential built environment in the RDN (against a 2007 baseline). In the City, under the medium adoption scenario, a local financing program could reach an average of 119 homes per year and generate 286 tCO_2e average annual GHG reductions. This would contribute 0.5% of annual GHG reductions needed by 2030 to achieve 50% GHG reductions from residential buildings, and contribute 0.4% of annual GHG reductions needed by 2050 to achieve 100% reductions from residential buildings (both against a 2010 baseline).

   Note: A financing program cannot and should not aim to achieve 100% of needed GHG reductions from existing homes. Not all households or retrofit projects will require financing, and financing is not suitable or recommended for all households.
4. **Enable more equitable access to healthy, comfortable and energy efficient homes.** This can be achieved through customized energy concierge services, risk mitigation measures (e.g., contractor vetting, consumer protection measures), simplified underwriting criteria, and collaboration with local community groups who have built connections and trust with local communities vulnerable to program risks.

The following section explores the business case for a local program in detail and considers its added value within the local energy efficiency ecosystem, as well as its potential impacts.

3.1 Overview of Program Benefits

By helping to reach a greater number of households, a retrofit program championed by the RDN and/or City can offer numerous benefits to residents, the municipality, and the local community more generally.

A local program would contribute not only to the RDN and City's climate mitigation objectives, but also its adaptation goals, by helping to make homes more resilient. Benefits to participating households, the RDN and/or City and the broader community are listed below.

Table 4: Benefits of a local government financing program

Benefitting groups	Description of benefits
Household benefits 	• Can help overcome numerous market barriers (e.g., upfront costs, access to financing) and fill gaps in existing offerings • Preferential financing terms at competitive/below-market rates, allowing homeowners to undertake more extensive home energy improvements while lowering risk and payments • Improves home comfort, safety, air quality and climate resiliency (e.g., air conditioning from heat pumps, increased airtightness and better ventilation during wildfire smoke events, increased airtightness during power outages) • Landlord participation could benefit renters (increased comfort and resilience) if potential risks (e.g., rent increases; "renovictions") are understood and mitigated within program design/implementation • Adds value to the property
Municipal benefits 	• Supports the RDN and City's climate mitigation targets and contributes to climate adaptation goals • Program costs can be partially covered by external grants or capital and shared with delivery partners, so that it does not add substantive operational costs to the RDN and/or City
Community benefits 	• Contributes to low-carbon resilient communities by reducing GHG emissions and increasing resilience of housing stock • Improves affordability through lower energy bills • Can support aging in place through low, fixed payments and health and safety upgrades, if eligible under the program • Reduces the need for costly energy infrastructure investments by reducing total energy consumption of existing housing stock • Strengthens local economy by increasing the number of green jobs

3.2 Addressing Market Gaps

Many existing initiatives have been unable to drive retrofit volume at the accelerated pace and depth needed in Nanaimo. A local program could be designed to overcome persisting market gaps and barriers while reducing risks to homeowners.

There are several market interventions currently in place that promote more efficient homes, including rebates, direct install programs, building codes and efficiency standards. While each presents its own set of strengths, various financing and delivery gaps remain in place, as described in the callout box below.

A comprehensive overview of specific programs for home energy retrofits available to residents of the Nanaimo region is provided in Appendix C.

1. **Building codes and standards and equipment standards** improve building and equipment efficiency and safety and create consistent standards within the industry. The application of these regulations is often triggered by voluntary homeowner decisions to upgrade and modernize their home. However, these codes and standards do not address financial barriers related to a homeowner's ability to afford upgrades. Financing can help households meet increasingly stringent Code requirements – including BC's proposed Highest Efficiency Equipment Standards. These standards, currently under consultation, would require all new space and water heating equipment sold and installed in BC after 2030 to be at least 100% efficient[31].
2. **Incentive and rebate programs** are effective at driving uptake by reducing total project costs. However, these programs often come and go, creating market uncertainty. They also require a significant, non-recoverable investment by the program provider (usually government or utility) to make funds available to participants. There is typically a wait of several months to receive the rebate. These programs frequently exclude certain segments of the market, particularly renters and households who cannot cover upfront costs.
3. **Direct install programs** offer services and upgrades at no cost to "income eligible" households (e.g., BC Hydro and FortisBC Energy Conservation Assistance Program)[32]. However, many such programs offer minor improvements (e.g., LED light bulbs, high efficiency showerheads, weatherstripping), have fairly low participation rates and are costly and complex to administer[33]. These programs can increase home comfort for participants as well as awareness of energy efficiency more broadly, and sometimes include energy coaching. They often do not achieve material bill savings or energy or GHG reductions at the scale required to meet municipal targets.

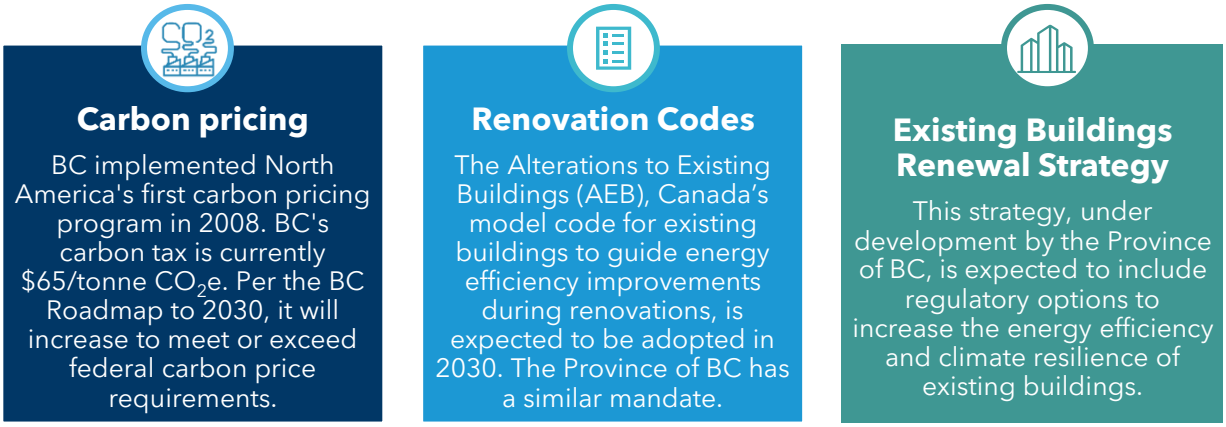
[31] CleanBC (2023). Highest Efficiency Equipment Standards Regulatory Consultation. December 2023.
[32] The income threshold for eligible participants in these programs tend to roughly align with the income thresholds for Low and Moderate Income households.
[33] Based on one study's estimate, this number wavers between 0.7% to 1% of eligible households, costing $400 - $1,000 and achieving energy savings of less than 5 GJ per participant. For more details, see Kantamneni, A., & Haley, B. (2022). Efficiency for All: A Review of Provincial/Territorial Low-income Energy Efficiency Programs with Lessons for Federal Policy in Canada. *Efficiency Canada*.

4. **Unsecured green loan products** can offer slightly better terms than regular consumer loans but tend to follow rigorous underwriting standards. A number of financial institutions have introduced these products, including RBC's Energy Saver Loan and VanCity's Planetwise Renovation products (loan, line of credit, and home equity line of credit). Exceptionally, the Canada Greener Homes (CGH) Loan program currently offers interest-free loans, making payments more manageable and affordable than other financing options on the market. While the program has received considerable interest to date, it often fails to cover the full upfront cost of upgrades or any cost overruns. The program also faces an uncertain future, potentially sunsetting in 2024.

Note about the CGH Grant and Loan Programs. In early February 2024, the Government of Canada announced that CGH Grant program is fully committed and no longer accepting new applications[34]. The Government confirmed that the next phase of the CGH initiative, part of the forthcoming *Canada Green Buildings Strategy*, will target grants more precisely to low- and median-income households. Presently, the CGH Loan program continues in its current form.

At the same time, policies, regulations and voluntary standards are needed to stimulate new demand for home retrofits. These include BC's current carbon pricing system (via the *Carbon Tax Act*[35]), as well as federal and provincial work to develop and adopt the Alterations to Existing Buildings (AEB) model code by 2030. The City of Vancouver has already implemented energy efficiency requirements for home renovations to single detached houses, duplex units and laneway houses/infill via the 2019 Vancouver Building By-law[36].

Figure 24: Range of existing and future low-carbon and energy efficiency policies and requirements



Additional policies and regulations that drive demand for home energy retrofits, and thus the need for financing solutions, could come into force in the next five to ten years. As part of BC's Roadmap to 2030, the Province intends to introduce energy efficiency ratings or labels to home sales to motivate owners to invest in retrofits.

[34] Government of Canada (2024). News release. February 5, 2024.
[35] Government of BC (2008). Carbon Tax Act. Accessed December 2023.
[36] City of Vancouver (2024). Energy requirements for home renovations. Accessed February 2024.

3.3 Overcoming Retrofit Barriers and Addressing Risks

Barriers to home retrofits include not only the challenges of paying for upgrades, but also factors that contribute to limited homeowner awareness, motivation, and support. When designing programs to lower barriers, it is equally important to understand and minimize potential risks of participation – especially for vulnerable communities.

Energy efficiency and renewable energy upgrades offer numerous benefits, but there are several barriers that can preclude or slow adoption by households. There may also be risks that arise from participation, especially for vulnerable households. Common barriers and program design features to help overcome these are described in Tables 5 and 6.

While the below overview of barriers applies to all households, specific considerations are noted for vulnerable households, identified from the diversity, equity and inclusion (DEI) consultations with community groups conducted for this project. These groups serve a diversity of communities in the region including low- and moderate- households, renters, Indigenous community members, new Canadians and racialized communities, unhoused communities and those living in transitional and/or precarious housing, seniors, people who identify as members of the transgender community, domestic violence survivors, and families.

Table 5: Summary of household barriers to undertaking home energy retrofits

Financial Barriers

- Cashflow, and unrealized energy and bill savings
- Upfront costs
- Access to capital

Engagement Barriers

- Competing priorities
- Trust
- Information, education and financial literacy
- Behaviours & perceptions

Implementation Barriers

- Split incentives
- Landscape complexity
- Industry fragmentation

The top barriers for vulnerable communities are financial and trust-based and have been compounded by the housing and affordability crises. Energy efficiency is not a priority for many vulnerable individuals and households who are preoccupied with immediate concerns around stable housing, employment, food, and existing debt. Limited household budgets are already strained and there is a reluctance or inability to take on additional debt. Lowering barriers to participation may expose vulnerable individuals to unintended risks. These include unnecessary upgrades (e.g., from upselling or predatory business practices), over-extended budgets (if expected energy and bills savings are not realized) and the potential for housing unaffordability and insecurity to be exacerbated if retrofit costs in rental housing are passed down to tenants.

Table 6: Retrofit barriers and potential risks, and local program design solutions

	BARRIERS	DESIGN SOLUTIONS
Financial Barriers	**1. Cashflow**	
	LMI homeowners have little ability to absorb increased expenses – a reality that has been compounded by the housing and affordability crises. These households also often live in older, more dilapidated homes, which typically results in higher utility costs than more modern homes. Seniors living on fixed incomes, workers with certain types of employment (e.g., gig workers), and new Canadians often find it particularly challenging to afford unexpected or additional monthly costs. The risk is increased for households that do not realize anticipated energy and cost savings, which impacts household bills and debt repayment.	Provisions to ensure households understand financial impacts to help avoid financial risk. Low interest rates and financing spread across long amortization periods (e.g., 10 years) help lower payments for homeowners while allowing them to plan and budget for other expenses. Flexible payment plans with the ability to pause payments and pay off anytime, as well as waiving penalties and late fees, also remove barriers and reduce risk to many households. Prioritizing energy cost saving measures can also lower utility bills, and therefore reduce a household's recurring expenses.
	2. Upfront costs	
	Homeowners may not be able to afford or be willing to pay for energy upgrades. Incentive programs typically require upfront payment and a wait (e.g., several months or longer) before reimbursement. LMI homeowners are especially affected, as they cannot afford to carry high-cost debt, even in the short term. The need for basic home repairs, as well as electrical and health and safety upgrades, before energy retrofit projects are possible can make projects even further out of reach for LMI homeowners due to the added costs of this work.	A local program can provide multiple disbursements to cover the full upfront cost of a project at different stages. Contractors may even be paid directly by the program administrator. This may not only improve their ability to pay back the amount borrowed, but also accrue cost savings over time, thus improving their purchasing power. Many local programs are also designed to permit a portion of the project financing to include non-energy upgrades.
	3. Access to capital	
	Households may lack access to sufficient or low-cost capital. In addition, poor credit scores and high levels of debt can make accessing additional financing more challenging.	Different financing mechanisms can allow for broader participant eligibility via relaxed underwriting (e.g. PACE financing, loan loss reserve).

	BARRIERS	DESIGN SOLUTIONS
Engagement Barriers	**4. Competing priorities**	
	Energy efficiency is not a priority for either capital or time for many vulnerable individuals and households. A significant portion of LMI household income is already reserved for critical needs and concerns around housing, employment, food, health and existing debt; the significant amount of time that must be invested to research and implement home energy retrofits is also a real barrier. Homeowners may also be faced with competing home retrofit projects (e.g., deferred maintenance needs over energy upgrades).	There is an opportunity to pair energy upgrades with other value-add home renovations that improve comfort, health and safety. Community groups consulted for the DEI assessment identified priority measures to support aging in place (e.g., guardrails) and home safety (e.g., lead-based paint and mold removal; asbestos abatement). These co-benefits can be promoted through further homeowner engagement and education. Effective messaging often emphasizes improved comfort and modernization of homes.
	5. Trust	
	High-pressure sales tactics and/or predatory business practices may result in unnecessary upgrades (e.g., upselling) to vulnerable households; seniors and new Canadians are particularly at risk. Misleading or misunderstood payment terms can erode trust. The HEN administrator has received reports of high-pressure sales tactics in the RDN from HEN participants. If paired with contractor-offered on-the-spot financing, the potential risk is multiplied. Some community members may lack trust in the institutions delivering the programs and be unwilling to engage.	Dedicated supports and protections to ensure individuals are not pressured into unsuitable or unneeded upgrades or financing lowers risk. Program terms should be communicated as simply and transparently as possible. Energy advisors and coaches – perceived as unbiased – can help homeowners decide on which measures to prioritize and program-approved contractors and installation standards help minimize risk. Partnering with local community groups who are connected to vulnerable communities can build capacity, custom support and trust in a local program.
	6. Information, education and financial literacy	
	Many homeowners are not familiar or aware of the benefits of home energy upgrades. They may have limited or incorrect knowledge of the costs and benefits of upgrades and/or are unaware of existing rebates and financing.	Homeowners need credible information and advice to help prioritize measures and assess their value. Simple and clear messaging, educational content offered in different languages, and alternatives to online services can help to reach certain equity deserving groups. Dedicated

	BARRIERS	DESIGN SOLUTIONS
	Financial literacy is also a key barrier for some vulnerable households. Community groups and City Green Solutions, program administrator of the HEN, both emphasized the need for financial literacy education and ensuring products, terms and payments are well understood.	supports and resources to improve financial literacy can lower risk for these households.
	7. Behaviours and perceptions	
	Many households are averse to taking on additional debt, instead favouring low-cost upgrades they can afford to pay with their savings. Similarly, measures with short payback periods are often favoured over deep energy retrofit projects. People may also have concerns about project risks, including energy savings not materializing, potential budget and/or time overruns with longer than expected disruptions to the home, and uncertainty on the return on investment or property value gains from improvements. Finally, some people mistrust these kinds of programs due to fear of scams ("too good to be true") and a lack of transparency that can result in hidden fees and costs.	Energy advisors and coaches – perceived as unbiased, especially compared to contractors – may help homeowners decide on which measures to prioritize based on the particularities of their home, communicate the merits of certain combinations of measures to encourage deeper retrofits, and estimate total savings and financing costs. Low recurring payment installments (due to low interest rates and longer amortization periods), as well as LIC financing tied to the property rather than the owner, can help make financing feel more manageable.
	BARRIERS	**DESIGN SOLUTIONS**
Implementation Barriers	**8. Split incentives**	
	A commonly cited barrier for reaching renter households, split incentives occur when those responsible for paying for energy upgrades (landlords) are different from those benefiting from the energy cost savings (tenants). With this kind of capital investment, landlords may have additional expenses but no increased revenues. However, if rents are increased after completed upgrades, there is a significant risk of contributing to the housing affordability crisis, e.g., via "renovictions" or higher monthly rents. 	Landlord sensitization and education, combined with incentives to encourage energy upgrades, can increase the number of building owners undertaking retrofit projects. On-bill financing can theoretically also overcome this barrier, such that the cost of energy improvements is repaid by tenants.

	BARRIERS	DESIGN SOLUTIONS
	9. Landscape complexity	
	The homeowner's energy retrofit journey can be time-consuming and cumbersome due to the amount of technical research required and the variety of complex application forms and processes to access grants, rebates and other benefits. It can also feel daunting to identify, hire and coordinate with qualified and trusted contractors and energy advisors. These barriers can be especially significant for LMI households and individuals for whom English is a second language.	Energy concierge services such as the RDN's Home Energy Navigator can simplify and facilitate the retrofit process. This can include help in identifying relevant rebates and incentives, partially completing application forms, reviewing contractors quotes and other kinds of support in planning and executing retrofit projects. Providing a pre-vetted list of qualified contractors and NRCan-registered energy advisors – or directly connecting participants to qualified professionals – can simplify the process and enhance quality assurance as well.
	10. Industry fragmentation	
	Energy efficiency technologies are often poorly understood among key market actors (e.g., contractors, equipment suppliers and retailers), which can lead to greater resident uncertainty regarding savings and poor coordination among specialists. This industry challenge is generally compounded by homeowner risk avoidance and an absence of regulations to require and enforce energy upgrades.	Close communication with the local workforce and relevant associations can help disseminate information on the program and promote relevant training. This often has the additional benefit of driving program uptake, as contractors are key players in program promotion and quality of work delivered impacts program impact and homeowner confidence. The Region's Home Energy Navigator is perfectly positioned to act as a liaison with local industry.
	 *Indicates a top barrier and/or risk identified through the diversity, equity and inclusion assessment*	

Existing interventions – including building codes and standards, incentive and rebate programs, direct install programs, third party unsecured loan products and local government PACE/LIC programs – are or can be designed to address common barriers, as shown in the table on the next page.

Table 7: Strengths of different market interventions in addressing common barriers

Legend: ● Generally addresses barrier ◑ Somewhat addresses barrier ○ Not applicable

Interventions	Examples of existing initiatives	Participation barriers					
		Upfront cost	Access to capital	Information	Complexity	Competing priorities	Industry fragmentation
Building codes / equipment standards	British Columbia Building Code Energy Star appliances	○	○	○	◑	○	●
Incentive / rebate programs	CleanBC Better Homes and Home Renovation Rebate Program and Income Qualified Program Canada Greener Homes Grant *(closed Feb 2024)*	◑	◑	◑	○	◑	◑
Direct install programs	BC Hydro and FortisBC income-qualified Energy Conservation Assistance Program	●	○	◑	●	●	◑
Third party unsecured loan products*	Canada Greener Homes Loans Green loans by various financial institutions (e.g., VanCity, RBC)	◑	●	○	○	○	◑
Municipal LIC programs	District of Saanich Heat Pump Financing Program	●	●	●	◑	◑	◑

** Importantly, this does **not** include loans offered by financial institutions as part of a municipal financing program partnership*

3.4 Staff Capacity and External Support

A local program can support the RDN and City's climate commitments and goals. Leveraging external supports like CEF grant funding to hire staff and/or experienced third parties to lead program administration can limit the impact on municipal staff.

As with any local government-led initiative, an investment of staff time and resources is needed to lead or champion a successful program – no matter which model is implemented.

A Direct Lending model, in which loan agreements and payments, as well as a portion of program reporting, are handled by the financial partner, requires less time and resources from local government staff.

A PACE program requires more resources and staff time during both program design (e.g., legal consultation, homeowner financing agreements, program-establishing bylaw, review and setup of tax roll and financial record-keeping for program LICs) and administration (e.g., preparing and passing local area service bylaws for each property, disbursement/billing and collections, loan underwriting).

During project discussions, Staff raised concerns that a local program – and in particular a PACE-style program – could overextend the capacity of existing staff. In recognition of this, the project team met with the program administrator of the Home Energy Navigator to explore integration of a financing program into its structure. These conversations confirmed that the RDN and/or City could effectively outsource a portion of responsibilities to an experienced third party. The HEN was designed to integrate special offers and associated administration and would be well-positioned to support a future financing program. Under a Direct Lending model, the HEN would be perfectly positioned to support marketing, homeowner and contractor engagement, and education. Under a PACE-style program, the HEN could potentially take on additional responsibilities including loan underwriting, disbursement and program reporting. Under either model, responsibilities for administering both the HEN and a local financing program could potentially be managed by one staff member (e.g., at the RDN) once the program is setup. Additionally, pending its success, City Green's Neighbourhood Energy Navigator Offer (currently being piloted in the CRD as an alternate pathway in the Home Energy Navigator) could be expanded to the study region to address barriers and risks associated with financial literacy. At the same time, resources could also be allocated to make programming more equitable (e.g., via additional language supports, community group training sessions, and offline marketing materials). The cost of these services could potentially be paid, in part or in full, through CEF grant funding.

The HEN is considered a critical success factor for a local financing program. It adds significant value to program partners and participants, and drives efficiencies in the administration, costs and local government staffing of a financing program. The HEN is currently only a pilot offer in the RDN and likely to be fully subscribed by end of February 2024. If the HEN is not continued, administrative costs to introduce a financing program will be significantly higher and uptake will likely be lower.

Given that PACE financing has greater implications for the municipality than a Direct Lending model, Table 8 below provides a high-level and simplified description of some of the central

responsibilities for this type of program allowing a conceptual notion of the staffing implications. It is not a comprehensive list of responsibilities, as a PACE financing program would impact other local government departments, including the legal, building, and communications teams, and could entail to a greater or lesser extent other administrative responsibilities like program reporting and evaluation.

Table 8: Summary of key local government responsibilities under a PACE program

Legend: ✓ Municipal responsibility ✓ Optionally municipal responsibility ○ Third party responsibility

Admin. Model	Energy concierge services	Special charge on tax bill	Loan underwriting	Disbursement / billing & collections	Delinquencies & defaults
	Offers guidance and support to homeowners	*Special charge tied to the property*	*Reference municipal tax payment history*	*Pay homeowners (or contractors), oversee repayment*	*Same remedy for non-payment as uncollected property taxes*
In-house	✓	✓	✓	✓	✓
Turnkey	○	✓	✓	○	✓

In a program **fully administered in house**, a municipality assumes virtually all responsibilities for program administration (e.g. Toronto Home Energy Loan Program). In a **turnkey model**, many of these are outsourced to another entity, including, but not limited to, program monitoring and reporting, participant touch points, application processing, oversight over contractor directories, and website development and maintenance (e.g. District of Saanich PACE program).

A resourcing analysis to identify any additional staffing needs, provide further details on how to roll out and operate a local program, and determine the total capital and other investment needed from the RDN and/or City would be addressed in the program design phase. Moreover, leveraging the experience of other municipalities in BC (i.e., Districts of Saanich and Central Saanich) and across Canada, and ensuring the continued participation and input of municipal staff, will help to address concerns, secure municipal buy-in, streamline program design and implementation, effectively identify and mitigate risks, and improve the overall quality of the final offering.

3.5 Estimated Program Uptake and Impact

While the near-term impacts of a local program will depend on program uptake, it can also contribute to longer lasting market transformation effects that will accelerate the pace of home retrofits in the community in the mid- to long-term.

Estimating program uptake is critical to understanding the feasibility and potential impact of a financing program. Dunsky developed ten retrofit packages that included energy and GHG reducing measures likely to be undertaken considering Nanaimo's low-rise housing stock characteristics, energy use and homeowner preferences. These were chosen from the 30 archetypes developed for the project (Appendix A) to maximize potential participation (i.e., large market share) and energy and/or GHG reduction impact (i.e., segments with a high proportion of oil heating; stand-alone solar PV retrofit). These ten retrofit packages, detailed in Table 9, were used in Dunsky's financing model to estimate retrofit project costs and potential impact (i.e., energy, energy bill and GHG savings). Key assumptions used to develop retrofit packages are detailed in Appendix D.

Retrofit packages include mechanical-only projects (i.e., air source heat pump installation; solar PV installation) and deeper retrofit projects combining heat pump installation and energy efficiency measures (i.e., insulation, windows and doors).

A note on modeled retrofit packages

Modeled retrofit packages were chosen based on program goals, housing characterization, resident survey results (preferred measures, retrofit investment intentions, etc.) and internal expertise. **Retrofit packages were built to approximate measure impacts and required capital, and do not represent recommendations for specific measures to be installed by homeowners**. There may be many permutations and the resulting energy, GHG, and utility bill savings will vary for each homeowner. Retrofit packages should therefore not be presented to homeowners as they are only helpful for program design estimates. In an eventual program, homeowners should choose their projects based on their individual preferences, home characteristics, financial capabilities, etc. **Risks of unrealized energy and bill savings are higher for vulnerable households, so transparent and customized advice is paramount.**

All packages offer significant energy and/or GHG emissions savings, are relatively cost-effective when factoring in available rebates, and/or are of interest to households based on survey and DEI assessment results. Total project costs range from $12,185 to $35,464 (before incentives) and total costs for 8 of the 10 packages are below $28,000. This aligns with project survey results that show only 7% of respondents would be willing to invest over $30,000[37]. Project costs tend to be highest for natural-gas heated homes, but incentives cover a larger share of costs for these homes and heating oil-heated homes. Homes converting from electric resistance (e.g., baseboard) and oil heating realize the most significant energy bill savings, while natural gas heated home retrofit result in slight energy bill increases or minor energy bill savings. This is a barrier for households primarily interested in energy bill savings and a risk for vulnerable (e.g., LMI) households.

[37] Study region-specific survey findings are corroborated by recent Dunsky studies that indicated that only 4 – 10% of homeowners are willing to spend more than $40,000.

Table 9: Selected priority retrofit packages for key low-density residential market segments

Retrofit Package	1	2	3	4	5	6	7	8	9	10
Housing Type	**Small/Medium Single-Family Dwelling**						**Rowhouse / Duplex**		**Manu-factured**	**All**
Floor Area (m^2) (per dwelling)	188						157		112	N/A
EUL (years)	15	15	15	20	20	20	20	20	20	30
Primary Space Heating Energy (Baseline)	Electricity	Natural Gas	Heating Oil	Electricity	Natural Gas	Heating Oil	Electricity	Natural Gas	Heating Oil	Any
Retrofit Package Measures	**Heat Pump Only**	**Heat Pump Only**	**Heat Pump Only**	**Deeper Retrofit (HP+EE)**	**Deeper Retrofit (HP+EE)**	**Deeper Retrofit (HP+EE)**	**Deeper Retrofit (HP+EE)**	**Deeper Retrofit (HP+EE)**	**Deeper Retrofit (HP+EE)**	**Solar PV**
Air source heat pump	✓	✓	✓	✓	✓	✓	✓	✓	✓	×
Insulation	×	×	×	✓	✓	✓	✓	✓	✓	×
Doors & windows	×	×	×	✓	✓	✓	✓	✓	✓	×
Rooftop solar PV	×	×	×	×	×	×	×	×	×	✓
Estimated Annual Costs and Savings per Home ($)										
Costs*	12,185	12,421	10,575	32,813	35,464	27,939	25,797	25,791	25,804	18,735
Available incentives**	3,850	9,125	9,375	6,350	11,625	11,875	11,350	11,625	12,225	5,250
Cost covered by incentives (%)	32%	73%	89%	19%	33%	43%	44%	45%	47%	28%
Energy bill savings	**900**	**-100 to 100**	**2,100**	**1,200**	**200**	**2,400**	**1,100**	**-100 to 100**	**1,500**	**900**
Estimated Annual Energy per Home (GJ)										
Baseline energy consumption	86	94	97	86	94	97	86	96	60	N/A
Retrofit energy consumption	60	60	58	49	50	51	54	55	32	-27
Energy savings	27	34	38	38	45	46	32	40	28	27
Energy savings (%)	**31%**	**36%**	**40%**	**43%**	**47%**	**47%**	**37%**	**42%**	**47%**	**N/A**
Estimated Annual GHG Emissions per Home (tCO_2e)										
Baseline GHG emissions	0.36	3.3	5.1	0.36	3.3	5.1	0.36	3.6	3.5	Varies
Retrofit GHG emissions	0.25	0.69	0.24	0.20	0.65	0.21	0.23	0.60	0.13	Varies
GHG savings	0.11	2.6	4.8	0.16	2.7	4.9	0.13	3.0	3.3	0.11
GHG savings (%)	**31%**	**79%**	**95%**	**43%**	**81%**	**96%**	**37%**	**83%**	**96%**	**Varies**

** All costs adjusted to 2023 CAD*

*** Incentives are specific to BC and the package measures and include offers from CleanBC, Canada Greener Homes, and the RDN and/or City, as appropriate.*

Retrofit package costs and impacts were used to inform estimates of potential uptake of each package in the study region under low, medium and high uptake scenarios. Potential program uptake was modeled using estimated market size, competition for each retrofit package within a particular market segment (e.g., single-family small/medium homeowners would choose only one of the heat pump only package *or* the heat pump and insulation package) and estimated market share for each package within each market segment. Modeling considered retrofit costs, annual and lifetime savings, barrier levels, and other such factors. After arriving at an estimated final market share for each retrofit package within each market segment, three different uptake scenarios were modeled: Low, Medium, and High adoption. These scenarios consider experience and uptake rates in other jurisdictions with similar finance programs[38]. Further details are presented in Appendix D.

Using modeled retrofit packages and program uptake, the potential impact of a financing program was estimated for the study region. Overall program impacts are presented below for program participation (# households), GHG reductions, energy savings, and household energy bill savings. Impacts are generally presented as a range, accounting for differences between the modeled low, medium and high uptake scenarios.

Between ~540 – 1,570 home energy retrofit projects in the study region over five years. Analysis reveals a solid opportunity for a local financing program. Under the medium adoption scenario, a local financing program could reach 1,078 households in the study region over five years. This includes 593 homes in the City and 485 homes in the rest of RDN. Homes installing solar panels and electrically heated small and medium SFDs and duplexes/townhouses represent the largest share of participating homes in the study region due to overall market size and lower uptake barriers, respectively. Modeled estimates show that a local program could support an average of 108 – 313 projects on an annual basis across the study region, with a medium adoption scenario seeing an average of 216 homes participate each year. In the City, an average of 119 homes per year could participate. *This pertains solely to program participation. A larger number of households are likely to undertake retrofits outside of the program due to program spillover. An indirect benefit of a well-designed program is to increase energy literacy and awareness and further support retrofits.*

Table 10: Estimated annual and cumulative program uptake (# low-density households), study region

Program year	Year	Low uptake scenario		Medium uptake scenario		High uptake scenario	
		Annual	Cumulative	Annual	Cumulative	Annual	Cumulative
1	2025	98	98	194	194	281	281
2	2026	98	196	194	388	281	562
3	2027	115	311	230	618	335	897
4	2028	115	426	230	848	335	1,232
5	2029	115	541	230	1,078	335	1,567
Average	5-year	108	-	216	-	313	-

[38] Factors influencing program selection included: availability of public participation data, being an established program and similarity in program mechanism(s). Programs include HELP, PACE Maine, and Michigan Saves for non-solar retrofits and Halifax Solar City, Sonoma and HELP for solar retrofits.

Table 11: Estimated annual and cumulative program uptake (# low-density households), City

Program year	Year	Low uptake scenario		Medium uptake scenario		High uptake scenario	
		Annual	Cumulative	Annual	Cumulative	Annual	Cumulative
1	2025	54	54	107	107	155	155
2	2026	54	108	107	213	155	309
3	2027	63	171	127	340	184	493
4	2028	63	234	127	466	184	678
5	2029	63	298	127	593	184	862
Average	5-year	60	-	119	-	172	-

Average GHG reductions of ~240 – 670 tCO_2e per year and ~6,660 – 18,650 tCO_2e in residential GHG reductions across the study region over 20 year retrofit lifespans. Under the medium uptake scenario, a program could achieve average (5-year) reductions of 466 tCO_2e per year in the study region. It could also create cumulative (based on annual GHG savings, not lifetime) emissions reductions of 2,329 tCO_2e over 5 years. Unsurprisingly, two thirds of the region's GHG reductions are expected from gas-heated homes (8,511 tCO_2e, or 66%), with SFDs accounting for 76% (6,480 tCO_2e) of these reductions. Oil-heated homes contribute significantly to GHG reductions at 2,785 tCO_2e (21.5%), despite low participation rates (3.5% of participating homes). Despite significant participation, electrically heated homes contribute only 407 tCO_2e (3.1%) of GHG reductions. Similarly, solar PV retrofits contribute 1,270 tCO_2e (10%) of GHG reductions but account for 58% of participants. The impact of these retrofits is most significant in terms of energy reductions. At the same time, mechanical and deeper retrofits also make homes healthier and more comfortable in both the summer and winter, while improving their resiliency.

In the City, the medium uptake scenario of 593 participants during the program's initial five years could result in average annual GHG reductions of 286 tCO_2e and drive cumulative emissions reductions of 7,978 tCO_2e by year 20 of retrofit measure lifespans. As with the study region, natural gas and oil-heated homes represent the majority of GHG reductions. Natural gas heated S/M SFDs are the largest single market segment driving GHG reductions.

Table 12: Estimated annual and cumulative program impact, GHG reductions (tCO_2e), study region

Program year	Year	Low uptake scenario		Medium uptake scenario		High uptake scenario	
		Annual	Cumulative	Annual	Cumulative	Annual	Cumulative
1	2025	78	78	146	146	206	206
2	2026	156	234	291	437	413	619
3	2027	241	475	461	898	659	1,278
4	2028	326	801	631	1,529	906	2,184
5	2029	411	1,212	801	2,329	1,152	3,336
Average	5-year	242	-	466	-	667	-
20	2044	166	6,658	326	12,973	472	18,648
Average	20-year	333	-	649	-	932	-

Table 13: Estimated annual and cumulative program impact, GHG reductions (tCO_2e), City

Program year	Year	Low uptake scenario		Medium uptake scenario		High uptake scenario	
		Annual	Cumulative	Annual	Cumulative	Annual	Cumulative
1	2025	48	48	90	90	127	127
2	2026	96	144	179	269	254	381
3	2027	148	292	283	552	405	786
4	2028	200	493	388	940	557	1,343
5	2029	253	745	493	1,433	708	2,051
Average	5-year	149	-	286	-	410	-
20	2044	102	4,094	200	7,978	290	11,467
Average	20-year	205	-	399	-	573	-

Average energy reductions of 9,350 – 26,850 GJ per year and 272,800 – 786,930 GJ in residential energy reductions across the study region over 20 year retrofit lifespans.
Over half (56%) of energy reductions in the medium uptake scenario are anticipated from rooftop solar PV retrofits, which also increase household climate resilience and reduce grid demand during peak events. Energy reductions for natural gas homes are estimated to contribute 21% (115,257 GJ) of reductions under the medium adoption scenario, while retrofits to electrically heated homes could deliver 18% (97,764 GJ) of energy reductions due to the significant efficiency gains of heat pumps over electric resistance heating. Energy reductions for study region oil heated homes account for 4.4% (23,632 GJ) of energy reductions. Under the medium uptake scenario, a program could achieve an average of 18,497 GJ energy reductions per year and cumulative (based on annual GHG savings, not lifetime) energy reductions of 92,483 GJ by 2030 (if the project begins in 2025).

In the City, average energy reductions of ~5,150 – 14,800 GJ per year could be achieved. For the medium adoption scenario, average energy reductions are estimated at 10,198 GJ per year, again resulting mainly (59%) from solar PV retrofits.

Table 14: Estimated annual and cumulative program impact, energy reductions (GJ), study region

Program year	Year	Low uptake scenario		Medium uptake scenario		High uptake scenario	
		Annual	Cumulative	Annual	Cumulative	Annual	Cumulative
1	2025	2,922	2,922	5,747	5,747	8,315	8,315
2	2026	5,843	8,765	11,495	17,242	16,629	24,944
3	2027	9,247	18,012	18,288	35,529	26,531	51,475
4	2028	12,651	30,663	25,080	60,610	36,433	87,907
5	2029	16,055	46,719	31,873	92,483	46,335	134,242
Average	5-year	9,344	-	18,497	-	26,848	-
20	2044	10,992	272,804	21,756	541,344	31,731	786,929
Average	20-year	13,640	-	27,067	-	39,346	-

In addition to projected uptake and impacts for the full study region, it was also important to estimate uptake and impacts separately for the City and the rest of RDN. These results are shown in the below table for the medium adoption scenario.

Table 15: Estimated annual and cumulative program impact, energy reductions (GJ), City

Program year	Year	Low uptake scenario		Medium uptake scenario		High uptake scenario	
		Annual	Cumulative	Annual	Cumulative	Annual	Cumulative
1	2025	1,611	1,611	3,169	3,169	4,584	4,584
2	2026	3,222	4,833	6,338	9,506	9,168	13,753
3	2027	5,098	9,931	10,083	19,589	14,628	28,381
4	2028	6,975	16,906	13,828	33,417	20,087	48,468
5	2029	8,852	25,758	17,573	50,990	25,547	74,014
Average	5-year	5,152	-	10,198	-	14,803	-
20	2044	6,060	150,409	11,995	298,468	17,495	433,870
Average	20-year	7,520	-	14,923	-	21,693	-

Table 16: Estimated financing program uptake and impacts by retrofit package, medium scenario

Retrofit Package	1	2	3	4	5	6	7	8	9	10	Total
Housing Type	**Small/Medium Single-Family Dwelling**						**Rowhouse / Duplex**		**Manu-factured**	**All**	**All**
Space Heating Energy (Baseline)	Electricity	Natural Gas	Heat Oil	Electricity	Natural Gas	Heat Oil	Electricity	Natural Gas	Heat Oil	Any	All
Retrofit Package Measures	**Heat Pump Only**	**Heat Pump Only**	**Heat Pump Only**	**Deeper Retrofit (HP+EE)**	**Deeper Retrofit (HP+EE)**	**Deeper Retrofit (HP+EE)**	**Deeper Retrofit (HP+EE)**	**Deeper Retrofit (HP+EE)**	**Deeper Retrofit (HP+EE)**	**Solar PV**	**All**
Estimated Program Uptake by Year 5 (# of households)											
City	99	86	15	3	12	8	16	20	4	330	593
Rest of RDN	74	54	3	2	8	2	27	18	6	291	485
Study region	**173**	**140**	**18**	**5**	**20**	**10**	**43**	**38**	**10**	**621**	**1,078**
Estimated GHG Reductions over 20 years (tCO_2e)											
City	166	3,397	1,092	8	592	732	37	1,053	225	675	7,978
Rest of RDN	125	2,121	215	6	370	144	65	978	376	595	4,995
Study region	**291**	**5,518**	**1,307**	**14**	**962**	**877**	**102**	**2,031**	**602**	**1,270**	**12,973**
Estimated Energy Reductions over 20 years (GJ)											
City	39,917	44,076	8,621	1,932	9,922	6,849	8,985	14,274	1,915	161,977	298,468
Rest of RDN	29,921	27,522	1,700	1,448	6,195	1,351	15,561	13,268	3,197	142,714	242,876
Study region	**69,838**	**71,598**	**10,321**	**3,380**	**16,117**	**8,200**	**24,546**	**27,542**	**5,111**	**304,691**	**541,344**

GHG and energy reductions are shown after 20 years to account for measure impacts over most of the estimated useful life of chosen retrofit measures. A five-year program (and associated costs) is therefore expected to deliver these estimated impacts after 20 years.

As separate local governments serving different populations and operating under different processes and legislation, each government has a different set of conditions, opportunities and constraints to consider when designing and introducing a local government financing program. This analysis will allow the RDN and City to understand the impact of including or excluding specific retrofit measures (packages) in future program design.

Importantly, solar PV retrofits and electrically heated homes represent a significant portion of both projected participants and energy reductions, whereas natural gas and oil heated homes – while fewer in projected participants – account for the majority of GHG reductions.

Significant energy bill savings between for households currently using electric resistance and oil heating. As shown in Table 9, modeled retrofit projects could significantly reduce home energy costs for households heated with electricity or heating oil. Small and medium single-family homes heated with electric resistance could see annual energy bill savings of $900 (heat pump only) to $1,200 (heat pump + insulation). Duplexes/townhouses currently using electric resistance heating would see savings of $1,100. Energy bill savings are even higher for oil-heated homes, ranging from $2,100 (heat pump only) to $2,400 (heat pump + insulation) for small/medium single-family homes and $1,500 annually for manufactured homes. For natural gas heated homes, energy bill savings are lower ($200 annually for small/medium single-family homes undertaking heat pump + insulation projects) or roughly neutral (-$100 to $100 for small/medium single-family homes installing a heat pump and rowhouses/townhouses undertaking heat pump + insulation). This is a barrier for households primarily interested in energy bill savings and a potential risk for vulnerable (e.g., LMI) households if energy bills were to increase. The RDN and/or City could consider offering additional incentives to increase the likelihood that these homes achieve bill neutrality or minor savings. Solar PV retrofits could reduce annual energy bills by as much as $900.

Infrastructure in place to support further action: To achieve GHG emission reduction targets at the federal, provincial, and municipal levels, many more retrofits are needed. Under the medium adoption scenario, a local financing program could contribute 0.5% of annual GHG reductions needed by 2050 to achieve 80% reductions from the residential built environment in the RDN (against a 2007 baseline). In the City, under the medium adoption scenario, a local financing program could contribute 0.5% of annual GHG reductions needed by 2030 to achieve 50% GHG reductions from residential buildings. A financing program could similarly contribute 0.4% of annual GHG reductions needed by 2050 to achieve 100% reductions from residential buildings (both against a 2010 baseline).

It is important to emphasize that a financing program cannot and should not aim to achieve 100% of needed GHG reductions from existing homes. Not all households or retrofit projects will require financing and financing is not suitable or recommended for all households. Over the mid- to long-term, a local program that develops and strengthens relationships with program partners, local financial institutions, the retrofit workforce and/or community groups can help build momentum towards broad scale adoption and grow the local economy while mitigating GHG emissions and increasing community resilience.

Table 17: Contribution of technical and financing program potential to RDN and City climate targets

	RDN	City of Nanaimo	Unit	Notes
GHG emissions				
Residential GHG emissions, all residential buildings, baseline	178,457	112,374	tCO_2e	RDN baseline: 2007 (Stantec 2023) City baseline: 2010 (Stantec 2023)
Residential GHG emissions, low-density homes	101,668	59,523	tCO_2e	Dunsky 2024 (this study)
GHG reduction targets				
GHG reductions target below baseline, 2030	-	50%		City: Target is 50 – 58%
GHG reductions target below baseline, 2050	80%	100%		City: Target is 94 – 107% RDN: Target applies to built environment
Technical potential, GHG emissions and contribution to targets				
Low-density retrofits, heat pump only, GHG reductions	62,542	37,422	tCO_2e/year	Electric, natural gas and oil-heated homes
Low-density retrofits, heat pump only, contribution to 2030 target	-	67%		of annual residential emission reductions needed against chosen baseline year
Low-density retrofits, heat pump only, contribution to 2050 target	44%	33%		of annual residential emission reductions needed against chosen baseline year
Low-density retrofits, heat pump + insulation	63,845	38,182	tCO_2e/year	Electric, natural gas and oil-heated homes
Low-density retrofits, heat pump + insulation, contribution to 2030 target	-	68%		of annual residential emission reductions needed against chosen baseline year
Low-density retrofits, heat pump + insulation, contribution to 2050 target	45%	34%		of annual residential emission reductions needed against chosen baseline year
Financing program potential, GHG emissions and contribution to targets				
Low-density retrofits (5-year annual average reductions)	466	286	tCO_2e/year	Based on projected uptake by program participants, medium adoption scenario
Low-density retrofits (20-year annual average reductions)	649	399	tCO_2e/year	Based on projected uptake by program participants, medium adoption scenario
Low-density retrofits, contribution to 2030 target	-	0.5%		of annual residential emission reductions needed against chosen baseline year
Low-density retrofits, contribution to 2050 target	0.5%	0.4%		of annual residential emission reductions needed against chosen baseline year

Estimated Uptake Can Vary

While estimated annual participation in a local program in the study region ranges between 108 and 313 homes,[39] different design levers can affect uptake. These include:

- ***The minimum cost of eligible retrofit projects***: Allowing light retrofits can help reach a greater number of homeowners since these projects are simpler and more affordable to implement than a more comprehensive set of upgrades. While deep energy retrofits create a greater impact per project, and often provide better value relative to the level of investment needed to implement a program, they increase the barriers and risks to participation.
- ***Participant eligibility restrictions***: Narrow participant eligibility criteria, combined with stringent underwriting, can preclude a large number of homeowners from benefiting from a local program. This lever can also be used strategically, for example to target the program towards equity-deserving groups or homes with higher GHG reduction potential.
- ***Financing mechanism and terms***: Homeowner preferences for certain financing and repayment models, as well as the attractiveness of the available offer (e.g., interest rate, loan term) combined with other incentives and rebates on the market, can impact program success. However, these perceptions can vary between communities and population groups.
- ***Buy-in from key stakeholder groups***: Contractor engagement is critical to program success. Experiences from PACE programs in the U.S. show that they are often one of the most effective sources of program promotion to drive up participation rates, while missteps around contractor engagement contributed to poor uptake of the BC on-bill financing pilots. Alignment and engagement with other key delivery partners is needed to streamline processes and minimize reputation risks.

Other external factors outside of local government control could affect program uptake in the study region. For instance, rising inflation and interest rates throughout 2023 have diminished many households' purchasing power and led to a more cautious investment environment. While economic conditions will likely gradually improve in the coming years, this could have longer lasting impacts on the community that could affect uptake numbers (e.g., reduce the likelihood of reaching high uptake scenario participation). Changes to the landscape of existing financing and incentive programs – notably, the Canada Greener Homes program – could also impact participation in financing programs broadly and in a local program specifically, depending on future program model and design.

[39] This estimate draws from Dunsky's proprietary financing model, which uses uptake data from programs in Canada and the U.S., as well as project specific data and assumptions. See Appendix D.

4. Evaluation of Financing Approaches

Summary of Findings

Direct Lending, PACE and On-Bill Financing (OBF) are all theoretically options for a financing program and eligible models for CEF funding. Each was reviewed in the context of the RDN and City, with particular attention given to PACE (Table 20) due to the lack of provincial enabling legislation and differences between statutes applicable to the RDN and City.

Due to a firm lack of interest in OBF by key provincial utilities, different potential models of Direct Lending and PACE were explored further (Table 21). Three specific program designs were developed and analyzed to estimate program capital requirements and impacts: two Direct Lending models (2-year bridge loan and 5-year personal loan), ideally implemented across the study region by the RDN, and a 10-year PACE loan most easily implemented by the City based on current legislative conditions and precedent (Table 22, Table 23).

The analysis looked at feasibility and alignment, as well as critical success factors for each program. Ultimately, the choice to implement a local financing program – and the type and design of any program – is informed by many factors, including overall feasibility.

Regional District of Nanaimo

A Direct Lending program implemented by the RDN across the study region, in conjunction with the Home Energy Navigator, is feasible and broadly aligned with households needs and program objectives. A five-year program could reach an estimated 541 to 1,567 households and drive GHG reductions of 6,658 – 18,648 tCO_2e across the study region over 20-year retrofit measure lifespans. Since capital is provided by the lending partner and program administration is distributed among program partners, resource needs from local government are greatly reduced. Critical program success factors include:

- **Regional program:** Provides standardization for households and local industry and increases potential program uptake and impact.
- **Preferential lending terms:** Securing preferential lending terms (e.g., below market interest rates) and expanded underwriting criteria is critical to program success. Ideally, the RDN would leverage credit enhancements (e.g., a loan loss reserve; interest rate buydowns) that minimize risk to the lending partner to enable broader and more equitable uptake; otherwise, even more significant focus and effort should be put on lender negotiations and establishment of program lending terms.
- **Investigation into legislative context for credit enhancement features:** As noted above, a successful Direct Lending program requires preferential lending terms. Credit enhancements help achieve such terms. The RDN should seek internal and external legal consultation, as well as liaise with the CEF, regarding the use of these features in the RDN.
- **Home Energy Navigator:** The HEN adds significant value for the program lending partner, supports and raises awareness among study region households, and reduces local government administrative costs and staffing needs for the program.

- **Strategic eligibility criteria:** To add value above and beyond existing financing offers, a local program should allow additional measures beyond heat pumps, participation by electrically heated homes and combining financing with existing incentives.

City of Nanaimo

If the RDN introduces a regional Direct Lending program, it is recommended that the City participates in the program and collaborates with the RDN on program development, implementation and marketing. If the RDN chooses not to move ahead with a Direct Lending program across the region, the City of Nanaimo could implement either a City-scale Direct Lending program or a PACE program. Success factors for a Direct Lending program are broadly the same as for the RDN, while success factors for PACE are summarized below.

- **Dedicated municipal reserve funds:** Options to capitalize a PACE program are constrained by MFA and Community Charter restrictions on long-term borrowing. The success of a local program to deliver financing at the scale needed to stimulate home energy retrofits relies on dedicating municipal reserve funds for program capital.
- **Home Energy Navigator:** The HEN supports and raises awareness among households and reduces local government costs and staffing needs. The program offer could be integrated into HEN and much of program administration handled by a third-party.
- **Preferential lending terms and expanded underwriting:** Local governments have more control and influence over financing terms in a PACE program and the ability to design financing specifically for vulnerable households to support more equitable uptake (e.g., Income-Qualified stream). To overcome barriers to traditional financing associated with credit checks, property tax standing can be used to underwrite loans.
- **Collaboration with the Districts of Saanich and Central Saanich:** Reaching out to districts who have introduced a PACE program will allow the City to understand key design features, anticipate and mitigate challenges and risks, and benefit from program materials (e.g., program establishing bylaw, LAS bylaw, homeowner agreements).
- **Successful marketing and awareness:** Program participation will depend in part on raising awareness of the program. The HEN, integration into in-person events offered as part of HEN programming, direct mail, and social media are all recommended.

Three different financing products were modeled to provide an estimate of program capital and administrative costs: two Direct Lending products (2-year bridge loan and 5-year personal loan) and a 10-year PACE loan. The PACE loan program requires the largest capital commitment by the local government to cover both loans and administration costs, whereas loan capital is provided by the lender in the Direct Lending models.

The 2-year and 5-year Direct Lending loans have significantly lower local government costs per tonne of GHG reduced. Costs are \$168/tCO_2e (2-year loan program) and \$166/tCO_2 (five-year loan program) for to implement a Direct Lending program across the whole RDN compared to \$865/tCO_2e for the PACE loan (though legislative challenges and uncertainty make an RDN-wide PACE program a less feasible choice). If the RDN were to implement a PACE program that excluded the City, program costs would be even higher at \$1,040/tCO_2e.

For the City, 2-year and 5-year loan programs have a cost of \$149/tCO_2e and \$145/tCO_2e, respectively, compared to \$755/tCO_2e for the PACE program.

4.1 Program Objectives

The objectives of a local program include supporting more equitable retrofit uptake in the community while reducing unintended risks to program participants and driving energy and GHG emission reductions in existing low-rise residential buildings.

Program objectives will be defined during the design of an eventual program. However, discussions and consultations from this study identified several key considerations. It is recommended that any future program's success is evaluated by its positive outcome for equity-deserving communities, and that those outcomes are placed at equal value to program performance indicators such as GHG reductions, energy savings, and default rates.

- **Enable broader access while reducing participant risk.** Nanaimo is strongly committed to an equitable transition to a low-carbon-economy. While not every household can or should take on additional debt to finance home retrofits, the program should aim to find a balance between broad homeowner eligibility criteria that reduce barriers to participation and consumer protection measures that address risks from participation. The target audience would therefore include members of equity-deserving groups,[40] such as seniors, newcomers, non-English speakers, and "income qualified" homeowners.
- **Reduce GHG emissions.** Reducing GHG emissions from existing residential buildings through fuel switching and energy efficiency improvements is a key objective of a local program. Any future program will form part of the local government's actions to reach its ambitious decarbonization and residential retrofitting targets.
- **Reduce energy consumption and home energy costs.** Directly tied to the above goal, reducing energy consumption – and particularly, the consumption of fossil fuels in home energy heating systems – is foundational to the program. Homeowners switching from electric resistance heating and heating oil are likely to benefit from immediate energy bill savings. Moderate retrofits that also tackle efficiency improvements to windows, doors and insulation further reduce home energy needs and energy bills.
- **Create and deepen partnerships within the community.** A local government-led program will benefit from capacity-building and collaboration with frontline communities, including those consulted for this study. This could include education and training for staff and community members, continuous feedback mechanisms, and tailored outreach and communication specific to their served communities. A future program also offers the opportunity to leverage the Home Energy Navigator to continue to develop relationships with the local retrofit workforce as well as community groups.

The preferred financing mechanism and design features described below are, broadly, aligned with these objectives. As such, a social equity lens has been applied to the range of financing solutions explored through this study to improve energy affordability; access to programs, services and technologies; and promote inclusive program design and delivery.

[40] Equity-deserving groups are here defined as individuals and groups that have been and continue to be underserved and underrepresented, including people of different ages, races, ethnicities, abilities, genders, religions, cultures, sexual orientations and socioeconomic status.

4.2 Financing Options

A Direct Lending model offering low-cost, unsecured consumer loans is currently the most feasible option for immediate uptake in the RDN. Both Direct Lending and a PACE program designed to act as a springboard for future expansion are feasible in the City.

4.2.1 Overview of Innovative Financial Products

Innovative financing mechanisms can be used to help increase energy upgrade activity by overcoming the cost barrier for many homeowners who are either unwilling or unable to access needed capital. The three homeowner financing options considered also align with eligible options under the CEF program. They are described below.

Table 18: Description of possible financing mechanisms

Financing Models	Direct Lending (unsecured)	PACE/LIC	On-Bill
Repayment mechanism	Homeowner repays a **participating lender** through a consumer loan agreement	Homeowner repays **local government** through their property tax bill	Homeowner repays their **utility** through their energy bills
Main underwriting criteria	Credit score, income and debt levels	Property tax payment history	Utility bill payment history
Key attractive features	Quick approvals and familiar process via centralized partner Can be designed to include features to minimize risk (loan loss reserves) and enhance inclusiveness (interest rate buy-downs) and Innovative approach in attractive for CEF application Can be implemented across the whole RDN	Transferable loan, i.e., tied to the property and not the individual More control and influence over eligible projects and financing terms City gains direct experience with PACE program delivery and is ready to scale if Province passes PACE-enabling legislation	Streamlined repayment and simple agreements Easy for participant to compare costs and benefits on utility bills (energy use and costs pre- and post-retrofit) Depending on energy savings and loan terms, net bill payments may be similar or lower
Limitations	Relies on successful leveraging of loan loss reserve and negotiations with lender to secure below-market interest rates & other preferential lending terms Traditional underwriting criteria can be a barrier to some households	Lack of provincial enabling PACE legislation and municipal borrowing restrictions constrain program scale/impact and limit CEF funding Legislatively more complex and unpiloted in a regional district	Difficult for local governments to influence Energy utilities have not shown interest to date
Primary municipal responsibilities and resources required	Program champion and loan loss reserve Minimal impact on local government staff and resources	Program champion, register LICs, program loan capital, loan loss reserve Moderate staff time required	Program champion and loan loss reserve Minimal impact on local government staff and resources

Option #1: Direct Lending

Within a Direct Lending model, a private lender offers eligible participants an unsecured consumer loan product for home energy upgrades. The municipality can help de-risk these investments to secure preferential lending terms for participants, including below-market interest rates, extended repayment terms more closely aligned with the average lifespan of installed measures, larger loan amounts, and expanded underwriting criteria to enable participation by households with lower credit scores.

In particular, the RDN and/or City may be able to include credit enhancement tools in program design to improve the credit risk profile for lenders to provide loans and provide greater assurance that their products will realize an adequate financial return to justify their investment. In turn, credit enhancement can improve financing terms for homeowners (e.g., lower interest rate, longer repayment timelines) and/or enable financing for homeowners that would otherwise not have access. Credit enhancements include loan loss reserves (LLR) and interest rate buydowns (IRBs). The success of a Direct Lending program is driven in large part by negotiated financing terms (e.g., interest rates, loan repayment period, absence of penalties) and underwriting criteria. The RDN/City should seek legal advice regarding the use of LLR and IRBs in a local financing program in BC prior to moving ahead with program design.

> The **GoGreen Home** financing program in California facilitates access to affordable financing which **can cover up to the full upfront cost of home energy upgrades**. Participating lenders generally offer conditions like no closing costs or annual fees, no collateral required, loan terms up to 15 years, rates between 5% and 8%, and preapproval within 24 hours. The State offers a loss reserve credit enhancement in to support the program.

Unlike LLR, IRBs are not specifically addressed in CEF program materials. The RDN and/or City should discuss this option with their Finance and Legal teams as well as CEF staff, and seek an external legal opinion.

Depending on the program, financing may or may not be combined with incentives or rebates. For example, participants in CleanBC's Low-Interest Financing Program through FinanceIt are not eligible for CleanBC heat pump rebates.

***Examples**: Durham Greener Homes[41], California's GoGreen Home program[42], CleanBC Low-Interest Financing Program through Financeit[43]*

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[41] City of Durham (2024). Durham Greener Homes. Accessed January 2024.
[42] GoGreen Financing (2024). GoGreen Home program. Accessed January 2024.
[43] CleanBC's Low Interest Financing program only finances heat pump fuel-switching for homes primarily heated by fossil fuels, and therefore is more restrictive than the recommended approach for the study region's program. Participating in the CleanBC financing program also disqualifies you from accessing the CleanBC Better Homes and Home Renovation Rebate Program.

Loan Loss Reserve (LLR)

In this model, a reserve fund is established (e.g., by the local government) to cover a portion of losses incurred by private lenders in the event of borrower defaults. A sum in proportion of the overall loan value is placed in an escrow fund and held until the loan is repaid by the homeowner. Lenders can apply to the LLR fund to recover a portion of their losses in cases of default.

In the case of a loan loss reserve, the RDN and/or City offer the lender partial coverage for losses on, for instance, 10% or 20% of the total loan portfolio (i.e. a leverage ratio of 10:1 or 5:1). If lending to homeowners with lower credit quality, greater loan loss reserves may be required. Unlike loan guarantees, risks are shared within a loan loss reserve structure as a small portion of any loss (e.g. 20%) would still need to be covered by the private lender. This motivates the lender to follow careful underwriting and collection procedures.

Interest Rate Buydowns (IRBs)

In this intervention, the local government pays the lender to provide a reduced interest rate. In the method applied in this assessment, also used in the Mass Save HEAT Loan program in Massachusetts, an upfront payment is made by the local government (e.g., RDN) to the lender that is equivalent to the difference in interest payments between the standard lending rate and the preferential program rate over the lifetime of the loan.

IRBs are flexible and can be customized by amount, term, qualifying borrowers, and project type. They can be applied in a targeted manner to support equity deserving groups, such as to improve low-to-moderate income access to loans by buying lower interest rates for this group specifically. IRBs add to program costs and become more expensive with longer loans; as such, they are best suited to shorter loans.

Examples of programs that have leveraged interest rate buydowns in a Direct Lending model include CleanBC's Better Homes Low-Interest Financing Program[44], the Mass Save HEAT Loan program in Massachusetts[45] and the Rhode Island 0% Financing Program[46]. These programs offered no-interest financing via third party financial partners on qualifying energy efficiency improvements including heat pumps (all three programs) as well as other measures (MA and RI programs).

Note: It is unclear whether Interest Rate Buydowns would be eligible for CEF funding. The CEF program acknowledges the importance of credit enhancement tools (e.g., dedicated funding for loan loss reserves) and has a stated interest in innovative financing programs and tools, including Direct Lending. The RDN and/or City would need to discuss the use and funding of IRBs with CEF staff during program design. If IRBs are not eligible to CEF funding, this capital would need to be provided by the RDN and/or City.

[44] CleanBC (2024). CleanBC Better Homes Low-Interest Financing Program. Accessed February 2024.
[45] Mass Save (2024). 0% Interest Financing Program. Accessed February 2024.
[46] Rhode Island Energy (2024). Steps to Apply for 0% Financing for Home Energy Upgrades. Accessed February 2024.

Option #2: PACE / LIC Financing

Property Assessed Clean Energy (PACE) financing, also known as Local Improvement Charge (LIC) financing, can be used by municipalities to offer financing to homeowners for a range of climate mitigation and resilience measures. These include energy conservation and renewable energy installations, energy and water efficiency, climate disaster and seismic resilience, EV charging, and home health and safety.

Financing is typically provided as a loan from a government (e.g., municipality) or third-party program partner. Under this model, the loan is affixed to the property (rather than the individual) as a primary lien and transferred with property ownership. Loans are repaid over a set term (typically 10+ years) via a special charge on the homeowner's property tax bill. This allows any outstanding balance to be transferred by a new property owner, who will inherit the repayment plan. PACE financing often provides access to low-cost and long-term financing with a fixed interest rate. It can typically be combined with government/utility incentives and rebates.

In the absence of provincial PACE-enabling legislation, Nanaimo would need to use the Local Area Service charge (LAS) mechanism to implement a municipal program. Municipalities have historically used LICs to recoup costs associated with community improvements to municipally owned infrastructure. However, BC's Community Charter could be interpreted to define GHG reductions as a direct community benefit. Under this model, the municipality passes a program-establishing bylaw. Property owners interested in voluntarily participating in the municipal program petition Council for a LIC for each property (e.g., District of Saanich's Heat Pump financing program), a process that requires coordination and capacity by the local government. Municipalities piloting LIC programs in BC must be willing to adopt individual local area service bylaws for each property and accept a certain degree of risk associated with challenges to this interpretation of the Charter.

The **District of Saanich's Heat Pump Financing Program** uses the LIC mechanism to offer homeowners 0%-interest financing of up to $12,000 to upgrade fossil fuel heating systems to efficient electric heat pumps. Property tax and utility bill standing are used as underwriting criteria, and loans are repaid over 10 years via property tax payments. Half of the program's 50 spaces each year are reserved for income-qualified participants. The program's standard stream is usually fully subscribed, with a waitlist, and the IQ stream has strong uptake as well. The program is designed to address 4% of annual home retrofits needed to meet the District's emission reduction targets.

Examples: *District of Saanich's Heat Pump financing program[47]; Toronto's Home Energy Loan Program (HELP); Ottawa Better Homes; Kingston Better Homes*

[47] District of Saanich (2024). Heat Pump Financing Program. Accessed January 2024.

Option #3: On-bill Financing/Repayment

As a utility-led initiative, on-bill programs provide financing that are repaid by customers' utility bills. On-bill programs can take one of two forms, as described below.

Table 19: Types of on-bill program

Type of On-Bill Program	Program Model
On-Bill Financing (OBF)	The utility provides capital (e.g., using utility or ratepayer funds). Underwriting typically primarily based on a customer's payment history.
On-Bill Repayment (OBR)	Third-party lender (e.g. bank or credit union) provides program capital or loans directly to participants. Payments are then collected by the utility.

Neither the RDN or City has its own energy utility and therefore isn't able to offer a municipal utility program as done in Nelson's EcoSave On-Bill Financing Program and the City of Penticton's On-Bill Financing Program. Nanaimo would therefore need to rely on provincial utility companies to implement OBF. To date, provincial utilities have offered only two such programs: the 2012 pilots in Colwood (via BC Hydro) and the Regional District of Okanagan-Similkameen (via Fortis BC). Several program design (e.g., non-competitive interest rates, no bill neutrality requirement, lack of contractor training) and marketing (e.g., limited investment, lack of contractor engagement) decisions contributed to minimal uptake. The program was deemed unsuccessful and, largely because of this and cited costs to upgrade administration and billing systems, BC Hydro has expressed that they do not intend to introduce a broad OBF program in the near term (i.e., the next five years). It is unlikely that a single municipality or district would influence current provincial utility plans. Rather, significant collaboration between jurisdictions would likely be required.

Examples: *Nelson's EcoSave On-Bill Financing program[48], City of Penticton On-Bill Financing program, Colwood (BC Hydro) and the Regional District of Okanagan-Similkameen (Fortis BC)'s "LiveSmart" On-Bill Financing pilot programs in 2012*

Nelson's EcoSave On-Bill Financing Program is an on-bill financing program offered by Nelson Hydro to City of Nelson residents for energy efficiency retrofits. Loans of up to $16,000 at 3.5% interest over 2, 5 or 10 years are approved based on utility payment history over the previous 24 months. Loans are repaid by participating homeowners via Nelson Hydro electric bills, and cannot be transferred with the sale of the home. The broader Regional Energy Efficiency Program includes a low-interest financing option offered through the local Nelson & District Credit Union for non-City residents. As of early 2023, around 150 participant had used OBF to finance retrofits, the most common being space heating, insulation and window upgrades.

[48] City of Nelson (2024). On-Bill Financing Program. Accessed January 2024.

4.2.2 PACE in the BC Context

In the absence of provincial PACE-enabling legislation, such financing programs face several additional risks and challenges to implementation in BC.

PACE financing is not currently provincially enabled in BC. The Province identified PACE as a priority measure in Minister mandate letters in November 2020 and held consultations in early 2021 to develop an internal PACE Roadmap. BC's Roadmap to 2030, released in late 2021, stated that the Province would, "proceed with the next steps on a Property Assessed Clean Energy" program. However, the Province has not since released any concrete actions or timelines related to PACE-enabling legislation or potential programs. In its absence, there are several additional considerations and risks that the RDN and City should understand, investigate and mitigate. Given the potential legal risk, local governments should liaise with the Province and MFA prior to initiating a PACE/LIC program.

Table 20: Risks and considerations for PACE-style programs in BC

Type of risk	Risks and considerations	Risk mitigation
Legal	**PACE and the Local Area Service (LAS) Mechanism:** BC's Community Charter grants municipalities authority to provide LAS that, "the council considers provide particular benefit to part of the municipality"[49]. Municipalities have historically used these to recoup costs associated with improvements to municipally owned infrastructure (e.g., street lighting, sidewalks). However, GHG reductions could be considered direct community benefits. This is the interpretation applied in establishing the Saanich and Central Saanich PACE programs. Whether this interpretation could also apply to energy reductions has not been tested by either of these municipal BC PACE pilot programs. The Charter does not specifically allow or prohibit municipalities from using LAS for improvements to private property. Regional districts (RDs) are treated uniquely within provincial statutes and introduce complexity into the PACE implementation mechanism in the absence of provincially enabling legislation. Neither BC PACE pilot program was introduced by or in a Regional District, and as such the specific implementation mechanism via LAS and collection via property taxes has yet to be defined and tested for a Regional District, and would be different within member municipalities and rural areas.	Municipalities in BC using the LAS mechanism before the Province enacts PACE-enabling legislation must accept a degree of risk from legal challenges associated with this interpretation of the Community Charter. The City should seek legal advice on the interpretation of the Community Charter and reach out to the Province prior to initiating a program. Legal consultation on legislation and processes to introduce PACE in RDs and their rural areas is also needed. Specifically, a review of Section 163(1)(c) of the Local Government Act as it relates to board powers, "to provide assistance for the purpose of benefiting the community or any aspect of the community", and the Local Government Act (e.g., Sections 31(4) and (5), Section 337(4) and section 386(2)) and Taxation (Rural Area) Act as they relate to the ability of the Surveyor of Taxes to impose and collect PACE charges in rural areas. Should BC enact PACE legislation, subsequent changes to the above acts and charters would greatly facilitate this method for the City and RDN.

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Legal	**Local Government Long-Term Borrowing:** The Community Charter and Municipal Finance Authority Act establish the Municipal Finance Authority (MFA) as the primary source of capital for local governments. It is intended that, for long-term borrowing (+5 years), local governments only borrow from the MFA. Local governments do borrow from the GMF if or when the cost of borrowing is preferable to the MFA cost of borrowing. However, long-term borrowing (from the GMF or otherwise) requires Ministry approval and must be for a permitted purpose under Section 179 of the Charter. Section 179 of the Community Charter on "Loan authorization bylaws for long-term borrowing" applies to both the City of Nanaimo (via Community Charter directly) and the RDN (via 403(1) of the Local Government Act, which states that Section 179 "Loan authorization bylaws for long term borrowing" of the Community Charter applies to Regional Districts)[50]. It was confirmed that the Ministry is unlikely to approve borrowing for PACE. Firstly, it is non-capital in nature and therefore doesn't satisfy Section 179(1)(a). Secondly, to date the Ministry has not been amenable to the suggestion that a loan to one household constitutes a benefit to the overall community (Section 179(1)(b)) and would be unlikely to approve lending for this purpose. Lastly, any borrowing used for establishing and lending through a Local Area Service via bylaw established for each PACE loan (e.g., District of Saanich PACE program) must be done via loan authorization bylaw, which falls under Community Charter Section 179 and requires Ministry approval; this was confirmed unlikely by the MFA. Borrowing for PACE could also encounter challenges from the *Municipal Liabilities Regulation* regarding borrowing limits. This includes borrowing capital for residential retrofit loans from the GMF.	The RDN and/or City can finance PACE loans issued through Local Area Service bylaws via options that do not require borrowing capital (and therefore do not require approval by the Ministry of Municipal Affairs). These options include self-financing through reserve funds and/or partnering with third party financial institutions. For example, the District of Saanich financed their PACE program via municipal reserve funds and FCM grants. Only some of the provisions of the Community Charter apply to Regional Districts. While research indicated that Section 179 on Loan authorization bylaws for long-term borrowing applies to Regional Districts, it is recommended that the RDN conduct legal review of Section 179 of the Community Charter and Section 403 of the Local Government Act to legally validate this understanding and confirm the findings presented here. The Province could introduce legislation that permits a local government to exceed the *Municipal Liabilities Regulation* limit for PACE borrowing.
Legal	**Eligible Classes of Retrofit:** Section 25(1) of the Community Charter restricts municipalities from providing loan or grant assistance to businesses. Section 273 of the Local Government Act similarly restricts regional districts from providing assistance to businesses.	The program should not include commercial buildings or home-based businesses as eligible for PACE financing. The Charter does not prohibit financial assistance for residential property owners.

[50] RSBC (2015). Local Government Act. Current to February 6, 2024. Accessed February 2024.

	Priority Lien: Mortgage lenders may resist PACE financing if concerns about priority lien are not adequately addressed and/or mortgage lender approval is not a program requirement.	Engage and educate mortgage holders to lower resistance and potential legal issues. Note: requiring mortgage lender consent may mitigate lender concerns *but* can create a significant barrier to participation (e.g., Toronto HELP).
Financial	**Long-Term Capitalization:** The absence of provincially enabling legislation and long-term borrowing restrictions make it more difficult for local governments in BC to access external funding to offer PACE programs at scale. The GMF's CEF program can provide grants and credit enhancement but is not long-term financing. Without opportunities to recapitalize, funding would be exhausted; similarly, the inability to expand the program would hinder a local government's ability to provide financing at the scale needed to support local residential retrofit targets.	Local governments should have a clear plan for long-term recapitalization of the program. Engage third-party lenders for capital, keeping in mind that a local government program (in absence of a provincial program) may restrict private capital entry into the market. Dedicate reserve funds for the purpose of long-term capitalization of the program. Moderate residential retrofits carry lower costs and shorter payback periods compared to deep retrofits, resulting in lower capital requirements.
	Missed Payments due to Default: PACE programs, while exhibiting low default rates, do have a risk of homeowner defaults.	Credit enhancement, in the form of a loan loss reserve. This protects local governments from needing to seize properties in case of non-payment of the PACE loan. Note: A province-wide program would presumably incorporate a loan loss reserve into program design. Individual local governments would not need to establish their own LLRs in this case.
	Internal Resources and Capacity: Staff and resource needs associated with a local government-led program vary significantly with the type and design of program and the wider feasibility context (e.g., PACE legislation and any provincial program design).	Collaboration between local government jurisdictions (e.g., developing direct lending partnerships; administering home energy concierge services) can reduce capacity impacts. This can also distribute costs, enhance borrowing terms and/or leverage economies of scale.

4.2.3 Feasibility of Financing Models

Direct Lending is feasible across the study region, while PACE financing supported by municipal reserves is most feasible in the City of Nanaimo. Large-scale PACE and on-bill financing require significant action from the Province or local utilities, and are significantly less feasible in both the RDN and City currently.

The assessment of the overall feasibility of the below financing models considers factors including provincial legislation and statutes, utility plans, initial and long-term program capitalization and local government borrowing feasibility, and potential program risks and scale. This assessment was informed by project-specific, recent and/or ongoing discussions with the Municipal Finance Authority of BC, the Province, financial institutions (FI) and utilities serving the region (BC Hydro and FortisBC). *Program feasibility is one of many factors local governments will consider when deciding if and how to implement a local financing program.*

Table 21: Overall feasibility and considerations for financing options

Approach	Description	Borrowing feasibility	Implementation considerations	Overall feasibility - RDN	Overall feasibility - City
Direct Lending					
Direct lending *e.g., CleanBC Low-Interest Financing Program through Financeit*	Local government partners with an FI, which offers unsecured personal loans to homeowners for retrofits	**N/A** (capital from FI)	Critical to unlock preferential loan products and terms Legal consultation to support use of credit enhancements and eligibility of IRBs to CEF Large enough market size (loan volume) needed to attract financial institution	**Higher**	**Higher** Smaller market size if offered in the City only and not the RDN
Direct lending with LIC	FI provides financing to homeowners Local government collects payments via property tax bill	**N/A** (capital from FI)	Unlikely that a City can collect funds on behalf of other entities (requires further investigation).	**Low** Requires changes to Community Charter and deep legal due diligence	**Low** Requires changes to Community Charter and deep legal due diligence
PACE and LIC/Local Area Service					
PACE with funds borrowed by local government	Local government borrows to lend to homeowners	**Unlikely** (requires approval from Ministry of Municipal Affairs)	Administratively heavy – must establish a Local Area Service and separate bylaw for each participating homeowner Legal consultation needed to investigate legislative context and mechanism for Regional District participation	**Low** Constrained on ability to borrow and on borrowing limits. PACE untested in BC RDs. RDs don't collect taxes for all residents.	**Low** Constrained on ability to borrow for program and on borrowing limits

PACE with grant funds from the CEF *e.g., District of Saanich initial PACE pilot program*	Local government implements a pilot-scale program using pilot funding from the CEF	**Possible** (requires approval from limited pilot funding stream; no longer as innovative following Saanich and Central Saanich projects)	Administratively heavy – must establish a Local Area Service and separate bylaw for each participating homeowner Legal consultation needed to investigate legislative context and mechanism for Regional District participation Not scalable without provincial PACE legislation and additional CEF funding. Limited impact on energy and GHG reductions due to lower number of participants. Funds will diminish over time if program does not create plan for recapitalization	**Low** PACE untested in Regional Districts in existing BC pilots RDs don't collect taxes for all residents, reducing overall pool of participants.	**Moderate**
PACE with funds from the CEF and municipal reserves (e.g., green fund) *e.g., District of Saanich recapitalized PACE program*	Local government establishes a special purpose reserve fund	**N/A** (use of internal funds)	Administratively heavy – must establish a Local Area Service and separate bylaw for each participating homeowner Legal consultation needed to investigate legislative context and mechanism for Regional District participation Funds will diminish over time if program doesn't recuperate costs via fees and/or additional revenue streams	**Low** PACE untested in Regional Districts in existing BC pilots RDs don't collect taxes for all residents, reducing pool of participants	**Higher**
Municipal corporation/ special purpose vehicle with LIC to collect payments	Local government establishes another entity that can borrow	**Unlikely** (requires approval from Ministry of Municipal Affairs)	Complex and costly to establish	**Low**	**Low**
Equipment rental with LIC to collect	Local government bulk purchases, installs and maintains equipment on private property	**Unlikely** (requires approval from Ministry of Municipal Affairs)	Reputational risk and significant liabilities; unrealistic logistics Approach may not meet FCM CEF requirements	**Low**	**Low**
Utility On-Bill					
Utility OBR or OBF *e.g., pilots in Colwood (BC Hydro) and RD of Okanagan-Similkameen (Fortis BC)*	A BC utility (BC Hydro, FortisBC) offers financing to customers, with repayment via an additional charge on their utility bill	**N/A** (capital from FI or utility)	BC Hydro and FortisBC have firmly declined on short-term, aside from potential specific cases (e.g., Indigenous communities)	**Low** Requires action by Province and/or change in plans by utilities	**Low** Requires action by Province and/or change in plans by utilities

4.3 Recommendations for a Local Financing Program

The project team's assessment of the innovative financial products described above considers their feasibility and ease of implementation ("feasibility"), in addition to the local context and broad program objectives ("alignment"). These, alongside success factors for Direct Lending and PACE, are described below. This was done in recognition of the fact that feasibility is one of many factors a local government will consider when deciding if and how to implement a local financing program.

- **Regional District of Nanaimo:** A Direct Lending financing program implemented by the Regional District of Nanaimo across the entire study region, in conjunction with the continued offering of the Home Energy Navigator, is recommended due to its feasibility and broad alignment with program objectives.
- **City of Nanaimo:** If the RDN introduces a regional Direct Lending program, it is recommended that the City participates in the program and collaborates with the RDN on program development, implementation and marketing. If the RDN chooses not to move ahead with a Direct Lending program across the region, the City of Nanaimo could implement either a City-scale Direct Lending program or a PACE program. If PACE is pursued, dedicated municipal reserve funding is needed for program capitalization. The Home Energy Navigator is considered critical to the success of either program and should be administered by the City if the RDN does not continue offering the service.

Note: recommendations are based on current market, legislative and program conditions, which are likely to evolve. The information in this report will allow local government staff to monitor changing conditions and respond to new realities and emerging opportunities.

A **Direct Lending** program is both feasible and aligned with program objectives and homeowner preferences. When combined with a partnership with a values-aligned financial partner and local community groups, and possibly further enhanced through loan loss reserve and/or interest rate buydowns (pending legal consultations), this option could create financing rates and terms that allow for broader participation.

Feasibility: Direct lending is feasible across the study region and recommended for implementation by the RDN at the regional level. The feasibility of credit enhancement features requires legal consultation (LLR, IRBs) and discussion with the CEF (IRBs).

- Financial institutions tend to favour investments with a considerable market opportunity size. The estimated market size in the RDN is likely to be large enough to attract private lenders, though participation rates depend on many factors.
- The RDN could partner with financial institution(s) willing to offer preferential lending terms and a streamlined application process. Working with a local bank or credit union could allow the RDN to piggyback on existing products and services and reduce start up costs, while leveraging operational efficiencies from their existing business model. Local government staff and resource requirements are lower for a Direct Lending program.
- Should this option be selected, the RDN would need to identify and engage with a values-aligned financial institution with a local presence interested in partnering on the program. Local credit unions are suited to this role.

Alignment: Direct lending is broadly aligned with objectives and community needs.

- Over one third of survey respondents indicated an appetite for more modest retrofits (<$20,000), an amount that is suitable for personal loan products. Around two thirds of respondents noted high upfront costs as a barrier to undertaking retrofit projects. This approach helps to address that barrier.
- Repayment of a loan via a local lender was also the preferred choice by survey respondents, if by a narrow margin. Furthermore, 35% of respondents preferred a short-term loan (0 – 5 years) and an additional 30% were interested in a 5 – 10 year loan.
- Within any financing model, but critical for a Direct Lending model with a third-party lending partner, is emphasis on non-extractive financing for vulnerable households (e.g., LMI). Community organizations consulted for DEI perspectives emphasized a mindful, flexible approach to loan payback that is tailored to the needs and risks of each community. Desirable features included the ability to pay off the loan anytime, waive penalties and late fees, and pause payments. Reducing risks associated with participation in home retrofit financing is equally, if not more, important than removing barriers.
- Both City Green and community groups consulted for this project emphasized the need to improve financial literacy as part of any future program, to reduce barriers and risks to equity-deserving individuals. City Green noted that cooperating with a local financial partner, in tandem with community groups who have the trust of their communities, could facilitate this goal. A standardized program offered in tandem by the municipality and local financial institution can also reduce the risk to vulnerable households of high-pressure contractor sales tactics combined with contractor financing.
- A municipal-lender partnership is a relatively innovative approach for BC, a design feature that can be leveraged in an application to the CEF.

Success Factors

- **Regional program:** A regional program can access a larger potential market, which increases potential program impact and adds value for prospective lending partners. A regional offer also increases standardization for residents and industry. It is recommended that the RDN lead this style of program in the study region, with support and collaboration from the City and other interested members.
- **Home Energy Navigator:** Continuation of the HEN is considered a critical success factor for a financing program. It adds significant value for the program lending partner, supports and raises awareness among study region households, and reduces local government administrative costs and staffing needs for the program. The program offer should be integrated into HEN materials and supports.
- **Preferential lending terms:** Designing a low-cost financing program can be more challenging with a Direct Lending model, as there is no homeowner collateral (e.g. property) as loan security. It is critical for the RDN to take measures to secure preferential lending terms (e.g., below market interest rates) and expanded underwriting criteria, such as by offering a loan loss reserve. Identifying a values-aligned lending partner and leveraging the loan loss reserve and potential market size to secure preferential lending terms, including below-market interest rates, is critical to program equity and uptake.

- **Credit enhancement:** Including a loan loss reserve in program design minimizes risk for the lending partner and helps secure preferential lending terms and expanded underwriting criteria for participants, both of which enable broader participation. Interest rate buydowns can possibly be offered and customized to better support low-to-moderate income households, enhancing inclusiveness and reducing participant risk. CEF funding for program design can be used to explore and identify an approach.
- **Eligibility criteria:** To add value above and beyond existing financing offers (e.g., CleanBC Low Interest Financing Program) and position the program strategically, a local program should include additional measures beyond heat pumps (windows, doors, insulation, rooftop solar PV and, possibly, non-energy upgrades related to safety and aging in place) and allow participation by electrically heated homes. Program participants should also be eligible to combine financing with existing incentives and rebates (e.g., CleanBC and RDN/City top-up rebates).

PACE financing is technically feasible and aligned with the City's goals, despite greater complexity in implementation. An impactful program would need to include dedicated municipal reserve funds to ensure program scale and impact are in balance with time and resources required to implement the program. Due to differences in applicable legislation and the collection of property taxes between municipalities and regional districts, the RDN would need to undertake additional legal work to determine if the LIC mechanism applied in municipal PACE programs could be used by a Regional District.

Feasibility: PACE financing is constrained by a lack of provincially enabling legislation and local government long-term borrowing restrictions. PACE is feasible in the City of Nanaimo, with precedent from existing municipal PACE pilots. In the RDN, PACE is constrained by the District's limited property tax collection role (resulting in a limited overall pool of participants and lower potential uptake and impact) and requires legal consultation regarding justification and implementation mechanism via the Local Government Act.

- PACE is not provincially enabled in BC. Saanich and Central Saanich have successfully piloted a model using the Local Area Service mechanism in a municipal context that could be applied in the City. The City of Nanaimo's internal tax system already allows for LICs to be administered.
- To date, a Regional District in BC has not implemented a PACE project. Critically, regional districts have a limited role in property tax collection, reducing the overall pool of homes and potential program impact. Further legal consultation is also required to understand whether and how the Local Area Service mechanism and repayment via property taxes could be applied in a Regional District, which – unlike the City – references the Local Government Act in addition to the Community Charter. The combination of a significantly reduced pool of RDN-participating homes, the need for legal consultation of an unprecedented legislative mechanism and interpretation, and the inability – unlike the City – to fully benefit from the existing program materials and processes of existing BC PACE pilots results in an overall low feasibility for PACE in the RDN.
- Local government (i.e., RDN and City) borrowing for PACE in BC is not permitted under the *Municipal Finance Authority Act* and would also encounter challenges from the

Municipal Liabilities Regulation regarding borrowing limits. This includes borrowing capital for residential retrofit loans from the GMF. A local government can finance PACE via options that do not require borrowing capital, such as through reserve funds, and could secure initial grant funding or loan loss reserve capital from the CEF.

- The ease of implementation will depend on identifying an effective third-party program administrator (e.g., City Green, via the HEN), as well as the ability to dedicate appropriate resources, information and training to involved local government departments.
- A PACE program has higher local government resource and staff needs during program design and implementation.

Alignment: PACE financing is aligned with local government and community needs, if constrained in uptake and impact for the RDN by its limited property tax collection role.

- Local governments have more control and influence over financing terms, eligible projects, and other design features in a PACE program. An attractive financing offer can play an important role in encouraging broad uptake and reducing GHG emissions across the community. Moreover, the program can be designed to favour deep retrofits, thereby increasing the impact of each individual project.
- PACE financing programs can enable participation by homeowners that would not qualify for a personal loan or would face greater interest rates and fees in doing so. Overall, this can increase the accessibility of the program and likelihood that savings resulting from home upgrades will more closely match loan payments.
- The interpretation of the Community Charter and related mechanism applied in BC may not allow for the inclusion of non-carbon intensive energy reductions and/or non-energy upgrades (e.g., home comfort, safety) in eligible measures, as these may not constitute "direct community benefits" in the same manner as GHG reductions.
- The local government has an opportunity to gain direct experience with PACE program delivery and is positioned to act if the Province passes enabling legislation.

Success Factors

- **Dedicated reserve funding and long-term capitalization plan:** Long-term borrowing restrictions constrain options for program capital. The success of a local program to deliver financing at the scale needed to stimulate home energy retrofits depends on identifying and dedicating capital funding to the project in the form of municipal reserve funds.
- **Home Energy Navigator:** Continuation of the HEN is considered a critical success factor for a financing program. It supports and raises awareness among study region households and reduces local government administrative costs and staffing needs for the program. The program offer could be integrated into HEN materials and supports, with much of program administration handled by an experienced third-party.
- **Preferential lending terms and expanded underwriting:** Local governments have more control and influence over financing terms in a PACE program, which can lead to broader uptake generally and the ability to design financing and supports specifically for vulnerable households to support more equitable uptake (e.g., Income-Qualified stream, as done in the District of Saanich program). To overcome barriers to traditional financing associated with credit checks, property tax standing can be used to underwrite loans.

- **Direct payment of contractors:** To overcome barriers associated with upfront costs, the program should be designed to pay contractors directly.
- **Collaboration with the Districts of Saanich and Central Saanich:** Reaching out to districts who have introduced a PACE program will allow the City to understand key design features, anticipate and mitigate challenges and risks, and benefit from the sharing of program materials (e.g., program establishing bylaw, LAS bylaw, homeowner agreements).
- **Successful marketing and awareness:** Program participation will depend in part on raising awareness of the program among area residents. The HEN, integration into in-person events offered as part of HEN programming, direct mail, and social media are all recommended.

On Bill Financing (OBF) While OBF is permitted in British Columbia, large utilities have consistently expressed a firm refusal to implement a wide-scale program. OBF would represent a promising option for the study region but would require significant advocacy to the Province and a change in plans from BC Hydro and/or FortisBC in the short term, which is considered unlikely.

Feasibility: An on-bill program has low feasibility due to stated lack of interest from utilities.

- While an OBF mechanism is permissible in BC, BC Hydro and Fortis BC – the main utilities within the study region – have no near-term plans or interest in offering on-bill programs.
- While it may be possible to add a repayment mechanism to a regional utility bill (i.e., water utility bill), this approach is not recommended. In addition to concerns raised by staff about including energy projects on a water bill, a local government delivered on-bill program would be constrained by many of the same limitations regarding raising, borrowing and lending capital as apply to a PACE program. This would hinders its ability to be implemented at scale and would increase local government program costs and staff requirements.

Alignment: An on-bill program is aligned with government program goals.

- Since customers have an existing agreement with their local utility, customers can easily repay the cost of their home upgrades through their existing energy bills. Moreover, utilities can easily reach their customers with promotional materials. Together, these factors can favour broad uptake that increases energy and GHG savings.
- Utilities have existing customer payment data, which provides some indication of their ability to pay. They may also have some recourse in the case of default (e.g., shutting off a customer's power). As a result, on-bill programs can allow for broad participation, depending on how they are structured (e.g., no income qualification or minimum credit score). Moreover, in programs where payments can be easily transferred to any new resident, renters can more easily participate, provided explicit landlord consent is obtained and other program terms are met. Finally, the use of utility bills for repayment allows participants to understand the costs and benefits of their investment more easily. Costs are shown as an additional charge on their energy bills, and energy savings are easily calculated by comparing energy bills before and after the home retrofit.

4.4 Program Design, Capital and Administration

High-level design features were modelled alongside projected program uptake to estimate and compare three specific financing products: a 2-year bridge loan and 5-year consumer loan under Direct Lending, and a 10-year PACE loan.

Financial modeling was conducted to estimate and compare capital and administrative costs of different financing program models. Building on the identified feasibility and alignment of Direct Lending in the RDN, and both Direct Lending and PACE for the City of Nanaimo, three different program models and financing products were modeled: two Direct Lending offers (2-year bridge loan and 5-year personal loan) and a 10-year PACE loan.

Table 22: Summary of key financing program model design features

Financing Models	Model A. Direct Lending (unsecured) – 2 Year Bridge Loan	Model B. Direct Lending (unsecured) – 5 Year Personal Loan	Model C. PACE 10-Year Loan
Description	**Bridge loan to cover 100% of upfront costs** (i.e., pre-incentives) while homeowners wait for rebates and/or CGHL approval	**Personal loan product at below-market rates to cover post-incentive costs**	**PACE loan to cover post-incentive costs**
Program Capital	**Loans:** 3rd party lender **LLR:** RDN (and/or City)	**Loans:** 3rd party lender **LLR:** RDN (and/or City)	**Loans:** Local government reserve funds **LLR:** N/A
Credit Enhancement Features Loan Loss Reserve (LLR)* Interest Rate Buydown (IRB)**	**LLR:** 20% leverage ratio; 80% loss coverage. Enables all participants to access a negotiated preferential rate. **IRB:** Reduce interest rates from 8.2% (prime + 1%) to average of 5% for all participants	**LLR:** 20% leverage ratio; 80% loss coverage. Enables all participants to access a negotiated preferential rate. **IRB:** Reduce interest rates from 8.2% (prime + 1%) to average of 7% for all participants	**N/A** (no LLR or IRB)
Local government staffing needs* **	<0.5 FTE during program; 1/10th FTE until loans repaid	<0.5 FTE during program; 1/10th FTE until loans repaid	<1 FTE during program; 1/10th until loans repaid
Program Revenue	$50 applicant fee	$50 applicant fee	$250 applicant fee

** Leverage ratio aligns with requirements of FCM CEF credit enhancement funding*

*** Total capital allocated to IRBs can be flexibly allocated to provide lower interest rates for LMI households and higher below-market interest rates for other households. Interest rates were taken from standard lender personal loan offers and applied as conservative estimates for modeling; actual terms and conditions depend on lender.*

**** Staffing needs assume the continuation of the HEN. If the HEN is continued, the HEN and local financing program could be administered by the same staff member.*

4.4.1 Model A. Direct Lending – 2 Year Bridge Loan

In this program, a short-term 2-year loan acts as a bridge loan to cover the full upfront costs of retrofits while waiting to receive incentives, a Canada Greener Homes Loan (CGHL) or integration into a mortgage. The capital and loan volume required covers the total cost of home energy retrofits, before incentives.

Key model inputs include:

- Loan loss reserve leverage ratio of 5:1, and loss coverage of 80%. Assumed that the LLR is stored in escrow account with near 0% interest rate.
- Interest rate buydowns from 8.2% (prime + 1%, as of January 2024) to 5% for all participants. *Note that this is a conservative assessment and better terms may be possible depending on the lending partner.*
- Payment default rate of 0.8% (based on pre-COVID annual defaults for non-mortgage lending of around 0.5% of outstanding loan value, converted to percent of overall loan disbursement [51])
- The Canada Greener Homes Loan was included when identifying potential bridge loan participants. If the CGHL is sunset, participation in the bridge loan could be lower.

The **Gabriola Island Community Investment Co-op** provides **Green Loans** that prioritize local GHG reduction and community resilience. Dunsky confirmed that bridge loans of $500 to $5,000 are currently offered at 3% + 1% administrative fee. The low interest rate is the result of co-op investors prioritizing community well-being over significant financial return. The loans are designed to help homeowners cover upfront costs associated with a variety of projects including heat pump and solar panel installation; window and insulation improvements; and EVs, e-bikes, and charging infrastructure. The repayment schedule is flexible and customized, and the loan can be paid off at any point. Low awareness of co-op in the community has contributed to low initial uptake.

https://investingabriola.ca/green-loans/

In a future program, it is anticipated that the RDN and/or City would customize distribution of the interest rate buydown, for example, to support LMI households through the application of an income-qualified scale.

A five-year program across the study region was assumed, with staff time needed for all five years plus an additional year to close out the program administratively. After that, staffing needs are estimated at 1/10th FTE until all loans are repaid. After program setup, it is likely that the administration of the HEN and a local financing program could be jointly managed. For example, an RDN staff could administer both programs across the study region. Under a Direct Lending model, where the lender is responsible for underwriting and there are no LIC bylaws, there is little impact on the Finance department aside from occasional payments to the lender. An internal cost of $100 per new participant and active participant was applied. Program revenue consists of a one-time participant application fee of $50. Fixed program costs included program setup, website and marketing, legal fees for agreements with financial institutions, and program evaluation. Participant levels were not varied by program model to allow for direct comparison.

[51] Statistics Canada (2021). Trends in household non-mortgage loans: The evolution of Canadian household debt before and during COVID-19. August 2021.

4.4.2 Model B. Direct Lending – 5 Year Personal Loan

In this program, a 5-year personal loan covers the post-incentive cost of retrofits. It is designed to be similar to a standard personal loan product at the best lending rate.

Key model inputs include:

- Loan loss reserve leverage ratio of 5:1, and loss coverage of 80%. Assumed that the LLR is stored in escrow account with near 0% interest rate.
- Interest rate buydowns from 8.2% (prime + 1%, as of January 2024) to 7% for all participants[52]
- Payment default rate of 1.58% (based on pre-COVID annual defaults for non-mortgage lending of around 0.5% of outstanding loan value, converted to percent of overall loan disbursement[53])

In a future program, it is anticipated that the RDN and/or City would customize distribution of the interest rate buydown, for example, to support LMI households through the application of an income-qualified scale.

Program administration costs and revenues are the same as the 2-year bridge loan (aside from interest rate buydown costs). A five-year program was assumed, with staff time needed for all five years plus an additional year to close out the program administratively. As with the 2-year loan, it is anticipated that the HEN and a Direct Lending program could be managed across the study region by one staff member after program launch. After that, staffing needs are estimated at 1/10th FTE until all loans are repaid.

Under a Direct Lending model, where the lender is responsible for underwriting and there are no LIC bylaws, there is little impact on the Finance department aside from occasional payments to the lender. An internal cost of $100 per new participant and active participant was applied. Program revenue consists of a one-time participant application fee of $50. Fixed program costs included program setup, website and marketing, legal fees for agreements with financial institutions, and program evaluation. Participant levels were not varied by program model to allow for direct comparison.

[52] IRB costs were estimated based on an upfront payment made by the local government (e.g., RDN) to the lender that is equivalent to the difference in interest payments between the standard lending rate and the preferential program rate over the lifetime of the loan. This method was applied in the Mass Save HEAT Loan program: https://www.masssave.com/residential/programs-and-services/financing)
[53] Statistics Canada (2021). Trends in household non-mortgage loans: The evolution of Canadian household debt before and during COVID-19. August 2021.

4.4.3 Model C. 10-year PACE Loan with Municipal Reserve Funding

This program investigated a 10-year PACE loan offered by the City of Nanaimo. The loan volume and capital are based on post-incentive costs.

Key model inputs include:

- Annual loan interest rate of 5%
- Default rates for PACE programs are lower than mortgage defaults (0.33% from 2012 to 2023[54]). As a conservative measure, assumed PACE loan default rate of 50% mortgage delinquency rate (i.e., 0.17%) on loan balance, converted to percent of overall loan disbursement Default rates can trend higher or lower depending on economic cycles.

For the sake of consistency with the Direct Lending models, an initial five-year program was assumed, which could then be extended at the discretion of the local government. A longer-term program would allow for better household and contractor planning and avoid the "come-and-go" drawback of rebate programs, and could be considered during program design. For this model, more staff time is needed for all five years plus an additional year to close out the program administratively. After that, staffing needs are estimated at 1/10th FTE until all loans are repaid. An internal cost of $250 per new participant and $100 per active participant was applied; costs for new participant are higher because the local government (e.g., City) is responsible for underwriting the loans. Program revenue consists of a one-time participant application fee of $250. Fixed program costs included program setup, website and marketing, legal fees for agreements with financial institutions, and program evaluation. Participant levels were not varied by program model to allow for direct comparison.

4.4.4 Key Findings

The table below summarizes and key program capital needs and impacts across the three financing programs investigated. For Direct Lending, costs and impacts are shown for the RDN, City and rest of RDN based on overall feasibility for this program across the study region. For PACE, where current feasibility is low for implementation across the entire RDN, costs and impacts are shown for the City and rest of RDN.

The below analysis applies the medium (mid-range) uptake scenario. Program participation estimates are projections based on a range of inputs including participation in financing programs in other jurisdictions in Canada and the US. They therefore are not guaranteed and have a relatively high degree of uncertainty. The analysis and comparison of financing models investigated revealed several key findings, below and following the table.

The 10-year PACE loan program requires the largest capital commitment by the local government to cover both loans and administration costs. For the City, $6,025,700 in capital is needed. A PACE program aimed at the rest of the RDN (not including the City) requires $5,197,450 in capital. A study region-wide PACE program, which faces low feasibility due to legislative and implementation complexity and uncertainty, would require $11,223,150.

[54] CMHC (2023). Mortgage Delinquency Rate: Canada, Provinces and CMAs. December 2023.

Table 23: Summary of financing program model capital needs and program impacts, 5-year financing program, medium uptake scenario

Financing Models	Model A. Direct Lending (unsecured) 2 Year Bridge Loan			Model B. Direct Lending (unsecured) 5 Year Personal Loan			Model C. PACE/LIC 10-year Loan	
Jurisdiction	**RDN**	**City**	**Rest of RDN**	**RDN**	**City**	**Rest of RDN**	**City**	**Rest of RDN**
Program participants	1,078	593	485	1,078	593	485	593	485
Total loan volume ($)	19,171,800	10,393,750	8,778,100	12,364,200	6,638,650	5,725,600	6,638,650	5,725,600
Without solar ($)	*7,537,400*	*4,208,750*	*3,328,650*	*3,990,000*	*2,186,850*	*1,803,250*	*2,186,850*	*1,803,250*
Administrative costs ($) *(includes IRBs)*	2,068,900	1,121,650	947,300	2,001,100	1,074,450	926,650	1,022,950	882,250
Loan loss reserve, capital ($)	496,900	269,400	123,350	1,160,400	623,050	288,500	-	-
Loan loss reserve, default payouts ($)	116,650	63,250	53,400	156,150	83,850	72,300	-	-
Total program cost ($)	2,185,550	1,184,850	1,000,700	2,157,250	1,158,300	999,000	1,022,950	882,250
Total City/RDN program costs ($)	**2,185,550**	**1,184,850**	**1,000,700**	**2,157,250**	**1,158,300**	**999,000**	**6,025,700**	**5,197,450**
Total GHG savings, 20 years (tCO_2e)*	12,973	7,978	4,995	12,973	7,978	4,995	7,978	4,995
Total energy savings, 20 years (GJ)*	541,344	298,468	242,876	541,344	298,468	242,876	298,468	242,876
Loan $/$tCO_2e$	1,478	1,303	1,757	953	832	1,146	832	1,146
Program $/$tCO_2e$	168	149	200	166	145	200	128	177
City/RDN $/$tCO_2e$	**168**	**149**	**200**	**166**	**145**	**200**	**755**	**1,040**
Total $/$tCO_2e$	1,646	1,451	1,958	1,119	977	1,346	960	1,323

** GHG and energy reductions are shown after 20 years to account for measure impacts over most of the estimated useful life of chosen retrofit measures. A five-year program (and associated costs) is therefore expected to deliver these estimated impacts after 20 years. All costs per tCO_2e are calculated using 20-year GHG reductions.*

Totals may not add up due to rounding

The 2-year and 5-year direct lending loan products require significantly less capital raised by the local government, since the financial partner provides all loan capital. They are also more scalable. A study region wide 2-year loan program would need $2,185,550 in local government capital and a 5-year loan program would need $2,157,250. For a City-scale program, 2-year loan and 5-year loan programs require $1,184,850 and $1,158,300 in capital, respectively.

Loan volumes are highest for the 2-year loan due to coverage of full project costs (i.e., before incentives), while the 5-year and 10-year PACE loans have lower volumes because they cover project costs after incentives. Total loan volume required across all retrofit packages across the study region by the RDN for a 2-year loan offering is $19,171,800; removing the solar package reduces this to $7,537,400. For the City, total loan volume for the 2-year loan program is $10,393,750 (or $4,208,750 without the solar package). Total loan volumes for the 5-year program and PACE program are roughly two thirds of 2-year program loan volumes. Defaults for the 2-year bridge loan could trend lower than predicted due to the short duration of loans.

Administrative costs for Direct Lending programs are driven by interest rate buydown, while administrative costs for PACE are driven by program administration needs to setup and run the program. The City can lower Direct Lending program costs by choosing to offer interest rate buydowns to fewer participants (e.g., LMI households) and/or by securing lower rates from an eventual financial partner. It is not recommended that the City proceed with a Direct Lending model without interest rate buydowns, as these increase equitable uptake.

The 2-year and 5-year Direct Lending loans have significantly lower costs to the local government per tonne of GHG reduced than the PACE loan. This is because the local government (RDN or City) provides the capital for the loans under the PACE program but not Direct Lending. Costs for the RDN to implement a study region-wide 2-year loan or 5-year loan Direct Lending program are $168/tCO$_2$e or $166/tCO$_2$e respectively. The cost to implement study region-wide PACE is estimated at 865/tCO$_2$e, though this option is not recommended due to legislative and implementation complexity and uncertainty. For the City, costs for Direct Lending programs are $149/tCO$_2$e (2-year loan) and $145/tCO$_2$e (5-year loan) compared to $755/tCO$_2$e for a PACE program.

PACE and the 5-year loan offer the lowest loan dollars cost per tonne GHG reduced, while PACE has the lowest cost per tonne GHG reduced for program administration (due to the absence of interest rate buydowns). For the PACE and 5-year loan direct lending program, the cost per loan dollar across the study region is $953/tCO$_2$e, compared to $1,478/tCO$_2$e for the 2-year bridge loan. Administrative costs per tonne of GHG reduced are $146/tCO$_2$e for the RDN for a study-region wide program, compared to $166/tCO$_2$e and $168/tCO$_2$e for the 5-year and 2-year direct lending programs.

Participation rates for the 2-year bridge loan may be lower due to the recent ending of the current Canada Greener Homes Grant program. The Government of Canada confirmed in February 2024 that the CGH Grant is no longer accepting applications under the current program, but that a new program targeting LMI households would be forthcoming. The CGH Loan is ongoing. The impact on participation rates is tempered due to current continuation of the CGH Loan program and if participants are able to access affordable mortgage refinancing rates and use the bridge loan short-term prior to mortgage refinancing.

4.5 FCM Funding Opportunities

Leveraging private sector capital (i.e., via banks/credit union) for a Direct Lending Program, an innovative approach in BC, would likely make the RDN and/or City's FCM funding application more competitive. Establishing a relationship with a private lender can also streamline continued access to private sector capital beyond the initial program implementation years.

The Community Efficiency Financing (CEF) initiative offers substantial grants to support program development focused on existing low-rise residential properties. Both the RDN and the City are eligible for CEF funding.

The CEF both allows and has a significant interest in third-party lending programs that involve a regional district or municipality working in partnership with a third-party lender (e.g. a financial institution or impact investor, such as Cooperators Insurance) who is responsible for qualifying homeowners and underwriting loans, while utilizing an unsecured repayment mechanism. In jurisdictions where PACE legislation is not enacted, regional districts and municipalities can work with a third party that has experience with originating and servicing residential sector financial products (e.g., VanCity, RBC) This can be a viable alternative to PACE financing, especially for regional districts and municipalities that wish to play a more limited role or lack the internal capacity to administer a PACE model.

For program implementation, the CEF grant available is generally combined with either of the below, with funding provided for up to 80% of eligible costs:

- **Option 1:** An initial loan of up to $10M to act as program capital; or
- **Option 2:** A credit enhancement of up to a $2M to help leverage $10M or more in third party capital (minimum 5:1 leverage ratio). FCM's credit enhancement option is meant to act as a de-risking strategy to provide a program's financial partners with partial coverage for any loan losses from participants in exchange for lower interest rates, extended amortization periods, or similar benefits.

Option 1 is not available to local governments in BC due to municipal borrowing restrictions from the MFA. However, accessing the CEF initiative's credit enhancement funding via Option 2 offers a viable alternative. This has the added benefit of establishing a relationship with a financial institution that would allow the regional district and/or City to draw down additional capital as needed to support the program for the foreseeable future, whereas FCM's capital can only be accessed over a maximum four-year implementation period. Leveraging private sector capital may also be evaluated more favourably by FCM, given that there are few examples of public-private partnerships to support financing programs within Canada, and its alignment with GMF's strategic objective to "accelerate transformation by mobilizing capital through leverage."[55] If the Regional District and/or City accesses the CEF initiative's credit enhancement and grant option, the loan loss reserve account would be managed by FCM, alleviating some of the responsibility.

[55] Federation of Canadian Municipalities. (2023). Green Municipal Fund: Three-year Plan, 2023-2026.

5. Conclusion & Next Steps

5.1 Conclusions

The study findings confirm the feasibility of a local program for home energy upgrades in the study region given the generally favourable local context. The market opportunity is significant, as the region's housing stock primarily consists of older homes, over a third of which rely on fossil fuel space and water heating. Low-density existing residential buildings in the study region consumed 5,849,196 GJ of energy and produced 101,668 tCO_2e of GHG emissions in 2023. Electricity accounts for over 50% of energy consumption in both the study region and City but contributes minimally to emissions (<10%), while fossil fuel consumption generates around 82% (83,528 tCO_2e) of regional emissions from 37% (2,142,794 GJ) of overall energy consumption.

Home energy retrofits targeted at reducing the consumption of fossil fuels via electrification and energy efficiency upgrades are critical to decarbonizing existing low-density homes in the RDN and City. Even moderate energy upgrades could drive considerable GHG and energy savings. The total decarbonization opportunity from space heating and efficiency retrofits to low-rise electric, natural gas and oil heated homes in the study region is estimated between 62,542 tCO_2e, from heat pump only retrofits, to 63,845 tCO_2e (heat pump + insulation retrofits). In the City, GHG reductions could be 37,422 tCO_2e (heat pump only retrofits) to 38,182 tCO_2e, (heat pump + insulation retrofits). Conversion of electric baseboard heating systems to heat pumps and the installation of rooftop solar PV will significantly reduce electricity consumption.

A local program for home retrofits would benefit the municipality by contributing to the RDN and City's climate mitigation and adaptation goals, supporting job growth in the local economy, and increasing the value of participating properties. At the same time, home retrofits can improve the energy affordability and home comfort, safety, air quality and climate resiliency for the region's residents.

Against this backdrop, a local program is estimated to attract between ~540 to 1,570 participants across the study region during the program's initial five years, with roughly 55% of participating households from the City and 45% from the rest of the RDN. The program could drive average annual reductions of ~240 – 670 tCO_2e and cumulative (based on annual GHG savings, not lifetime) emissions reductions of ~6,660 – 18,650 tCO_2e over twenty year retrofit measure lifespans. These reductions could help the RDN achieve 0.5% of its target (specific to residential building emissions) to reduce annual GHG emissions from the built environment by 80% by 2050, against a 2007 baseline. In the City, a local financing program could contribute 0.5% of annual residential building GHG reductions needed by 2030 to achieve 50% GHG reductions. A program could contribute 0.4% of annual residential GHG reductions needed by 2050 to achieve 100% reductions (both against a 2010 baseline).

In BC's evolving energy policy context, it is likely that new complementary policies adopted in the coming years – such as alteration codes for existing buildings or home energy labeling requirements – could increase energy upgrade activity and therefore the need for home retrofit supports, financial assistance and related services. Other factors including program design and the availability of other incentive and financing programs (e.g., Canada Greener Home grants and loans) will also impact program participation and impact.

Recommendations, considerations and success factors for financing programs in the RDN and City of Nanaimo are summarized below. Note that the Home Energy Navigator (HEN) is considered a critical success factor for a local financing program. In absence of the HEN, a local financing program is considered significantly less viable.

Regional District of Nanaimo: A Direct Lending financing program implemented by the RDN across the entire study region, in conjunction with the continued offering of the Home Energy Navigator, is recommended due to its feasibility and broad alignment with program objectives, including potential program scale and impact. In the RDN, PACE is constrained by the District's limited property tax collection role (resulting in a limited overall pool of participants and lower potential uptake and impact). Further legal consultation is also required to understand whether and how the Local Area Service mechanism and repayment via property taxes could be applied in a Regional District, which – unlike the City – references the Local Government Act in addition to the Community Charter. The combination of a significantly reduced pool of RDN-participating homes, the need for legal consultation of an unprecedented legislative mechanism and interpretation, and the inability – unlike the City – to fully benefit from the existing program materials and processes of existing BC PACE pilots results in an overall low feasibility for PACE in the RDN. Both PACE and Direct Lending require further legal investigation into the legislative context. For PACE, this would focus on the application of the LAS and property tax collection mechanisms used in BC's municipally-led PACE pilots. For Direct Lending, this would center on the ability and considerations to use credit enhancement features (e.g., loan loss reserve and/or interest rate buydowns).

City of Nanaimo: If the RDN introduces a regional Direct Lending program, it is recommended that the City participates in the program and collaborates with the RDN on program development, implementation and marketing. If the RDN chooses not to move ahead with a Direct Lending program across the region, the City of Nanaimo could implement either a City-scale Direct Lending program or a PACE program. If PACE is pursued, dedicated municipal reserve funding is needed for program capitalization. The Home Energy Navigator is considered critical to the success of either program and should be administered by the City if the RDN does not continue offering the service.

Note that recommendations are based on current market, legislative and existing program conditions, which are likely to evolve. The information contained in this report will allow local government staff to monitor changing conditions during program design and implementation and respond to new realities and emerging opportunities.

Table 24: Recommendations and success factors for financing programs in the RDN and City

	Recommendation	Success Factors
Regional District of Nanaimo	Recommend that a Direct Lending model, in partnership with a values-aligned lending partner, is applied across the entire Regional District of Nanaimo and administered by the RDN	**Regional program:** A regional program can access a larger market, which increases potential program impact and adds value for prospective lending partners. A regional offer also increases standardization for residents & industry. **Home Energy Navigator:** Continuation of the HEN is considered a critical success factor for a financing program. It adds significant value for the program lending partner, supports and raises awareness among study region

	in conjunction with the Home Energy Navigator. *Note: If the City of Nanaimo moves forward with a successful PACE model, the RDN could support its member municipalities to introduce their own programs in the future.*	households, and reduces local government administrative costs and staffing needs for the program. The program offer should be integrated into HEN materials and supports. **Preferential lending terms:** Identifying a values-aligned lending partner and securing preferential lending terms, including below-market interest rates, is critical to program equity and uptake. **Credit enhancement:** Including a loan loss reserve in program design minimizes risk for the lending partner and helps secure preferential lending terms and expanded underwriting criteria for participants, both of which enable broader participation. Otherwise, more significant focus and effort will need to be put on lender negotiations and establishment of preferential program lending terms. **Investigation into legislative context for credit enhancement features:** As noted above, a successful Direct Lending program requires preferential lending terms. Credit enhancements help achieve such terms. The RDN should seek internal and external legal consultation, as well as liaise with the CEF, regarding the use of these features in the RDN. **Eligibility criteria:** To add value above and beyond existing financing offers (e.g., CleanBC Low Interest Financing Program), a local program should include additional measures beyond heat pumps (windows, doors, insulation, rooftop solar PV and, possibly, non-energy upgrades related to safety and aging in place) and allow participation by electrically heated homes. Program participants should also be eligible to combine financing with existing incentives and rebates (e.g., CleanBC, RDN/City top-ups).
City of Nanaimo	If the RDN introduces a regional Direct Lending program, it is recommended that the City participates in the program and collaborates with the RDN on program development, implementation and marketing. If the RDN chooses not to move ahead with a Direct Lending program across the region, the City of Nanaimo could implement either a City-	**Home Energy Navigator:** Continuation of the HEN is considered a critical success factor for any local financing program. It adds significant value for the program, supports and raises awareness among study region households, and reduces local government administrative costs and staffing needs for the program. The program offer should be integrated into HEN materials and supports. **Preferential lending terms and expanded underwriting:** For a Direct Lending program, identifying a values-aligned lending partner and securing preferential lending terms, including below-market interest rates, is critical to program equity and uptake. For PACE, local governments have more control and influence over financing terms, which can lead to broader uptake generally and the ability to design financing and supports specifically for vulnerable households. To overcome barriers to traditional financing associated with credit checks, property tax standing can be used to underwrite loans.

	scale Direct Lending program or a PACE program. If a PACE model is pursued, it is recommended that this is led by the City. If the RDN chooses not to continue funding and offering the HEN, and if the City moves ahead with a financing program, it is strongly recommended that the City takes over, dedicating funding to the HEN and offering it to City residents (at minimum).	**Credit enhancement for Direct Lending:** Including a loan loss reserve in program design minimizes risk for the lending partner and helps secure preferential lending terms and expanded underwriting criteria for participants, both of which enable broader participation. **Investigation into legislative context for credit enhancement features:** As noted for the RDN, a successful Direct Lending program requires preferential lending terms. Credit enhancements help achieve such terms. The City should seek internal and external legal consultation, as well as liaise with the CEF, regarding use of these features. **Dedicated reserve funding and long-term capitalization plan for PACE program**: Long-term borrowing restrictions constrain options for program capital. The success of a local program to deliver financing at the scale needed to stimulate home energy retrofits depends on identifying and dedicating capital funding to the project in the form of municipal reserve funds. **Collaboration with the Districts of Saanich and Central Saanich on PACE:** Reaching out to districts who have introduced a PACE program will allow the City to understand key design features, anticipate and mitigate challenges and risks, and benefit from the sharing of program materials (e.g., program establishing bylaw, LAS bylaw, homeowner agreements).

5.2 Next Steps

With program feasibility confirmed, local government staff can begin the program design process. To fund this effort, the RDN and/or City may submit a grant application to FCM's CEF initiative. It's important to note that the CEF initiative is expected to sunset in 2026, so the RDN and/or City will need to advance through the application phases within this timeframe to take full advantage of the limited window of opportunity. Generally speaking, a program design study application takes around 3 – 6 months to process. Once approved, the program design phase can take between 6 – 12 months, depending on local government and partner processes, priorities, coordination and capacity. An application to the CEF capital program takes roughly 6 – 8 months to process and execute an agreement. The above timelines allow the RDN and/or City to progress within the remaining program timeframe but require quick, coordinated action. To help expedite the program design process, the following approaches are recommended:

- **Initial steps:** Legal consultations on PACE (RDN) and/or Direct Lending (RDN and/or City). Investigate eligibility of interest rate buydowns for CEF funding.
- **Pre-application process:** Begin the pre-application process immediately. While time-intensive, it can be done at any time, requires very little program-specific information or detail, and does not expire.

- **Program design:** Once the *full* program design study application has been submitted (i.e., after the second stage), project costs incurred from that moment onward are eligible for reimbursement by FCM at a later date *provided that the project receives funding award*. Staff could therefore begin program design if they are willing to take on risk of non-reimbursed costs if the application is denied.

Consideration of program impacts, significant changes to external conditions (e.g., market, legislation, existing program landscape), resource constraints, and delinquencies and defaults will need to be addressed during the program design stage to mitigate risk and maximize the program's community impacts to ensure success.

While the design study process is underway, the RDN and City should continue to advance existing initiatives and other key actions related to home energy retrofits.

Build energy and financial literacy and a supporting ecosystem. Efforts are needed to increase energy and financial literacy, improve homeowners' general understanding of the role energy plays in their daily lives and how they consume energy, and to help them make informed decisions to reduce their energy consumption. The City should also continue to engage key program delivery partners and interested groups to strengthen relationships, create alignment and buy in, validate program features, and identify potential capital providers. This includes the community groups consulted for this project.

Commit resources to the continuation of the Home Energy Navigator and related services. The HEN is currently being piloted for a limited time in the RDN and is fully subscribed only a few months after launch. Dunsky recommends that the RDN (or City) continue offering the HEN to regional residents. Without the HEN, there would be significant challenges to deliver an effective and impactful financing program, regardless of chosen model. The HEN offers critical added value to a financial partner within a Direct Lending program and reduces staff impacts under a PACE model. In both models, the HEN provides key supports and helps raise awareness of the program. The HEN was designed to integrate special offers and would be well-positioned to support a future financing program. Several enhancements to the HEN would support program equity and resources:

- Pending its success, City Green's Neighbourhood Energy Navigator Offer (currently being piloted in the CRD as an alternate pathway in the Home Energy Navigator) could be expanded to the RDN to address barriers and risks associated with financial literacy.
- The RDN and/or City could also allocate funds to the HEN's program administrator to interview contractors and update the region's contractor database to reflect the significant growth in heat pump contractors and energy advisors in recent years and changes to the specialty and services offered by the region's contractors.
- Resources could be allocated to make programming more equitable via additional language supports, community organization training sessions and offline marketing materials.

Continue offering and promoting local government top-ups. The RDN and City should continue (and/or expand) their offerings of municipal top-up rebates for heat pumps, electrical upgrades, home energy assessments and renewable energy systems. To help alleviate contractor and homeowner uncertainty, the RDN and City should consider increasing the budget for these rebates to facilitate an accelerated pace of retrofits and

higher confidence in access. Given the large potential market for rooftop solar installations, the City should consider introducing a renewable energy rebate.

Engage with industry groups and contractors on key technologies. For example, City Green believes that many local contractors are not aware of load shedding and/or load-sharing devices. These technologies support electrification retrofits by helping to reduce or avoid costs from electrical panel upgrades. Increased awareness and training around these technologies could benefit project economics in favour of deeper retrofits and better payback periods. Note that City Green will be releasing an upcoming guide via TSBC/BCH focused on engaging electricians around home retrofits.

Engage proactively with the Province on provincial PACE. In all scenarios, but especially if designing a PACE-style program, the RDN and City should closely monitor provincial announcements and proactively and frequently reach out to confirm interest and take advantages of any opportunity to engage early and often on program design. The RDN and City should prepare a set of program design criteria under which they would be comfortable participating in a PACE program and, ideally in collaboration with similarly minded municipalities and organizations, communicate this to the Province. To prepare, the RDN and City could conduct a detailed review of existing property tax collection processes.

Monitor the evolving retrofit industry and program landscapes. Several local governments across Canada are currently in the process of designing or delivering similar programs and testing innovative features. Others could be interested in establishing partnerships to leverage efficiencies of scale and access private sector capital. The RDN and City can stay informed of these developments by actively engaging peers and participating in FCM's community of practice network designed to share knowledge, learnings and best practices.

Communicate the urgency. The RDN is aiming for 50% of homes in the region to meet EnerGuide 80 by 2030 (~10% more efficient than current code-built home) and 50% of dwellings to use non-fossil fuel sources for home energy demands. A local financing program could help the RDN achieve 0.5% of its target (specific to residential building emissions) to reduce annual GHG emissions from the built environment by 80% by 2050. In the City, a local financing program could contribute 0.5% of annual residential building GHG reductions needed by 2030 to achieve 50% GHG reductions. A program could similarly contribute 0.4% of annual residential GHG reductions needed by 2050 to achieve 100% reductions (both against a 2010 baseline). Following the feasibility study, it will take time to secure support, funding, design a program, and set up and implement the necessary partnerships, processes, infrastructure, and related activities. As a result, a local program may not launch until 2025 or later. By establishing a local program as early as possible, local governments will help avoid "locking in" decades of fossil fuel equipment and inefficient home upgrade that may occur on the short-term. As noted previously, a financing program alone clearly cannot be expected to meet local government targets. Rather, the program will act as a critical tool that can work in conjunction with other components of the emerging energy and GHG policy landscape, offering a solution that can assist study region homeowners in benefitting fully from home energy retrofits.

Appendices

Appendix A:
Community Energy and Emissions Inventory (CEEI) and Housing Characterization Methodology

Community Energy and Emissions Inventory (CEEI)

A detailed Community Energy and Emissions Inventory was conducted as part of this project to establish key technical features and current home heating type, energy consumption and GHG emissions. This inventory is critical to identify:

- **The theoretical potential impact from home energy retrofits across each jurisdiction**: the total estimated energy and GHG reductions theoretically possible from home energy retrofits to all homes in the region. This allows staff at the RDN and City to understand total theoretical contributions of home energy retrofits within the low-density housing sector and how these would contribute to overall jurisdictional energy and GHG targets.
- **Key opportunities and potential financing program impact from home energy retrofits across each jurisdiction:** the total estimated energy and GHG reductions that could be realized by a local financing program, considering economic context, market barriers and opportunities, and projected program uptake. This allows staff at the RDN and City to understand how much a local financing program – one of many possible and needed initiatives aimed at this sector – could contribute to existing residential energy and GHG reductions.

The CEEI for this study had a targeted scope focused exclusively on one segment of the Buildings sector: low-density (Part 9) existing homes. Specifically, the scope of this inventory included:

- **Jurisdiction:** Regional District of Nanaimo, including the City of Nanaimo (specific focus) and all other municipalities and unincorporated Electoral Area
- **Sector:** Low-density (Part 9) existing homes, i.e., single family dwellings, townhouses, rowhouses, duplexes, triplexes/quadplexes, and manufactured/mobile homes
- **Energy end use types:** Space heating, hot water heating, lights and appliances
- **Fuel types:** Electricity, natural gas, heating oil, propane and wood
- **Greenhouse gases:** Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and biogenic carbon dioxide from wood biomass

The Community Energy and Emissions Inventory was completed primarily using Climative's Energy Insights tool. This tool uses a machine learning model to estimate total energy use and GHG emissions by household. The machine learning algorithms leverage and are trained on past onsite EnerGuide assessments, conducted by registered energy advisors, from across Canada including over 50,000 audits from BC specifically. The energy

consumption prediction model is 83% accurate against the EnerGuide audits[56]. CEEI results are then presented in a web-hosted PowerBI platform that can flexibly display results by desired aggregations (e.g., energy and GHG emissions from natural gas-heated duplexes in the City of Nanaimo built after 1995). Per Climative, the underlying data used to model individual home profiles and energy consumption is all derived from public datasets that are either freely available or can be purchased.

Climative's approach for individual home and CEEI analyses differs from the archetype modeling approach used by Dunsky to identify and develop key retrofit packages used to inform the financing program modeling. An overview of these two types of modeling, and the specific ways they were applied within the project, is provided in the table below.

Table A-1: Overview of archetype and machine learning modeling approaches and uses for the study

Project modeling	Dunsky	Climative Energy Insights Tool
Modeling type	**Archetype modeling**	**Machine learning modeling**
Description	Archetypes are created to be representative examples of segments of the existing housing stock, each with an average profile including area, heating type, energy consumption and GHG emissions. This profile is applied to every dwelling in that archetype.	The machine learning model is trained using EnerGuide data from across Canada, including >50,000 BC EnerGuide datasets, as well as weather data (heating degree days). To calculate home energy retrofit potential and measures, the model emulates Energy Advisor behaviour.
Project uses	**Developing key retrofit packages and estimating costs and impacts of a local financing program** 1. Understanding home profiles in the region, their average energy and emissions consumption, and estimated retrofit costs 2. Developing the 10 retrofit packages used as inputs to the financing program model. This model estimates the potential market size for a financing program for each retrofit package, the associated impact (i.e., energy and GHG savings), and the program costs (capital and staffing) to deliver a financing program. 3. Calculating the total technical energy and emission reduction potential of home retrofits in each jurisdiction and the impact of a local financing program.	**CEEI, including estimating fuel type, energy and GHG emissions by home and across the region.** 1. Estimating and assigning primary home heating fuel across all homes in the region. 2. Generating energy and GHG profiles for each individual home in the RDN included in the inventory scope (i.e., low-density Part 9 existing homes). 3. Calculating CEEI for low-density (Part 9) residential buildings in the Regional District of Nanaimo and each FSA in the RDN.

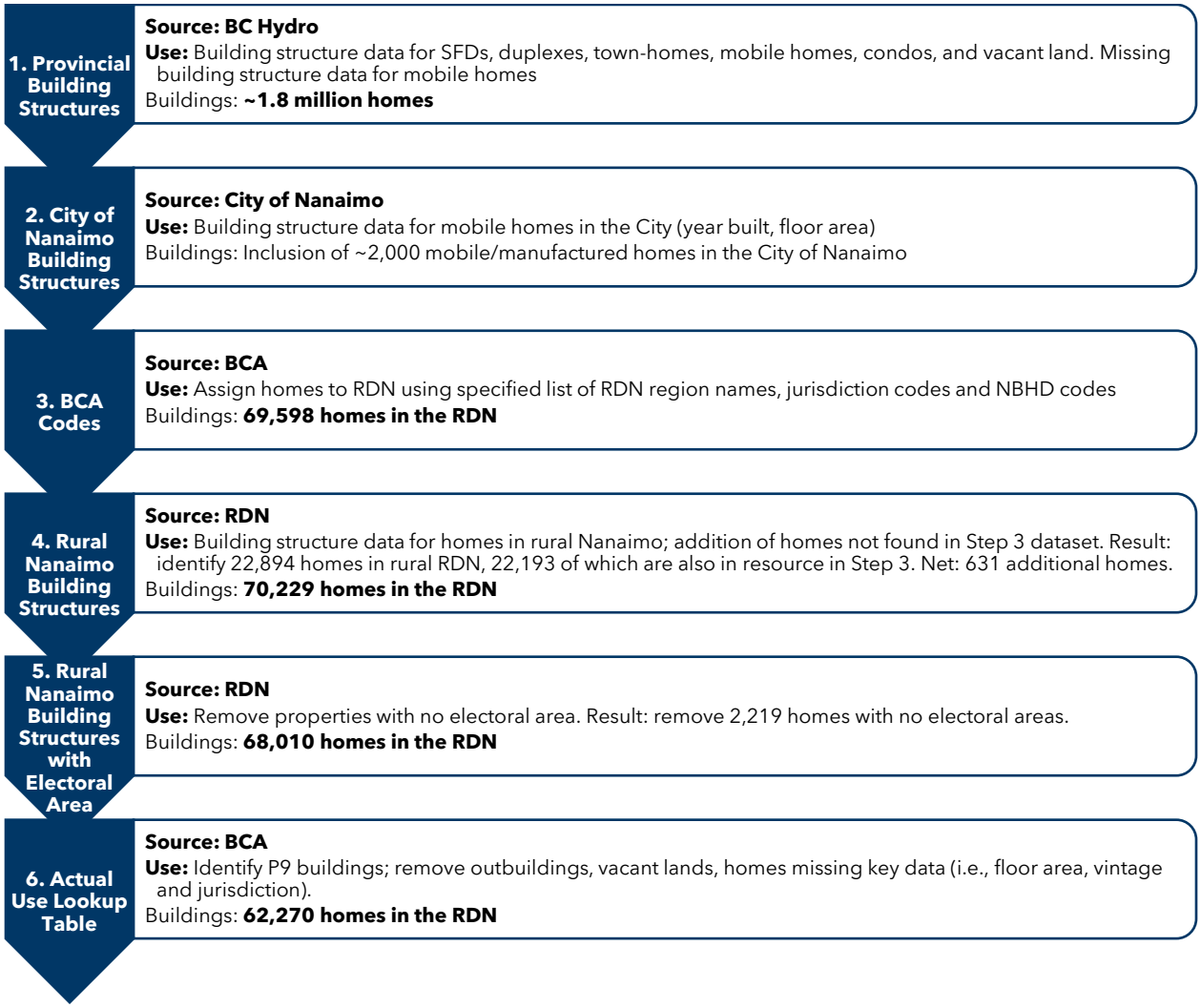
[56] Per Climative: Accuracy = 1 – median absolute percentage error (MedAPE), where MedAPE is individual home level median absolute percentage difference from EnerGuide audits from the test set.

The Community Energy and Emissions Inventory proceeded through four main steps. These are described below. All steps were applied to the full study region, to provide a regional CEEI, as well as the City of Nanaimo specifically.

Step 1: Count and characterize the region's low-density homes

Several key data sources were obtained by the team at Climative to determine the number of low-density homes in the study region by jurisdiction, market segment and vintage. The figure below provides a sequential overview of each dataset, the source of the data and its primary uses, as well as a tally of homes funnelled through each step.

Figure A-1: Overview of data sources used to count and characterize low-density homes



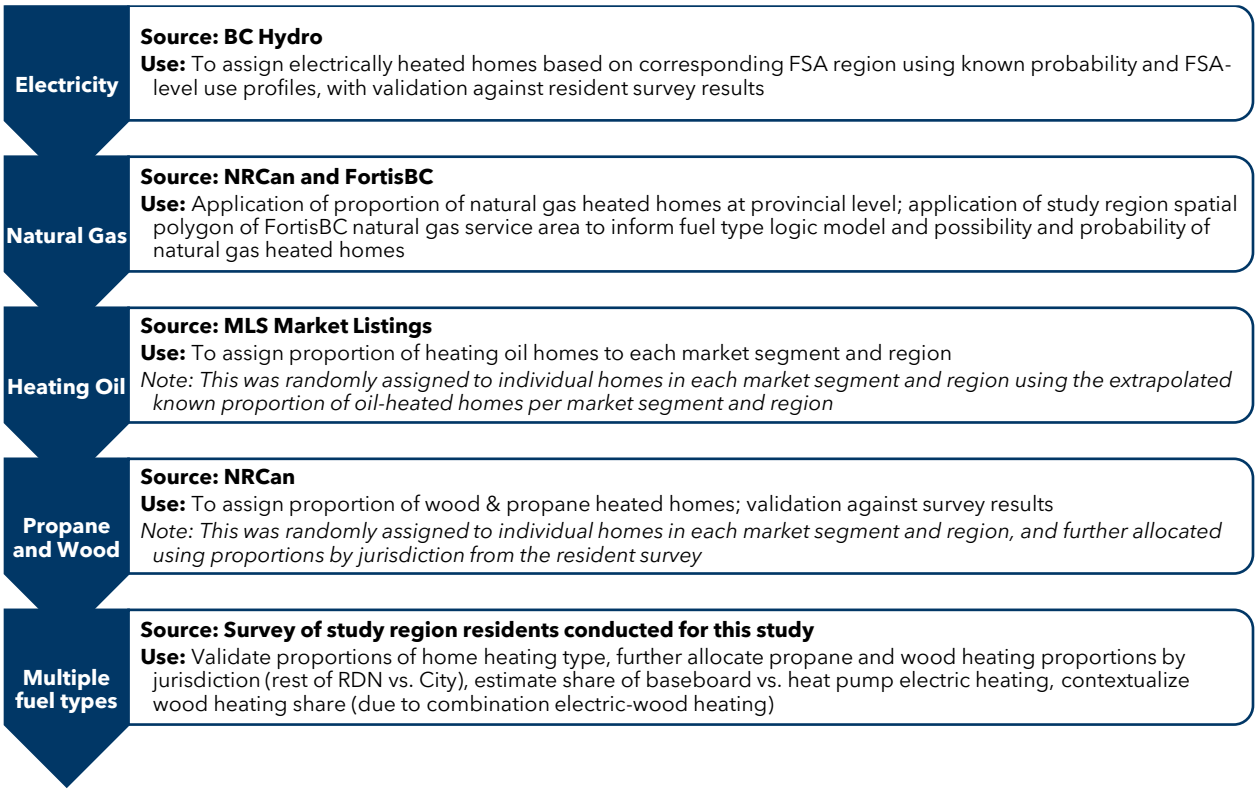
Step 2: Estimate and assign primary and secondary home energy fuel type to all homes

Baseline data in the Energy Insights tool did not include a breakdown of estimated home energy use by fuel source (i.e., electricity, natural gas, heating oil, propane and wood). This was a key task and needed to be assigned for primary and secondary home energy.

- **Primary home heating type:** Space heating for all homes; the primary energy type was also assumed to be used for hot water heating in all but wood-heated homes.
- **Secondary home heating type:** Lights & appliances for all homes; assumed electricity used for this end use in all homes. In the case of wood heated homes, hot water heating was also assumed to be electric.

Several data sources were used to estimate and assign primary home heating type, tag each home in the region (i.e., by fuel type and archetype), and estimate energy consumption and resulting GHG emissions within the Tool. These data sources are detailed in the figure below.

Figure A-2: Overview of data sources used to assign home energy fuel type



Using these data sources, primary (i.e., space heating) home energy type of each home was estimated and assigned via the following logic pathway:

- Assign oil heated homes based on extrapolated regional MLS market share by market segment, vintage and jurisdiction
- For remaining homes, if home falls within the study region natural gas service area:
  - Assign electrically heated homes using BC Hydro data at FSA level
  - Assign proportion of natural gas heated homes using NRCan data
  - Assign proportion of wood and propane heated homes using NRCan data, further allocated via survey results
- For remaining homes, if home falls outside the study region natural gas service area:
  - Assign electrically heated homes using BC Hydro data at FSA level
  - Assign proportion of wood and propane heated homes using NRCan data, further allocated via survey results

Step 3: Estimate energy consumption for all homes

The Climative Energy Insights Tool uses a machine learning model to estimate total energy consumption by household, as well as the proportion of energy used for specific end uses (i.e., space heating, hot water heating, and lights & appliances). The machine learning algorithms leverage and are trained on past onsite EnerGuide assessments, conducted by registered energy advisors, from across Canada including over 50,000 audits from BC specifically. The energy consumption prediction model is 83% accurate against the EnerGuide audits. Third party weather data is then used to measure and model weather impact on energy consumption.

The Energy Insights Tool does not include a full dataset or modeling parameters for condos, due to lower overall audit number and variations in building classification (i.e., Part 9 vs. Part 3). To estimate energy consumption for a portion of the region's triplex/quadplex homes, the average energy intensity (GJ/m^2) for each end energy use type (space heating, hot water heating, lights & appliances) was applied to the area of each home.

Step 4: Estimate GHG emissions for all homes

Greenhouse gas emissions for each home were calculated using assigned primary and secondary home energy fuel type (Step 2) and energy consumption by end energy use type calculated for each home (Step 3). Primary energy type dictated energy type assigned to space heating (all homes) and hot water heating (all homes except primary wood heating homes). Secondary energy type was assumed electricity for all homes and applied to lights & appliances (all homes) and hot water heating for primary wood-heated homes. Emission factors and global warming potentials (GWP) applied are detailed in the table below.

Table A-2: High heating values, emission factors and global warming potentials applied in the CEEI

	Coefficient	Source
Emission factor	**$kgCO_2e/GJ$**	
Electricity	3.14	2023 B.C. Best Practices Methodology for Quantifying Greenhouse Gas Emissions. BC Ministry of Environment and Climate Change Strategy. December 2023.
Natural gas	50.22	
Heating oil	72.70	
Propane	60.49	
Wood fuel, residential	27.10	*High heating values for wood biomass:* Solid Biofuels Bulletin No. 2: Primer for Solid Biofuels. Natural Resources Canada. *Emission factor:* 2023 B.C. Best Practices Methodology for Quantifying Greenhouse Gas Emissions. BC Ministry of Environment and Climate Change Strategy. December 2023.
Global warming potential		
Carbon dioxide (CO_2)	1	5th Assessment Report. IPCC. 2014.
Methane (CH_4)	28	
Nitrous oxide (N_2O)	265	

Key Archetypes for Low-Density (Part 9) Homes

Dunsky identified and defined thirty key archetypes to represent average profiles of most existing low-density residential building types in the study region. This was done by considering key building characteristics including building form, vintage, size (floor area) and primary heating fuel. Archetype dimensions and vintages were derived from MLS data. The market share came from the Community Energy and Emissions Inventory, and as such was derived from numerous data sources including BCA, BC Hydro, FortisBC, NRCan, MLS data, RDN, City of Nanaimo and the survey of local residents conducted for this study. Baseline energy consumption was derived from NRCan data, adjusted to align with BC Housing's 2018 Metrics Research and BC Hydro's Residential End-Use Survey and adjusted to Climate Zone 5.

For each of the thirty archetypes, the potential impact of two different retrofit packages was then modeled. Retrofit Package 1 represented a mechanical-only retrofit consisting of the installation of an air source heat pump. Retrofit Package 2 represented a deeper retrofit consisting of an ASHP installation and energy efficiency improvements including improvements to home insulation and installation of energy efficient windows and doors.

Details of all archetypes are shown below. Details of the ten retrofit packages chosen for inclusion in the program and financial modeling are shown in Appendix D.

*Note that archetypes are developed as **average representative profiles** for key housing segments, to allow for modeling of energy and GHG reduction potential broadly, as well as the potential impacts of a local financing program. Actual home characteristics and energy consumption will differ from the below.*

Table A-3: Residential archetypes defined for the City and Regional District of Nanaimo, #1 – 6

Archetype		1	2	3	4	5	6
Archetype		**Small SFD**					
Vintage		≤1995			≥1996		
Floor Area (sqm)		125			139		
Primary Heating Fuel		**Electricity**	**Natural Gas**	**Heating Oil**	**Electricity**	**Natural Gas**	**Heating Oil**
Est. Market Share (%)		18%	8%	1%	6%	2%	0.3%
Base Consumption	Elec (GJ)	92	33	33	67	27	27
	Gas (GJ)	-	69	-	27	47	-
	Oil (GJ)	-	-	74	-	-	50
	GHG Emissions (tCO2e)	0.3	3.6	5.6	0.2	2.4	3.8
Package 1: Heat Pump	Cost ($)	$9,500			$10,000		
	Energy Savings (%)	32%	38%	42%	26%	31%	35%
	GHG Savings (%)	32%	82%	97%	26%	75%	96%
Package 2: Heat Pump + Insulation	Cost ($)	$24,500			$25,500		
	Energy Savings (%)	41%	46%	49%	38%	42%	46%
	GHG Savings (%)	41%	82%	97%	38%	76%	97%

Table A-4: Residential archetypes defined for the City and Regional District of Nanaimo, #7 – 12

Archetype		7	8	9	10	11	12
Archetype		**Medium SFD**					
Vintage		≤1975			1976-1995		
Floor Area (sqm)		213			221		
Primary Heating Fuel		**Electricity**	**Natural Gas**	**Heating Oil**	**Electricity**	**Natural Gas**	**Heating Oil**
Est. Market Share (%)		3%	2%	1%	6%	3%	0.1%
Base Consumption	Elec (GJ)	74	41	41	91	25	25
	Gas (GJ)	-	39	-	-	77	-
	Oil (GJ)	-	-	42	-	-	82
	GHG Emissions (tCO2e)	0.2	2.1	3.2	0.3	3.9	6.2
Package 1: Heat Pump	Cost ($)	$9,000			$12,000		
	Energy Savings (%)	28%	35%	36%	35%	41%	45%
	GHG Savings (%)	28%	76%	95%	35%	84%	97%
Package 2: Heat Pump + Insulation	Cost ($)	$25,500			$26,000		
	Energy Savings (%)	36%	42%	42%	50%	55%	58%
	GHG Savings (%)	36%	77%	96%	50%	85%	98%

Table A-5: Residential archetypes defined for the City and Regional District of Nanaimo, #13 – 18

Archetype		13	14	15	16	17	18
Archetype		**Medium SFD**			**Large SFD**		
Vintage		≥1996			All		
Floor Area (sqm)		236			388		
Primary Heating Fuel		**Electricity**	**Natural Gas**	**Heating Oil**	**Electricity**	**Natural Gas**	**Heating Oil**
Est. Market Share (%)		7%	3%	0.008%	1%	0.3%	0.003%
Base Consumption	Elec (GJ)	90	31	31	112	35	35
	Gas (GJ)	-	70	-	-	91	-
	Oil (GJ)	-	-	74	-	-	96
	GHG Emissions (tCO2e)	0.3	3.6	5.6	0.3	4.6	7.3
Package 1: Heat Pump	Cost ($)	$13,000			$16,500		
	Energy Savings (%)	29%	35%	39%	33%	39%	44%
	GHG Savings (%)	29%	82%	97%	33%	85%	97%
Package 2: Heat Pump + Insulation	Cost ($)	$42,000			$63,500		
	Energy Savings (%)	44%	49%	52%	53%	57%	60%
	GHG Savings (%)	44%	83%	97%	53%	86%	98%

Table A-6: Residential archetypes defined for the City and Regional District of Nanaimo, #19 – 24

Archetype		19	20	21	22	23	24
Archetype		**Duplex**			**Row/Townhouse**		
Vintage		All			All		
Floor Area (sqm)		180			134		
Primary Heating Fuel		**Electricity**	**Natural Gas**	**Heating Oil**	**Electricity**	**Natural Gas**	**Heating Oil**
Est. Market Share (%)		6%	2%	0.3%	5%	2%	0%
Base Consumption	Elec (GJ)	100	32	32	57	18	18
	Gas (GJ)	-	81	-	-	45	-
	Oil (GJ)	-	-	86	-	-	48
	GHG Emissions (tCO2e)	0.3	4.1	6.5	0.2	2.3	3.7
Package 1: Heat Pump	Cost ($)		$9,000			$11,500	
	Energy Savings (%)	38%	44%	47%	33%	38%	43%
	GHG Savings (%)	38%	86%	97%	33%	79%	97%
Package 2: Heat Pump + Insulation	Cost ($)		$23,000			$23,000	
	Energy Savings (%)	50%	54%	57%	47%	50%	54%
	GHG Savings (%)	50%	87%	98%	47%	80%	98%

Table A-7: Residential archetypes defined for the City and Regional District of Nanaimo, #25 – 30

Archetype		25	26	27	28	29	30
Archetype		**Triplex/Quadplex**			**Manufactured**		
Vintage		All			All		
Floor Area (sqm)		294			111		
Primary Heating Fuel		**Electricity**	**Natural Gas**	**Heating Oil**	**Electricity**	**Natural Gas**	**Heating Oil**
Est. Market Share (%)		6%	2%	0.4%	3%	2%	0.7%
Base Consumption	Elec (GJ)	164	52	40	52	19	19
	Gas (GJ)	-	132	-	-	39	-
	Oil (GJ)	-	-	141	-	-	42
	GHG Emissions (tCO2e)	0.5	6.8	10.6	0.2	2.0	3.2
Package 1: Heat Pump	Cost ($)		$19,500			$9,500	
	Energy Savings (%)	41%	46%	46%	36%	40%	45%
	GHG Savings (%)	41%	90%	97%	36%	72%	97%
Package 2: Heat Pump + Insulation	Cost ($)		$31,500			$23,000	
	Energy Savings (%)	52%	57%	56%	39%	42%	47%
	GHG Savings (%)	52%	91%	98%	39%	72%	97%

Appendix B:
Local Industry Capacity

NRCan Service Organizations (SO): NRCan accredited Service Organizations are independent organizations licensed by NRCan to use the EnerGuide Rating System.

CleanBC Program Qualified Energy Advisors (PQEAs): PQEAs are NRCan registered EAs who have completed additional training specific to BC rebate programs. Homeowners must use a PQEA for the EnerGuide home energy evaluations required to access Better Homes and Home Renovation Rebates.

Forward Sortation Area (FSA): A forward sortation area is a way to designate a geographical area based on the first three characters of a Canadian postal code. The FSAs used for this search were: V9G, V9K, V9P, V9R, V9S, V9T, V9V, V9X, and V0R.

The below list of service organizations servicing the study region was compiled using NRCan's *Find a service organization for existing homes* database and CleanBC's *Find an energy advisor* tool. Of the 26 service organizations listed by NRCan, 20 provide services in all study region FSAs. For those SO servicing only some FSAs, the FSAs are *shown in italics* in the list below. Service organizations with at least one CleanBC PQEA are **shown in blue.**

- **(A1) NRGwise Consulting (British Columbia)**
- Acacia Engineering Ltd (British Columbia)
- **All Season Inspection (BC):** *V9R, V9S, V9T, V9V, V9X*
- **Canadian Home Builders Association of BC**
- Canada Energy Audit Ltd: *All except V9V*
- **Capital Home Energy**
- **City Green Solutions**
- **CoEfficient Building Science (BC Island)**
- **DW Energy Advisors**
- **Energuy Holdings Ltd (BC)**
- **Energy Werx Corp (British Columbia)**
- **Enerhold Solutions Ltd:** *V9R, V9S, V9T, V9V, V9X*
- **Enerhome Consulting Ltd (Lower Mainland & Interior BC):** *All except V0R*
- **Enerhome Consulting Ltd (Vancouver Island)**
- **EnerSolution Inc (BC)**
- **EnerTech Solutions Ltd:** *All except V9G*
- ER Energy Solutions Inc
- **GETS Energy**
- Greenbrain Inc (British Columbia-Alberta)
- **Green Canada Home Advisors Inc**
- Green Think Inc. (British Columbia): *V9K, V9R, V9S, V9V*
- **HomeTech Energy Solutions Inc**
- **Method Engineering and Building Services Ltd**
- **Ridge Energy Consultants Inc.**
- **Total Home Solutions Inc.**
- **VerdaTech Energy Management and Consulting Inc (British Columbia)**

Note: Although AmeriSpec of Canada (Vancouver) is listed in NRCan's and CleanBC's searchable tools for FSAs in the RDN, it was indicated that they no longer service the island.

Local Contractors

City Green developed a database of Central Island contractors in 2021 for engagement and awareness-building during the T2050 project. It has been used by the RDN for outreach and to support vendors, as well as for building awareness with local contractors during the launch of the HEN program. When this resource was created, none of the contractors listed heat pumps or renewables as their specialty, in contrast to the eleven contractors who listed windows/doors and twelve who listed insulation as their specialty at that time.

As part of this project, Dunsky updated this list through web-based research of contractor listings and services, outreach to certain contractors to confirm locations and services, and a cross-reference against the RenoMark and CleanBC databases. The below list combines Dunsky's recent research with a filtered set of contractors listed in the T2050 Central Island Contractor List who, in 2021, both a) serviced the Nanaimo area and b) had services that included at least one of the retrofits included in project packages (i.e., heat pumps, windows/doors, insulation or renewables). The list has been updated to indicate whether the contractor has achieved RenoMark certification and/or is listed as a CleanBC registered contractor. Note that the speciality of new contractors added from research for this project have not been confirmed. This is recommended in Section 5. Conclusions and Next Steps.

Table B-1: Summary of Nanaimo-area contractors and details on services and certifications

Company Name	Head Office City	Specialty	CleanBC Registered Contractor	RenoMark Certified Contractor	Heat Pumps	Windows, Doors	Insulation	Renewables	Added to T2050 List
Alair Enterprises BC Ltd	Nanaimo	Home Builder, Renovator, Design Services		x					x
Archie Johnstone Plumbing & Heating	Nanaimo	HVAC, plumbing			x				
Atlas (Coastal) Windows & Doors	Nanaimo	Windows/doors				x			
B. Gallant Homes Ltd	Nanaimo	Home Builder, Renovator, Built Green		x					x
Base View Homes Ltd	Nanaimo	Home Builder							
Boehm Construction	Nanaimo	Home Builder							
Browns Plumbing & Gas Ltd	Qualicum Beach	HVAC, plumbing			x				
Bryans Mechanical Ltd	Nanaimo	HVAC			x				
Blue Flame Ventures	Nanaimo	HVAC			x				

Buck Island Construction Ltd	Nanaimo	Home Builder, Renovator, Design Services							
Camelot Homes	Parksville	Builder/renovator				x	x		
Centra Windows Ltd	Nanaimo	Windows/doors				x			
Coastal Energy	Nanaimo	HVAC			x				
Coastal Heat Pumps	Nanaimo	HVAC	x		x				
Coastal Windows & Doors	Nanaimo	Windows/doors				x			
Complete Spray Foam	Parksville	Insulation					x		
Complete Window Services	Parksville	Windows/doors				x			
Cool Warm Technology	Nanaimo	HVAC			x				
dawntoduskcontracting	Nanaimo	insulation					x		
Diverse Drywall	Nanaimo	Insulation					x		
E&S Heating and Air Conditioning	Ladysmith	HVAC			x				
Flamewright	Nanaimo	HVAC			x				
Flamewright Services Ltd	Nanaimo	HVAC			x				
Glacier Industries	Parksville	HVAC	x		x				
Hayes Heating Services	Qualicum Beach	HVAC			x				
Insulpro Insulation Inc.	Nanaimo	Insulation					x		
Integral Installations	Lantzville	Windows/doors				x			
Intercity Insulation	Parksville	Insulation					x		
Island ecoEnergy	Nanaimo	HVAC			x				
Island Efficient Homes	Nanaimo	General contractors					x		
Island Home Energy Retrofit	Qualicum Beach	Home Builder		x					
JL Construction	Nanaimo	Builder/renovator					x		
Lewis Modern Home Renovations	Nanaimo	insulation					x		
Marshall Plumbing Ltd	Nanaimo	HVAC			x			x	
MJ Chahley Construction Group Ltd	Nanaimo	Home Builder, Renovator, Built Green		x					
Modern Windows	Courtenay	Windows/doors				x			
Nick's Insulation	Nanaimo	Insulation					x		
North Pacific Window	Qualicum Beach	Windows/doors				x			
Northstar Heating & Cooling Services	Nanaimo	HVAC			x				
Oasis Renovations	Qualicum Beach	Builder/renovator				x	x		

Our Glass Shop	Parksville	Windows/doors				x			
P & H Plumbing	Parksville	HVAC			x				
Peak Insulation Home Depot	Nanaimo	Insulation					x		
Pheasant Hill Homes Ltd	Nanaimo	Home Builder, Renovator, Built Green		x					
Pope & Sons Refrigeration Ltd.	Parksville	HVAC	x		x				
Proline Glass Ltd	Port Alberni	Windows/doors				x			
Rathy Homes Renovations & Interior Design	Nanaimo	Home Builder, Renovator, Built Green, Design Services		x					
Ron's Drywall	Nanaimo	Insulation					x		
Servicexcel Heating & Cooling	Nanaimo	HVAC	x		x				
St. Onge Construction	Nanaimo	Builder/renovator					x		
Starke Contracting	Nanaimo	General contractors				x	x		
Starline Windows	Lantzville	Windows/doors				x			
Storm Industries Limited	Saanich	HVAC	x		x				
Strategic Mechanical Services	Nanaimo	HVAC			x				
The Super Plumber	Shawnigan Lake	HVAC, plumbing			x				
TLC Insulation	Nanaimo	Insulation					x		
Total Heating	Parksville	HVAC			x				
Total Insulation	Parksville	Insulation					x		
Trane	Burnaby	HVAC			x				
Trev Homes	Nanaimo	General contractors				x	x		
Trident Energy	Mill Bay	HVAC			x				
Van Roc Interiors	Parksville	Insulation					x		
Westcore Electrical and Plumbing	Nanaimo	HVAC			x				
Westeck Windows	Nanaimo	Windows/doors				x			
Westisle Heating & Cooling	Courtenay	HVAC	x		x				
Westmark Construction Ltd	Nanaimo	Builder/renovator					x		
Wizards 4 Environmental Technologies	Nanaimo	HVAC			x			x	
Westcore Industries Ltd	Nanaimo	HVAC, plumbing			x				
Your Maintenance Man	Nanaimo	General contractors				x	x		

Appendix C:
Existing Energy Retrofit Programs

Table C-1: Current programs available to Nanaimo residents that support home retrofits

Program	Administrator *(Geography)*	Type *(Detail)*	Features	Eligibility criteria	Strengths	Limitations
Rebates for home renovations	BC Hydro *(BC)*	Rebate *(energy efficient upgrades)*	Up to $10,000: $2,000 for windows and doors, $5,500 for insulation, $2,000 for heat pumps, $1,000 for heat pump water heaters	BC Hydro client Home primarily heated by electricity	Bundled upgrades eligible for bonus rebates of $300 to $2,000 Low-rise housing eligible	Limited to homes primarily heated by electricity MURBs not eligible
Energy Conservation Assistance Program (ECAP)*	BC Hydro Clean BC Fortis BC PNG *(BC)*	Free services and upgrades	Includes heat pumps (for mobile homes only), furnace or boiler upgrades, water efficiency, insulation, non-affixed upgrades (e.g., LEDs, EE appliances), and select health & safety measures (e.g., CO detector, portable A/C)	BC Hydro or City of New Westminster or Fortis BC or municipal electricity customer account holder	Following all eligible: Renters, with consent form Low-rise housing MURBs, for A/C & energy saving kit Mobile and manufactured homes	Income qualified households only Heat pumps for mobile homes only
Canada Greener Homes Loan (CGHL)	Canada Mortgage and Housing Corporation (CMHC) *(Canada)*	Financing *(energy efficiency retrofits)*	$5,000 to $40,000 interest-free unsecured personal loan for energy efficiency home retrofits 10-year loan term Eligible retrofits include heat pumps, home insulation, air sealing, windows and doors, thermostats, renewable energy (solar PV), and resiliency measures (if combined with energy efficiency retrofit). MURBs of 3+ units not eligible for heat pumps.	Home must be owned and primary residence Requires good credit history Requires pre-retrofit evaluation completed on or after April 1, 2020	Interest free loans Energy efficiency and renewable energy measures eligible Low-rise MURB homeowners eligible (with additional criteria)	Limited loans available across Canada Relatively short repayment term Only a portion of loan can be delivered upfront MURBs of 3+ units not eligible for heat pumps
Municipal top-up	City of Nanaimo *(City of Nanaimo)*	Rebate *(fuel switching)*	$500 for electric service upgrade $350 for electric heat pump for space heating $350 for electric heat pump for water heating $150 for HEA and up to $200 in follow-up	Resident of City Upgrade to 100, 200 or 400A service Fully electric or dual-fuel ASHP HEA completed by certified EA	Can be combined with provincial and federal rebates	Limited to fuel switching Limited availability (often fully subscribed, as in 2023)

Better Homes and Home Renovation Rebates	Clean BC *(BC)*	Rebate *(home energy retrofit measures)*	Up to $6,000 Heat pumps, water heating, furnace/boiler upgrades, insulation, windows & doors	Primary residence Residential utility account	Low-rise housing eligible	
Better Homes BC Low Interest Financing	Clean BC *(BC)*	Financing *(fuel switching)*	Up to $40,000 0% loan to switch from fossil fuel to a heat pump Up to $15,000 for heat pumps with fossil fuel back-up Up to 60-month (5-year) term	Residential account with BC Hydro, Fortis BC or municipal utility Year-round primary residence Home heated primarily by natural gas, propane or oil	0% interest rate No penalty for early repayment Mobile homes (permanently fixed) eligible Duplex, triples & rowhouses eligible (each must have own meter) Can be combined with other (e.g., group, municipal) rebates	Cannot be combined with heat pump rebate Relatively short repayment term Not available to electric heated homes
Income Qualified Program (IQP)*	Clean BC *(BC)*	Rebate *(energy upgrades)*	Up to $33,900 rebate Covers 60 – 95% of costs Includes heat pumps, water heating, insulation, windows & doors, electrical service upgrade and select health & safety measures	Two levels of income qualification Requires landlord consent for renters Requires pre-registration	Available to renters Low-rise housing eligible	Income qualified households only
Heat pump rebate	Fortis BC *(BC)*	Rebate *(upgrade from inefficient electric space heating to heat pump)*	Up to $2,000 rebate Heat pump only	Residential FortisBC natural gas account and/or residential FortisBC customer or customer of Grand Forks, Penticton, Summerland or Nelson Hydro	Can be combined with CGHG Renters eligible with a consent form Low-rise housing eligible Can access a two-upgrade bonus of $300 if make other qualifying upgrade	Limited to current inefficient electric space heating Cannot be combined with Clean BC Homes IQP
Heat pump loan for fuel switching	Fortis BC *(BC)*	Financing *(upgrade from inefficient electric furnace or baseboard to heat pump)*	Up to $6,500 loan 10-year loan term 1.9% interest rate Heat pump only	Residential FortisBC customer or customer of Grand Forks, Penticton, Summerland or Nelson Hydro Specific EE requirements for heat pump	Low-rise housing eligible MURBs eligible	Limited to current inefficient electric space heating

Canada Greener Homes Grant (CGHG)[57]	NRCan *(Canada)*	Rebate *(energy efficiency retrofits)*	Up to $5,000 rebate for retrofits Up to $600 for EnerGuide evaluations Eligible retrofits include heat pumps, home insulation, air sealing, windows and doors, thermostats, renewable energy (solar PV), and resiliency measures (if combined with energy efficiency retrofit).	Home must be owned and primary residence Requires pre-retrofit evaluation completed on or after April 1, 2020	Energy efficiency, renewable energy and resiliency measures eligible Low-rise MURB homeowners eligible (with additional criteria)	MURBs of 3+ units not eligible for heat pump grants
Oil to Heat Pump Affordability Grant*	NRCan *(Canada)*	Rebate *(fuel switching)*	Up to $10,000 for fuel switching from oil to cold climate heat pump	Household income at median or below Primary resident and owner Home heated primarily with oil (at least 1,000L in last year) Haven't received CGHG for heat pump	Easy process that doesn't require HEA with an upfront payment Low-rise housing eligible MURBs (3 storeys or less; 600m^2 or less) eligible	Off-grid houses ineligible Limited to lower than median income households Limited to cold climate heat pumps
Energy Saver Loan	RBC	Financing	Interest rate reduced by 1% on personal loans, or $100 rebate on HEA Maximum loan amount not stated 5 – 10 year loan term, depending on loan amount Includes heat pumps, water heating, water efficiency, insulation, windows & doors, non-affixed upgrades, thermostats, EV chargers and renewable energy		No penalty for early or full repayment	Subject to RBC standard lending criteria No homeowner support throughout retrofit
Planetwise Renovation Loan	VanCity	Financing	Three different products (loan, credit line, HELOC) Includes one complementary consultation with energy expert Loan: up to $50,000 (minimum $3,500) and loan term up to 15 years at prime+0.75% Line of credit: depends on what you qualify for			Limited homeowner support throughout retrofit

[57] The Government of Canada confirmed in February 2024 that the CGH Grant is no longer accepting applications under the current program, but that a new program targeting LMI households would be forthcoming. Specific details related to the timing and design of this program are presently unknown.

			(minimum $5,000) with open-ended term at prime+0.3% HELOC: up to 65% home equity (minimum $25,000) with open-ended term at prime+0.4% Includes heat pumps, water heating, water efficiency, insulation, windows & doors, non-affixed upgrades, thermostats, EV chargers and renewable energy, as well as rebate for energy audit (members only)			
Retrofit Financing Program – Financing for Climate-friendly building upgrades	VanCity *(BC)*	Financing	Program for commercial or rental properties (can include single family homes) offering loans, lines of credit and mortgages. Includes heat pumps, water heating, insulation, windows & doors, thermostats, and renewable energy Includes support resources and personally support to use Energy Star Portfolio Manager	Commercial	Offers amortization up to 35 years Offers retrofit development support (paid by Vancity) Low-rise housing eligible MURBs eligible	Not accessible to homeowner living in the/their property

** Indicates program is designed for low to moderate income households and includes related eligibility criteria*

Appendix D

Residential retrofit financing model estimates & methodology

Retrofit Packages

Dunsky developed ten retrofit packages that include energy and GHG reducing measures likely to be undertaken considering Nanaimo's building stock characteristics, energy use and homeowner preferences. These were chosen from the 30 archetypes developed for the project (Appendix A) to maximize potential participation (i.e., large market share) and impact (i.e., segments with a high proportion of oil heating; stand-alone solar PV retrofit), and considering local preferences, barriers and risks identified from the survey and community organization consultation. These ten retrofit packages were used in Dunsky's finance model to estimate potential program uptake, impact and costs. Retrofit packages include mechanical-only (i.e., air source heat pump installation) and deeper retrofit projects combining heat pump installation and energy efficiency measures (i.e., insulation, windows and doors).

Dunsky's proprietary finance model and modeled retrofit packages

Dunsky's proprietary finance model estimates useful information for program design, such as potential program uptake, program impact estimates (energy, GHG emissions), program administration costs (fixed, variable) and required resources, and required loan capital and capital flows. Uptake scenarios are based on a market assessment that funnels local dwellings through criteria of eligibility and feasibility. Modelled retrofit packages are chosen by Dunsky's analysis team, based on City and program goals, regional housing characterization, resident survey results (preferred measures, retrofit investment intentions, etc.) and internal expertise.

Retrofit packages are built to approximate measure impacts and required capital, and **do not represent recommendations for specific measures to be installed by homeowners**. They are typically cost-effective with current available incentives and rebates. In an eventual program, homeowners should choose their projects based on their individual preferences, home, financial capabilities, EnerGuide Assessment results, and advice from an Energy Coach (if applicable). There may be many permutations and the resulting energy, GHG, and utility bill savings will vary for each homeowner. Retrofit packages should therefore not be presented to homeowners as they are only helpful for program design estimates. **Risks of misrepresented or unrealized energy and bill savings are higher for vulnerable households. Transparent, customized advice is paramount for these households.**

Key Assumptions of Modeled Retrofit Packages

Details and assumptions associated with each of the measures included in the retrofit packages are summarized below. Packages and their resulting energy savings were modeled using NRCan's Housing Technology Assessment Platform (HTAP), which included heat pump water heaters. Heat pump water heater impacts were then separately modeled using Dunsky's HEAT model and removed from energy savings modeled through HTAP.

Small/medium single-family dwelling. Small and medium single-family dwellings represent a significant share of the housing market (67% in the study region and 69% in the City of Nanaimo, across all vintages and fuel types), whereas large SFDs are a much smaller share (1.2% study region; 1.2% City of Nanaimo). Small and medium SFDs were combined into a weighted average small/medium SFD for retrofit package development, weighted using the market share of each archetype within that package category. For example, baseline electricity consumption for Retrofit Package 1 (Small/medium SFD, electricity, heat pump only) is the weighted average of baseline electricity consumption from five archetypes (small and medium electrically heated SFDs, i.e., archetypes 1, 4, 7, 10 and 13). This approach accounts for variation in baseline energy consumption by each fuel type while appropriately ensuring the average reflects the proportion of existing home types in the region.

Insulation. Dunsky modeled energy efficiency insulation improvements to ceilings/attics, basements, and walls. An overall improvement to airtightness of 50% reduction in air changes per hour (ACH) was modeled. The City of Nanaimo's insulation requirements for residential additions (i.e., existing dwellings) require nominal R-values of between R31 – R44 for ceilings, between R12 – R14 for foundation walls, R20 for exterior walls, and R30 for floors over unheated space[58].

Efficient doors and windows. Energy efficient windows were modeled with a USI value of 1.08. This was intentionally chosen to exceed current City of Nanaimo insulation requirements for residential additions, which allow a maximum U-value of 1.22 for windows. For reference, Vancouver's Building Bylaw requires a USI of ≤1.4 for one and two-family homes. Doors were assumed to be equivalent to steel doors in terms of energy efficiency, again designed to exceed City requirements of a U-value not greater than 2.10 for homes with three or less doors.

Rooftop solar PV array. Annual estimated energy savings per home were calculated using NREL's PVWatts Calculator specific to Nanaimo[59]. Dunsky assumed a fixed roof-mount array type with a DC system size of 7kW. A representative product model was selected to source nominal max power, array dimensions and equipment lifetime. This package was designed with broad parameters as an add-on package for any home and heating type. Costs and savings could therefore vary even more significantly when applied to specific homes.

[58] City of Nanaimo (2023). Insulation Requirements for Residential Additions. July 2023.
[59] National Renewable Energy Laboratory (2023). PVWatts Calculator. Accessed December 1, 2023.

Estimated Uptake and Required Capital

Market Size and Market Share for Retrofit Packages

Total market size of each market segment (e.g., duplexes/townhouses), which was calculated from the CEEI and housing characterization analysis, was reduced through a series of "funnels" to arrive at estimated **potential market size per market segment**. This included, for example, removing a share of newer homes (built after 2008), removing electrically heated homes already likely to be using a heat pump (from survey results), and/or removing a portion of low-income households. For solar PV retrofits, funneling included removing a share of renters and a small number of homes already using solar PV (estimated at 1 in 200 SFDs in Canada[60]). This exercise was done for each market segment. The process is modeled below for small/medium electrically heated SFDs.

Figure D-1: Estimated market size, electrically heated small/medium SFDs

Next, Dunsky estimated the market **share** that each retrofit package would be likely to capture. First, it was determined whether more than one retrofit package would be competing for the same market share. For example, single-family small/medium homeowners would only choose one of the heat pump only package *or* the heat pump + insulation package.

Dunsky estimated market share for each package within each market segment using our proprietary finance model – which takes into account retrofit costs, lifetime savings, barrier levels, and other such factors. Using these inputs, we modeled three uptake scenarios: Low, Medium, and High. This was done considering experience and uptake rates in other jurisdictions with similar finance programs. These programs were chosen based on, among other factors: publicly available participation data, being an established program (i.e., underway for >2 years) and using similar financing mechanisms (e.g., PACE). Chosen programs include HELP, PACE Maine and Michigan Saves for non-solar retrofits and Halifax Solar City, Sonoma and HELP for solar retrofits.

[60] Dunsky Energy + Climate Advisors (2023). BTM Solar: Canadian Market Outlook. October 2023.

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Dunsky is proud to stand by our work.