City of Richmond

Report to Committee

To:	General Purposes Committee	**Date:**	May 22, 2024
From:	Peter Russell Director, Sustainability & District Energy	**File:**	10-6000-01/2024-Vol 01
Re:	**FCM Feasibility Study on Financing Options for Energy Retrofits to Existing Ground-Oriented Housing**		

Staff Recommendations

1. That Council endorse a funding application in the amount of $175,000, to be submitted to the Federation of Canadian Municipalities (FCM), to conduct a feasibility study on a low-interest energy retrofit financing program for existing ground-oriented residential buildings;
2. That the Chief Administrative Officer and General Manager, Engineering and Public Works, be authorized to enter into a funding agreement with FCM, should the application be successful; and
3. That the Consolidated 5 Year Financial Plan (2024-2028) be amended accordingly.

Peter Russell
Director, Sustainability & District Energy
(604-516-9873)

Att. 1

REPORT CONCURRENCE		
ROUTED TO:	**CONCURRENCE**	**CONCURRENCE OF DEPUTY CAO**
Finance Department	☑	
Building Approvals	☑	
Intergovernmental Relations	☑	
SENIOR STAFF REPORT REVIEW	**INITIALS:**	**APPROVED BY CAO**

Staff Report

Origin

This report seeks Council approval for staff to proceed with a funding application to the Federation of Canadian Municipalities (FCM) Community Energy Financing initiative to conduct a detailed investigation of financing options that would help accelerate decarbonization and increase energy efficiency of existing ground-oriented residential buildings, which include single detached homes, townhouses, and multiplexes.

Council has previously advocated to the Province of BC to enable low-cost financing of energy and GHG emission retrofits for existing buildings. In May 2021, Council endorsed *Help Cities Lead Initiative*, which asked the Province to adopt a Property Assessed Clean Energy Program (PACE)[1] enabling legislation that would expand financing options for homeowners interested in reducing annual energy use and emissions. In February 2022, Council adopted the Community Energy & Emissions Plan 2050, which includes 77 actions and 199 implementation steps included within eight Strategic Directions. The implementation roadmap for Retrofit Existing Buildings includes 16 actions and 42 implementations steps, with adoption of 'a low-interest financing program for building energy retrofits' as a key implementation step to accelerate near-zero emission mechanical system retrofits in ground-oriented residential buildings. CEEP 2050 identifies retrofitting existing buildings as a major move to meet 2030 carbon reduction targets.

This report supports Council's Strategic Plan 2022-2026 Focus Area #4 Responsible Financial Management:

> *4.4 Work with all levels of governments for grant and funding opportunities.*

This report supports Council's Strategic Plan 2022-2026 Focus Area #5 Governance and Focus Area #5 A Leader in Environmental Sustainability:

> *5.1 Continue to demonstrate leadership in proactive climate action and environmental sustainability.*

This report supports the implementation of Richmond's Community Energy and Emissions Plan 2050, and OCP emission reduction policies through:

Strategic Direction 1: Retrofit Existing Buildings
Action Categories: ☑ Create incentives and remove barriers to low carbon energy retrofits

Analysis

Building retrofit financing is a method of funding improvements to existing buildings, such as low-carbon electrification and energy efficiency upgrades. Financing can be provided by a range of options, including city lending, third-party lending, PACE, utility on-bill financing, or other financial mechanisms aimed at improving building performance and reduce GHG emissions.

[1] PACE works by providing upfront financing for buildings energy upgrades, which are then repaid over time through an additional property tax payment. More information in the "Successful Financing Programs" section.

Utilizing established medium- and longer-term financing options for homeowners provides efficiencies for local implementation of citywide climate actions, as well as local take-up of available CleanBC incentives, thereby driving wider adoption of electric heat pumps and other building upgrades. The City currently has limited ability to provide significant direct financial incentives to homeowners seeking to implement a low-carbon retrofit, but can play a lead role in building local awareness, interest and participation in a building retrofit financing initiative. Consequently, resources allocated by the City to support financing initiatives would have a larger multiplier effect, enabling City funding to go further.

Implementing a financing mechanism to support building retrofits is crucial given the challenges posed by updating and oftentimes reconfiguring mechanical systems for space heating, cooling and domestic hot water systems. Together, these systems account for almost 90% of the GHG emissions from existing detached homes, duplexes and townhouses. Despite the existence of proven technologies that can dramatically decrease both total energy consumption and GHG emissions, as well as provincial and federal incentive programs, up-front capital costs pose a barrier for homeowners seeking to install high-efficiency electric heat pumps, upgrade the thermal performance of the building envelope, or implement energy efficient, mechanical ventilation.

A detailed retrofit action plan for existing buildings, listed in the CEEP as a key action, is currently in development. It will provide guidance on various key aspects, including energy data analysis, which might include a potential energy and greenhouse gas emissions reporting requirement, policy regulations, development of incentives and programs, demonstration projects, and financing mechanisms. Given the lead times to secure FCM funding, staff are bringing this request forward at this time. Additionally, financing options will inform the development of the strategy.

To support retrofits, staff have identified that reducing financial barriers for low-carbon retrofits in ground-oriented residential is a critical element to increase the number of energy retrofits in those buildings. The concurrent staff report titled *Municipal Top-Ups for Heat Pump Retrofits in Ground-Oriented Residential Homes* (May 21, 2024) proposes a municipal top-up incentive program for heat pumps and electrical service upgrades to further reduce this barrier.

Overview of ground-oriented residential buildings in Richmond

Richmond contains around 43,000 residential dwelling units within 28,000 ground-oriented buildings.[2] These buildings account for almost 60% of the city's total building stock by number, and 38% of total annual operational emissions from existing buildings, of which 28% comes from single-detached homes, and 10% from attached homes.

Attachment 1 includes a detailed breakdown of energy use and GHG emissions in ground-oriented detached and attached residential buildings in Richmond, categorized by age cohort. Ground-oriented homes constructed between 1946 and 1995 emerge as leading carbon emitters. These buildings commonly utilize gas-fired furnaces and/or boilers for space heating and domestic hot water, and experience significant heat loss through the building envelope.

[2] Statistics from 2019 Licker Geospatial study commissioned by the City

Moreover, the majority of ground-oriented buildings do not have cooling systems. With longer and hotter summers expected in the upcoming years, the implementation of heat pumps can enhance a building's climate resilience by providing cooling, improving occupants' thermal comfort, and reducing health risks, especially among vulnerable populations.
Staff conducted estimates to assess the potential impact of retrofitting gas-fired furnaces and gas-fired domestic water heaters with electric heat pumps in ground-oriented residential homes in Richmond. On average, retrofitting the space heating system of a Richmond home built between 1946 and 1990 is anticipated to result in a reduction equivalent to 3.4 tonnes of CO_2 per year[3], with an additional 1 tonne achievable by upgrading the domestic hot water system with electric heat pump water heater. Together, these retrofits could achieve 85-90% annual GHG emissions reduction per home in pre-1990 homes.

Staff also conducted a sensitivity analysis to determine estimated annual energy savings that could be achieved by retrofitting these building with electric heat pumps. Modelled scenarios included variations in predicted carbon price and average efficiency of heat pumps. Cost savings in terms of space heating, under these scenarios, ranged from $3,000 to $7,200 over the 15-year life cycle of the heat pump. Lifetime savings from a new heat pump domestic hot water system varied between $650 and $1,800 over the same lifespan.

Current heat pump incentives offered by provincial and federal governments seek to minimize the incremental purchase and installation costs of heat pumps relative to natural gas systems. However, upfront costs, as aforementioned, remain a primary barrier to proceeding with a heat pump retrofit, since these programs only provide rebates after upgrades are implemented. Heat pumps utilized for space heating and cooling, typically cost between $12,000 and $30,000, while up-front costs for heat pump water heaters range from $6,000 to $15,000. These costs include labour for equipment installation, but do not factor in heat pump rebates currently in the market. However, even with federal and provincial rebates, the homeowner has to show proof that the equipment is installed and paid for before receiving a heat pump rebate[4]. Covering all upfront costs at once poses a potential barrier to wider adoption of electric heat pumps. Potential implementation of a low-interest financing program reduces this barrier by spreading these costs over a longer period.

Successful Financing Programs in Canada

Several successful financing programs have been implemented in Canada in recent years and three notable examples are included below. The following programs use a Property Assessed Clean Energy (PACE) financing mechanism, in which loans are repaid by means of an additional levy on the home's annual property tax payment. With PACE, the loan is tied to the property rather than the property owner, so that both the capital asset and any remaining repayment debt are transferred from one owner to the next when a property is sold.[5]

- **District of Saanich - Heat Pump Financing Program:** This program offers up to $12,000 in zero-interest financing to support the upgrade of existing fossil fuel furnaces or boilers to efficient electric heat pumps. Loan repayment occurs over a ten-year period. This program

[3] Considering the incremental GHG emissions from addition of cooling by installing a heat pump
[4] Clean BC Income Qualified Program process is the only incentive program that provides rebates directly to registered contractors, alleviating upfront costs to customers.
[5] Due to the absence of PACE-enabling legislation in BC, other financing mechanisms will be explored in the proposed feasibility study.

has been very successful, reaching full capacity within two weeks of the first intake. The first intake was a pilot financed by FCM and Real Estate Foundation of BC. Recently, District of Saanich Council approved the expansion of this program, partially financed by FCM.

- **Province of Nova Scotia - Clean Energy Financing:** Operating since 2016, this program helps Nova Scotia municipalities provide low-interest financing to qualifying homeowners interested in undertaking clean energy upgrades, with 12 municipalities participating. The program offers financing for up to ten years, with the maximum loan amount and interest rate varying between participating municipalities. Due to its success, new FCM investments were recently approved, helping to drive future GHG reductions of 1,617 tonnes of CO2/year and energy savings of 20,400 GJ/year.
- **City of Toronto - Home Energy Loan Program (HELP):** Since 2014, homeowners in Toronto can borrow up to $125,000 to cover the cost of home energy improvements, such as heat pumps, air sealing, water heaters, envelope insulation, EV chargers and more. Interest repayment rates vary based upon the loan term. In 2022, the City extended this program, which in the first six years of operation financed 229 projects with a total value of $5.67 million.

FCM Community Energy Financing Initiative

FCM's Community Efficiency Financing (CEF) program is designed to support local innovation in energy retrofit financing. Specifically, CEF seeks to identify alternative financing models, such as PACE, but also utility on-bill financing as well as innovative third-party lending.

CEF provides funding to support program development at all stages, and staff are requesting Council approval to apply for the feasibility study grant, which would fund 80 percent of eligible costs up to $175,000. Table 1 shows the sequencing of FCM funding available to support this initiative, including expected timeline.

Should the City application be successful, staff will update Council at future date on results of the feasibility study and recommended next steps.

Table 1: Funding available through FCM Community Energy Financing (CEF) program

CEF Stage	Grant Up To	Grant Cap	Status	Timeline
Feasibility Study	80%	$175,000	**Seeking Council endorsement to proceed**	**Now**
Program Design	80%	$175,000	Based upon favourable results from the Feasibility Study, staff would seek Council approval to proceed with Program Design.	2025/2026
Capital Program	80%	FCM funding options available: a) $10M Capital Loan with grant up to 50% of the loan amount. [or] b) $2M in Credit Enhancement (leverage ratio 5:1 or greater) with up to $5M grant	Based upon favourable results from Program Design phase, staff would seek Council approval to proceed with Capital Program (a) or (b).	2026

Financial Impact

FCM offers up to $175,000 in funding to conduct a Community Energy Financing (CEF) Program study. Work on this study is anticipated to start during the second half of 2024, and will take approximately six months to complete. If Council endorses the recommendation to proceed, staff will submit a grant funding application to FCM.

Staff recommends that the CEF Study move forward, with an estimated $220,000 cost, and that the Local Government Climate Action Program (LGCAP) revenue be used to fund the study. If the grant application is successful, a portion of the LGCAP funding source will be replaced by the FCM grant to fund up to 80% of total eligible costs of the proposed study, to a potential maximum of $175,000. If approved, the Consolidated 5 Year Financial Plan (2024-2028) will be amended accordingly.

Conclusion

This report seeks Council approval to proceed with an FCM grant funding application to support an energy financing feasibility study for ground-oriented residential buildings. The scope of the study includes a baseline assessment, engaging stakeholders, evaluating a range of financing mechanisms, analyzing the impact of various retrofit measures covered by the financing program, and establishing next steps. This study will also determine the potential of an energy retrofit financing program to reduce the incidence of energy poverty for low-income households.

An energy retrofit financing program could offer a range of benefits to homeowners considering energy-related improvements to building envelope and/or mechanical systems. Based upon experiences from pilot programs elsewhere in Canada, they reduce the upfront capital cost barrier, hold the promise of lower energy bills after a retrofit, and enable allocation of energy cost savings toward repayment of the loan. These programs also increase the relative number of households considering and participating in an energy-related retrofit initiative, thereby boosting GHG emissions reduction in these homes, and creating a more comfortable and resilient living environment for occupants.

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Att. 1: Ground-Oriented Residential: Building Count, Energy Use and Emissions by Age Cohort

Ground-Oriented Residential: Building Count, Energy Use and Emissions by Age Cohort

Table A.1: Residential Single Detached Homes

Age Cohort	Buildings Count	Building Area (m2)	Total EUI (kWh/m2/yr)	GHGs (tCO2e/yr)	GHG Emissions (% of all buildings)
pre-1946	525	66,218	249.37	2,139	0.50%
1946-1977	9,164	1,406,677	196.54	35,816	8.34%
1978-1995	11,138	2,807,333	143.87	52,324	12.19%
1996-2010	4,554	1,449,002	109.37	20,529	4.78%
2011-2016	2,425	953,152	96.01	11,856	2.76%
Total	27,806	6,682,382	*N/A*	122,664	28.57%

Table A.2: Residential Single Attached Homes

Age Cohort	Buildings Count	Building Area (m2)	Total EUI (kWh/m2/yr)	GHGs (tCO2e/yr)	GHG Emissions (% of all buildings)
Pre-1946	9	437	289.37	16	0.00%
1946-1977	3,112	399,558	221.4	11,433	2.66%
1978-1995	5,314	761,697	162.83	16,030	3.73%
1996-2010	5,876	771,151	127.95	12,752	2.97%
2011-2016	1,358	174,015	111.29	2,503	0.58%
Total	15,669	2,106,858	*N/A*	42,734	9.94%

Table A.3: All Ground Oriented Homes

Building Category	Building Count	Building Area (m^2)	Total EUI ($kWh/m^2/yr$)	Total GHGs (tCO_2e/yr)	GHG Emissions (% of all buildings)
Total	**43,475**	**8,789,240**	**N/A**	**165,398**	**38.51%**