

# High-level building energy retrofit strategies for BC communities

Maximizing GHG emissions reductions from existing building sector in different case study communities - maximizing the effect of local government effort

EXECUTIVE SUMMARY

Prepared by: Parniyan Golkar, UBC Sustainability Scholar, 2021

Prepared for: Peter Robinson, Director of Climate Planning & Research, Community Energy Association

August 2021

## **Disclaimer**

This report was produced as part of the UBC Sustainability Scholars Program, a partnership between the University of British Columbia and various local governments and organizations in support of providing graduate students with opportunities to do applied research on projects that advance sustainability across the region.

This project was conducted under the mentorship of Community Energy Association staff. The opinions and recommendations in this report and any errors are those of the author and do not necessarily reflect the views of the University of British Columbia or the Community Energy Association.

## **Acknowledgments**

I would like to thank my mentor Peter Robinson for his guidance and support throughout my research. I would also like to thank Karen Taylor and all the interviewees for their time and insight.

I gratefully acknowledge the financial support for this research, provided by BC Hydro.

## Introduction

In communities, building emissions are unevenly distributed as some buildings emit much more than others. To reduce the GHG emissions of existing buildings in the province of British Columbia 40% below 2007 levels by 2030, 60% by 2040, and 80-100% by 2050, strategies and energy measures should be introduced.

The purpose of this research is to investigate the communities of Kelowna, Penticton and Vernon to identify which buildings are the highest emitting, and based on the available local government levers and energy efficiency programs determine what steps communities can take to eliminate emissions.

This research consists of background research, creation and analysis of community energy profiles, and recommendations. The researcher interviewed with representatives from the government of British Columbia, local governments, community energy association (CEA) and UBC staff. For each community, the residential and commercial energy profile was created and analyzed.

## Energy efficiency programs

The government of British Columbia encourages energy-saving improvements in existing homes, schools and workplaces and supports communities in reducing greenhouse gasses. There is several programs for building improvements including CleanBC Better Homes and CleanBC Better Buildings.

CleanBC Better Homes<sup>1</sup> is an online platform, which assists homeowners and businesses to get information about available rebates (administrated by the BC Hydro, FortisBC and BC Housing), financial supports and technical knowledge to reduce energy consumption and GHG emissions in new and existing buildings. They provide a rebate search tool for home renovation or new buildings which offers various programs in different categories including heating, hot water, windows, doors and draft proofing, insulation, appliances, wind, solar or geothermal, home energy evaluation, income-qualified programs, indigenous community offers, civic and community offers, mortgage refund, tax refund, bonus and special Offers.

CleanBC Better Buildings<sup>2</sup> is the other online hub, which provides information and financial support for commercial buildings. Resources and supports are available for the following building types in British Columbia:

- Commercial renovations for multi-unit residential buildings, commercial buildings, and institutional buildings
- Commercial new construction for multi-unit residential buildings, commercial buildings, and institutional buildings

The rebate search tool offers various programs in different categories including heating, whole building efficiency, hot water, lighting, kitchen and laundry, social and non-profit housing, rental housing, compressed air, motors and fans, energy efficiency guidance.

---

<sup>1</sup> <https://betterhomesbc.ca>

<sup>2</sup> <https://betterbuildingsbc.ca>

## Local government levers

- **Penticton Home Energy Loan Program (HELP)**

The City of Penticton offer residents a loan program<sup>3</sup>, which can work with FortisBC's HERO program rebate for insulation, exterior wall insulation, basement insulation, doors and windows. The maximum amount of loan is \$10000 to be repaid over 10 years on client's monthly electric utility bill (City of Penticton, 2021).

HELP upgrades can be used for the same energy efficient retrofits that are eligible for FortisBC's home rebate program including:

1. Insulation: Exterior wall insulation, crawl space insulation, and attic insulation
2. Draft proofing and air sealing
3. Upgrading doors and windows
4. Heat pump purchase and installation

- **Property Assessed Clean Energy (PACE)**

PACE<sup>4</sup> finance market has been evolving in the United States (US) since 2007, with California the first state to implement programs. Residential Pace (R-PACE), focuses on the single family home market; and Commercial Pace (C-PACE) which supports all multi-unit residential buildings (MURB), institutional, commercial, and industrial building typologies with various ownership and tenure. PACE has already worked for a huge number of buildings in the USA. Although in BC, it has not been evolved significantly, the province is developing it. The Pembina Institute, the Province of BC, the City of Vancouver, and the Canada Green Building Council are working on the BC PACE as an excellent financial support for existing buildings (Shoubridge, 2021).

- **Strata Energy Advisor Program**

Stratas with their complex stakeholder and decision-making process are usually a difficult market sector to reach. The Strata Energy Advisor<sup>5</sup> pilot program was developed as part of Metro Vancouver's Sustainability Innovation Fund. It supports the decision makers through identifying and implementing energy conservation measures (ECM's). To support stratas, the target of this program is to make smarter choices, save money over time and improve their building (Simpson, 2020).

- **Revitalization Tax Exemptions (RTE)<sup>6</sup>**

In order to encourage communities to economic, social or environmental revitalization, a municipal council may, by bylaw, exempt specific properties from municipal property value taxes for up to 10 years. This is limited to municipal property value taxes and do not extend to school and other property taxes, such as parcel taxes.

---

<sup>3</sup> <https://www.penticton.ca/city-services/utility-electrical-services/electric-water-accounts/home-energy-loan-program-help>

<sup>4</sup> [https://www.vancouvereconomic.com/wp-content/uploads/2021/05/PACE\\_Financing\\_and\\_Resilience\\_in\\_BC\\_Vancouver\\_Economic\\_Commission\\_V1\\_Web.pdf](https://www.vancouvereconomic.com/wp-content/uploads/2021/05/PACE_Financing_and_Resilience_in_BC_Vancouver_Economic_Commission_V1_Web.pdf)

<sup>5</sup> <http://www.strataenergyadvisor.ca>

<sup>6</sup> <https://www2.gov.bc.ca/gov/content/governments/local-governments/finance/requisition-taxation/tax-exemptions/permissive-tax-exemptions/municipal-revitalization-tax-exemptions>

As part of environmental revitalization, RTE encourages green building technologies (e.g., a council encourage economic, social or environmental revitalization within a community)(Government of British Columbia, 2008). It is an opportunity for larger for-profit rental apartment buildings and commercial buildings and currently, it is the main tool that communities can use for for-profit buildings.

- **Canada Greener Homes Grant (Small Multi-Unit Residential Buildings (MURBs))<sup>7</sup>**

To be eligible for Canada Greener Homes Grant, small MURB must meet the following requirements:

1. “A single EnerGuide evaluation must be undertaken of the entire structure (not on a unit basis)
2. The agreement for retrofits in small MURB must be agreed to the person who is in charge of decision- making about the renovation.
3. For small MURBs that are owned by one person and the remaining units are rented, the owner must live within the building as their primary residence.
4. The building must be habitable all year
5. The small MURB must have 50% of its total area, including the basement, as a residential living space.

## Creation of Profiles

Energy and emission inventory provides a snapshot of how much energy is consumed and GHG emissions are produced, and by what sources and sectors. Communities can use the energy and emission inventory to:

- Identify where the energy is being consumed and where the emission is being created
- Set target and milestone to tackle
- Track the progress of energy consumption reduction an emission over time
- Compare with other jurisdictions

Inventory of energy use and GHG emissions for different communities are conducted by collecting the number of households for residential sector ( from the Census 2016-StatsCan) and area for commercial<sup>8</sup> sector (from BC Assessment Building Information Report), multiplied by the End Use Intensity(EUI) in the base year, which was 2015 (from the British Columbia Conservation Potential Review (CPR)), converted to the greenhouse gases by the emission factor (CO<sub>2</sub>=49.58 Kg/GJ, CH<sub>4</sub>=0.0010 Kg/GJ, and N<sub>2</sub>O=0.0009 Kg/GJ). In the next step all gases are converted to the CO<sub>2</sub>e by the global warming potentials (CO<sub>2</sub>=1, CH<sub>4</sub>=25, N<sub>2</sub>O=298) (2018 B.C. Methodological Guidance For Quantifying Greenhouse Gas Emissions, 2019).

## Findings

The energy retrofit process for a community is not easy and brings with it both regulatory challenges and building type challenges (such as split incentives or issues with MURB strata councils), which can be solved by increasing the financial incentives, enforcing energy evaluation, increasing the carbon tax,

---

<sup>7</sup> <https://www.nrcan.gc.ca/energy-efficiency/homes/canada-greener-homes-grant/make-your-home-more-energy-efficient/learn-about-the-initiative/small-multi-unit-residential-buildings/23588>

<sup>8</sup> Since on the one hand the Conservation Potential Review (CPR) reports industrial sector gas as a whole and not broken down into individual industrial segments end use and on the other hand local governments have very limited levers over industrial sector buildings, therefore in this research only residential and commercial sectors will be investigated.

educating users, providing local governments with more levers through Provincial legislation, etc. These make creating business case for deep retrofits difficult.

Typically, single family detached homes, duplexes and apartments with less than four storeys are among the top five GHG emitters in all three communities. The GHG emissions from space heating are noticeably more than water heating in most building types (although in some building types water-heating emissions are a high proportion). As a result, decisions must be made to improve the condition of the space heating equipment, for example by electrification. Three categories of buildings would be considered as good business cases, buildings that emit significantly and have access to local government levers such as single-family homes, buildings that are owned by the province and already taking decarbonization steps by their own such as schools, hospitals and universities (local governments have no worry about these types) and finally, large buildings with high amount of emissions from water heating.

### Recommendations

To reduce the GHG emissions building owners might choose solutions with incremental reductions such as: fixing hot water fixtures, installing programmable thermostat, installing window film, replacing the showerheads to low-flow fixtures or they might look for game changing measures such as installing SHARC system<sup>9</sup>, replacing gas-fueled equipment with air source heat pumps and installing HRV's. Since we cannot get to 80-100% GHG reductions by 2050 targets by taking only incremental reduction approach, the game changing measures will at some point be essential to carry out. Local governments are also recommended to run awareness-building campaigns, enhance the financial supports and incentives and make building benchmarking and home energy-labeling mandatory.

---

<sup>9</sup> <https://www.sharcenergy.com>

## References

- BC Climate Action Toolkit. (2021). <https://www.toolkit.bc.ca/Program/EfficiencyBC>
- Navigant Consulting Ltd. (2016). *British Columbia Conservation Potential Review*
- City of Kelowna. (2018). *Our Kelowna as We Take Action*
- City of Kelowna. (2021). *Energy*.  
[https://www.kelowna.ca/ourcommunity/environment/energy#energy\\_efficiency\\_existing](https://www.kelowna.ca/ourcommunity/environment/energy#energy_efficiency_existing)
- City of Penticton. (2021). *Community Sustainability*. <https://www.penticton.ca/our-community/environment/community-sustainability>
- City of Penticton. (2021). *Home Energy Loan Program (HELP)*. <https://www.penticton.ca/city-services/utility-electrical-services/electric-water-accounts/home-energy-loan-program-help>
- CleanBC Better buildings. (2021). *CleanBC Commercial Express Program*.  
<https://betterbuildingsbc.ca/incentives/cleanbc-commercial-express-program>
- CleanBC. (2021). *Home Renovation Rebate Program and CleanBC Home Efficiency Rebates*.
- Government of British Columbia. (2019). *2018 B.C. METHODOLOGICAL GUIDANCE FOR QUANTIFYING GREENHOUSE GAS EMISSIONS*.
- Community Energy Association. (2008). *Community Energy & Emissions Planning*.
- Frappé-Sénéclauze, T.-P., Heerema, D., & Wu, K. T. (2017). *Deep emissions reduction in the existing building stock*. Pembina Institute.
- Government of British Columbia. (2008). *Revitalization Tax Exemptions*.
- Government of Canada. (2019, 09 05). *Energy efficiency in existing buildings*.  
<https://www.nrcan.gc.ca/energy-efficiency/buildings/existing-buildings/retrofitting/20707>
- Government of Canada. (2021). *Small Multi-Unit Residential Buildings (MURBs)*.  
<https://www.nrcan.gc.ca/energy-efficiency/homes/canada-greener-homes-grant/make-your-home-more-energy-efficient/learn-about-the-initiative/small-multi-unit-residential-buildings/23588>
- CleanBC Better Homes. (2019). *FAQ*. <https://betterhomesbc.ca/faqs/is-my-home-eligible-for-rebates-or-an-energuide-home-evaluation/>
- Navigant Consulting Ltd. (2017). *British Columbia Conservation Potential Review*.
- Pembina Institute. (2020). *Barriers to deep retrofits: Regulatory solutions from across Canada*.
- Province of British Columbia. (2018). *Clean BC*.
- Environmental Reporting BC. (2021). *Trends in Greenhouse Gas Emissions in B.C. (1990-2018)*. State of Environment Reporting, Ministry of Environment and Climate Change Strategy, British Columbia, Canada. <https://www.env.gov.bc.ca/soe/indicators/sustainability/ghg-emissions.html>
- Shoubridge, J. (2021). *PACE Financing and Resilience in BC*. Thrive Consulting.
- Simpson, D. (2020). *Strata Energy Advisor Pilot Program*. SES Consulting.

Statistics Canada. (2017). *2016 Census of Population*. <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=5907041&Geo2=CD&Code2=5907&SearchText=Penticton&SearchType=Begins&SearchPR=01&B1=All&TABID=1&type=0>

City of Vernon. (2021). *Vernon Climate Action Plan*.