



## MURB Electrification Ready Plan Framework

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## 1. Introduction

The electrification of the building and transportation sectors has been identified as a key strategy to meet British Columbia's ambitious emissions reduction targets. Buildings can reduce their operational GHG emissions by replacing fossil fuel equipment and systems with electric ones, as well as support low-carbon commuting by offering electric vehicle (EV) charging infrastructure. These upgrades draw from the same electrical capacity, which is already limited in a high number of multi-unit residential buildings (MURBs) and can be a challenge.

Current programs and incentives for building electrification retrofits and EV charging lack integration. This prevents stakeholders from effectively planning and prioritizing the electrification needs of their buildings. For example, building electrification programs such as CleanBC Custom are aimed at building retrofits but have no formal integration with EV infrastructure programs. On the other hand, existing EV infrastructure programs, such as the CleanBC Go Electric EV Charger rebate, provide incentives to support the electrical design to accommodate charging stations and install EV charging but exclude any analysis of electrical capacity needed for building upgrades not related to EVs.

In June 2022, Engineers and Geoscientists of BC (EGBC) published a Practice Advisory titled "Electrical Considerations for Decarbonizing Existing Part 3 Buildings.<sup>1</sup>" The advisory underscores the need to address all aspects of building electrification from the outset. This involves conducting a comprehensive analysis of decarbonization opportunities, ensuring compliance with government policies, and assessing electrical demand. The Advisory emphasizes the importance of evaluating the capacity of the electrical system and anticipating potential sources of future demand under decarbonization scenarios. For example, when implementing mechanical-system retrofits, future EV-charging needs should be considered. Similarly, EV-charging retrofits should consider the potential electrification of HVAC and domestic hot water.

This Practice Advisory serves as the foundation for best practices in coordinating electrical capacity assessments and infrastructure upgrades, encompassing building electrification retrofits and EV charging upgrades. Failure to integrate may result in additional costs for stakeholders including residents, building owners, stratas, electrical utilities, and government bodies. For instance, if an owner upgrades the electrical capacity to add EV charging in their building, and later decides to electrify the existing fossil fuel space heating to save on greenhouse gas (GHG emissions) and add cooling, they may need another electrical upgrade. The combined costs of these upgrades are likely higher than a single, more extensive electrical upgrade.

In alignment with the electrification best practices, this report proposes a concept framework for **Electrification Ready Planning**, outlining a comprehensive strategy for transitioning MURBs from using fossil fuels to electricity within a specified timeframe. Electrification Ready Planning integrates electrification retrofits with energy efficiency measures, EV charging installation, electrical load management, and existing building electrification programs and incentives. The report provides an overview of the Electrification Ready concept and framework, demonstrating its fundamental components, principles, phases and delivery structure. Furthermore, it explores the benefits, opportunities and best practices of aligning all electrification and building upgrade elements and programs.

<sup>&</sup>lt;sup>1</sup> Electrical Considerations for Decarbonizing Existing Part 3 Buildings (2022)

# 2. Concept Framework: Electrification Ready Planning

#### 2.1 What is Electrification Ready Planning?

**Electrification Ready Planning** refers to the process of developing a long-term adaptable strategy for transitioning a building from using fossil fuels to electricity within a specified timeframe (e.g., by 2050 or earlier). The primary objective of this planning process is to guide building owners through the electrification journey, establishing an effective pathway that adapts with the building's evolving needs. At its core, this process prioritizes the needs and desires of the owners and residents, taking into account the unique situation of each building.

#### 2.2 Electrification Ready Plan Framework & Core Components

The **Electrification Ready Plan Framework** is the basic structure that outlines the components, principles, phases, and delivery structure to enable Electrification Ready Planning.

The framework outlines an integrated approach to buildings by considering all the different systems and components that play a part in electrification retrofits, and how they interact with each other— an innovative shift from the conventional practice of addressing them in isolation.

The **six core components** that the framework addresses include (in no hierarchical or sequential order):

- **Fossil-Fueled Equipment:** Identifies all fossil fuel mechanical equipment and appliances that can be electrified, and highlights opportunities for high-efficiency electrification upgrades and the addition of space cooling.
- **Electric Vehicle Charging:** Determines the short- and long-term electric vehicle (EV) charging needs and alternative electric transportation modes and presents solutions to meet these needs while minimizing the electrical load demand.
- **Energy Efficiency Measures:** Identifies opportunities for building enclosure upgrades and other building components that can maximize building efficiency and reduce demands on electrical capacity.
- **Existing Electrical Capacity:** Assesses the building's electrical infrastructure and service capacity to determine if it can accommodate future electrical loads related to building electrification and low-carbon commuting. It also identifies necessary infrastructure upgrades and explores strategies to minimize overall load, such as load reduction and load management.
- **Building Electrification Phased Plan:** Recommends an integrated, phased strategy to building electrification upgrades that takes into consideration:
  - Existing financial plans (e.g., capital plan, depreciation report).
  - End-of-useful-life estimates of mechanical equipment and other major systems (e.g. windows, elevators).

• Existing and pending regulations, bylaws and other requirements that may trigger building electrification retrofits (e.g., pending Highest Efficiency Equipment Standard regulations and carbon pollution limits).

Capital Cost and GHG Emission/Energy Projections and Savings: Includes investment estimates for the proposed electrification phased plan, as well as expected energy and emissions savings from the proposed electrification retrofits.

#### 2.3 Principles Guiding the Framework

The framework underpins a holistic strategy to streamline the building electrification process, and is anchored in **ten principles** that shape how an Electrification Ready Program could be delivered:

**1. Function for all MURB ownership types.** The framework caters to diverse MURB ownership types, including strata corporations, market rentals, social housing, and cooperative housing. Although Electrification Ready Plans can be tailored to meet the unique needs and characteristics of a specific buildings, it is not targeted to a specific ownership model.

**2. Low barrier and low-cost entry.** The framework has built-in mechanisms to provide no-to-low-cost services to educate and promote owner awareness of electrification opportunities, upcoming regulatory requirements, and guidance on how to proceed. The framework is designed to not invest funds in expensive studies on buildings that will not proceed with electrification in the near future, but rather to identify opportunities and provide guidance early to enable more building electrification.

**3. Determine electrical capacity for full building electrification.** The framework is structured to assess the electrical capacity needed for comprehensive electrification and the addition of EV charging early in the planning process, to optimize electrical capacity upgrades, saving time and costs.

**4. Holistic & integrated approach**. The framework is designed to identify all decarbonization and energy efficiency upgrade opportunities, and then focus efforts and resources on retrofits that are likely to be implemented in the short term. By considering all building systems together, retrofits can be coordinated and aligned to optimize resources and ensure a systematic and well-informed approach to building electrification.

**5.** Facilitate short and long-term planning. The framework can help owners prioritize the recommended retrofits and lay out a timeline to avoid early or late investments. For example, pairing space heating retrofits with enclosure upgrades and passive measures to minimize the building heating and cooling loads and optimize the existing electrical capacity. The timeline considers compliance with existing and upcoming government regulations that may trigger building electrification retrofits. The plan should also consider the potential life of the building and the feasibility of making the building electrification-ready (e.g. if the building is approaching its end of life or being deconstructed in the near future).

**6. Phased and flexible approach.** Electrification-ready planning can entail significant expenses, and therefore it is crucial to adopt strategies that optimize the cost-effectiveness of implementation. The framework is divided into phases that can be delivered independently, combined or omitted based on the unique circumstances of each building. This strategy is optimized for cost-effectiveness, expediting the retrofitting process, accommodating re-entry retrofits, and adapting to various retrofit models.

**7. Not prescriptive.** The framework outlines the key elements for an effective transition to fullyelectric building without prescribing a specific tool, technology, software or approach to encourage innovation and accommodate technological developments.

**8. Standardization of technical solutions.** The framework enables and encourages the adoption of standardized technical solutions where practical and applicable. While each building is unique, components and systems can generally be retrofitted with similar solutions, which helps identify electrification opportunities earlier in the planning process.

**9. Leverage existing programs.** The framework utilizes existing rebates, incentives, and assessment and support programs, while avoiding dependence on any specific one. This way, funding can be directed towards promoting electrification awareness and long-term planning, and existing funding and incentive opportunities can still be leveraged for retrofit planning, design and implementation where applicable.

**10. Data access and sharing.** The framework recommends that data collected and produced within the program is collected, stored, and managed for convenient sharing among relevant stakeholders, with privacy of data taken into consideration. This approach is recommended to enable buildings to re-enter into a Electrification Ready Program and for the data and reports previously produced to be re-visited and updated as many times as needed for future electrification upgrades.

#### 2.4 Phases of the Electrification Ready Framework

The Electrification Ready Framework features **five dynamic phases**, offering a tailored and flexible approach to guide building owners through the intricate journey of transitioning their buildings from fossil fuels to electric systems. The phases can be merged, skipped and revisited as necessary, accommodating varied levels of awareness, readiness and implementation for different buildings, and ensuring each building's unique circumstances are met.



- **1. Electrification Opportunity Assessment:** Offers a quick, semiautomated, and low-to-no-cost (to participant) service to educate and promote owner awareness of electrification opportunities, current and upcoming regulatory requirements, and guidance for obtaining an Electrification Ready Plan.
- **2. Electrification Ready Plan:** Provides building owners with a comprehensive, low-to-moderate cost, and short- and long-term strategy for transitioning buildings from fossil fuels to electricity within a specified timeframe (e.g., by 2050 or earlier).
- **3. Feasibility Study for Specific Retrofit:** Presents building owners with a business case based on technical and financial analyses for specific retrofits that the building is ready to undertake.



- **4. Retrofit Implementation:** Conducts the design, procurement, installation and commissioning of the selected electrification retrofit based on the planned scope.
- **5. Post-Retrofit Review:** Evaluates the building's performance and, if necessary, implements changes to enhance the effectiveness and operation of the retrofit measures.

The phases are designed to be iterative, as shown in Figure 1. For example, a building can receive a phase one and two report to identify all the available building energy efficiency, electrification and EV charging opportunities and then re-enter multiple times at the point of pre-retrofit to receive a feasibility study for electrifying space heating, hot water and ventilation or for a building envelope upgrade. The foundational information provided in the first two phases enables more cost-effective feasibility studies for each future retrofit.



Figure 1: Iterative diagram of the Electrification Ready framework phases.

#### **Purpose:**

To offer a quick, semi-automated no-to-low-cost (to participant) entry-level service to educate and promote owner awareness of electrification opportunities, current and upcoming regulatory requirements, and guidance for obtaining an Electrification Ready Plan.

#### Components:

- Identification of electrification opportunities, including:
  - Existing fossil fuel mechanical equipment and appliances that can be replaced with high-efficiency electric systems and equipment.
  - Existing EV charging infrastructure and options for integrating EVs and other electric means of transportation.
  - Other building component upgrade recommendations that can impact electrification upgrades (e.g., windows, insulation, air sealing, fixtures, etc.).
- Alignment with existing benchmarking (where applicable).
- High-level overview of current and upcoming regulatory requirements that may trigger building electrification, such as constraints for like-for-like replacement of fossil fuel mechanical equipment and mandates for EV charging installation.
- High-level overview of existing incentives, rebates and financing offers available.
- Outline of next steps to proceed with an Electrification Ready Plan.

#### Data Collection Methods:

- Virtual data collection with building owner/manager.
- Virtual or physical site survey as part of strata depreciation report, energy assessment or study.
- Existing capital plans, depreciation reports, building condition assessment reports, energy benchmarking, etc.

#### **Product:**

- A short report presented as:
  - A digital stand-alone report; or
  - A companion report to a depreciation report, building condition assessment, capital plan or similar; or
  - o Included within an energy assessment or study; or
  - Included within an online report platform.

- Engineering consultants, technical professionals or technologists.
- Other non-technical professionals.

#### Purpose:

To provide building owners with a comprehensive, low-to-moderate cost, short- and long-term planning strategy for transitioning buildings from fossil fuels to electricity, improving the efficiency of the building and installing EV charging within a specified timeframe (e.g., 2050 or earlier) considering phased retrofit measures.

#### **Components:**

- High-level electrical capacity assessment, including condition of the building's electrical system, preliminary electrical capacity estimates, and potential upgrade strategy identifying load diet and load management opportunities.
- Building energy use benchmarking through Energy Star Portfolio Manager or similar.
- Phased short and long-term strategy and timeline to retrofit all fossil fueled building systems and appliances, and other necessary upgrades, including:
  - Heating, ventilation and air conditioning (HVAC) systems.
  - Domestic hot water (DHW) systems.
  - Fireplaces, pool heating systems, kitchen and laundry appliances, etc.
  - Charging infrastructure for EVs and other electric means of transportation.
  - Complementary upgrades that can maximize building efficiency and reduce demands on electrical capacity (e.g. windows, insulation, air sealing, fixtures, etc.).
  - Consideration of current and upcoming regulatory requirements regarding building electrification, such as highest efficiency equipment standards, EV charging and building cooling mandates, etc.
- High-level capital and operational cost projections, as well as GHG emission reduction and energy savings.
- Overview of available incentives, rebates and financing offers for near-term upgrades.
- Outline of next steps.

#### **Data Collection Methods:**

- Virtual data collection with building owner/manager.
- Virtual or physical site survey by a qualified professional.
- Existing capital plans, depreciation reports or building condition assessment reports.
- Existing building studies and assessments.

#### **Product:**

- The plan consists of a brief report, presented as:
  - A digital stand-alone report; and/or
  - Included within an online report platform.

- Engineering consultants.
- Technical professionals or technologists.

#### **Strategy and Timeline Examples**

An Electrification Ready Plan can include a table or graph to visualize the proposed retrofits and how they interact, as well as regulatory requirements, capital investments, GHG emission reductions, energy savings, etc. It is, however, important to note that it may not be viable or feasible for many buildings to complete all potential energy efficiency upgrades and electrification retrofits. The planning for a building that is operating with 20 years of remaining life will be very different from a building with 50+ year lifespan.

Figure 2 illustrates an example of an electrification timeline that integrates and aligns upgrades (e.g., replace AC system for heat pump first, and shift heating from boiler to that same heat pump later). An overview of estimated costs, GHG emission reductions and upcoming electrification regulations could also be added to this timeline or displayed in a companion table.



Figure 2: Example Ready Building Capital Planning Process.<sup>2</sup>

Figure 3 demonstrates an example of a traditional capital plan with upcoming replacements to plan for different expenditures per year. The integration and alignment between different building systems are not portrayed visually as in the timeline from Figure 1, but it can still be planned for by allocating the corresponding expenditures in the same year. An overview of upgrade alignment between building systems, as well as estimated GHG emission reductions and upcoming electrification regulations could also be added to the table or displayed in a companion timeline.

Building Condition Assessment												
	123 Anywhere Lane, Vancouver, B.C											
YEAR	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	TOTALS	ACTIVITIES
YEAR #	3	4	5	6	7	8	9	10	11	12		
STRUCTURE	\$20,000	\$30,000								\$8,000	\$58,000.00	Invesigation into wall repairs
BUILDING ENVELOPE		\$225,000						\$12,500			\$237,500.00	Wall upgrade and window replacemen
INTERIOR FINISHES				\$75,000							\$75,000.00	Cabinetry and millwork improvements
MECHANICAL SYSTEMS					\$150,000	\$22,500	\$70,000				\$242,500.00	Upgrade domestic hot water
ELECTRICAL SYSTEMS	\$15,000		\$225,000						\$10,000		\$250,000.00	Elevator Maintenance and 10 EV stalls
SITEWORKS	\$7,000				\$3,500				\$2,500		\$13,000.00	Asphalt replacements
SURVEYS/STUDIES	\$25,000				\$31,000						\$56,000.00	Investigation, energy studies
	\$932,000.00											
Figure 3: Capital Planning Table. <sup>3</sup>												

<sup>&</sup>lt;sup>2</sup> Image source: https://newbuildings.org/future-ready-buildings-increase-asset-value-and-reduce-real-estate-investment-risks-by-preparing-for-building-performance-standards-now/

<sup>&</sup>lt;sup>3</sup> Table adapted from: <u>Building Condition Assessment</u> (2016). CCI Group

## **Feasibility Study for Specific Retrofit**

#### **Purpose:**

To present building owners with a business case based on technical and financial analyses for specific retrofits that the building is ready to undertake.

#### **Components:**

Components will vary based on the retrofit project, and can include:

- Refinement of retrofit goal, scope, and basis of design.
- Detailed equipment addition or replacement strategy for the chosen equipment(s) or system(s), including an estimate of energy and GHG emission reductions.
- Detailed electrical load analysis and long-term upgrade recommendations taking into consideration new future loads.
- Detailed cost estimates and recommended incentives, rebates and financing opportunities.
- Outline of next steps.

#### Data Collection:

- Physical site survey(s) by a qualified professional.
- Existing building studies and assessments.
- Existing drawings and specifications.

#### **Product:**

- Detailed report defining the recommended retrofit scope and basis of design, which owners can use to proceed with implementation. The report should include descriptions, key considerations, performance specifications, estimated costs, and energy and emissions savings.
- Documentation to support incentive, rebate and financing applications.

- Electrical and mechanical engineering consultants.
- Electrical and mechanical contractors.
- Enclosure consultants (where applicable).

## **Retrofit Implementation**

#### **Purpose:**

To conduct the design, procurement, installation and commissioning of the selected electrification retrofit(s) based on the planned scope.

#### **Components:**

Components will vary based on the retrofit project, and can include:

- Finalizing retrofit scope and design.
- Accessing rebates and financing, where available.
- Hiring necessary contractors.
- Developing a resident impact and engagement plan, where applicable.
- Installing new equipment and decommissioning of fossil fueled equipment, where applicable.
- Coordinating commissioning and hand-off.
- Post-implementation reviews.
- Developing an M&V plan.
- Support and guidance throughout the implementation process.

#### **Product:**

- New equipment installation and building upgrades.
- Proof of project implementation and commissioning.
- Retrofit implementation support.

- Electrical and mechanical engineering consultants.
- Electrical and mechanical contractors.
- Enclosure consultants (where applicable).

### **Post-Retrofit Review**

#### Purpose

To evaluate the building's performance and, if necessary, implement changes to enhance the effectiveness and operation of the retrofit measures.

#### **Components:**

Post-installation program support will include:

- Coordinating with a contractor for re-commissioning.
- Conducting measurement and verification, as well as billing analysis post-installation to verify energy and GHG savings.
- Other measurement and verification as required.

#### **Product:**

- Re-commissioning.
- M&V report.
- Feedback to program/stakeholders for continuous improvement.

- Electrical and mechanical engineering consultants.
- Electrical and mechanical contractors.
- Technical professionals or technologists.
- Certified Measurement & Verification Professionals (CMVP), if required.

## 3. Benefits, Opportunities and Existing Initiatives

#### 3.1 Benefits of an Integrated Electrification Ready Framework

The Electrification Ready framework outlines a strategy to integrate and align electrification retrofits with energy efficiency measures, EV charging additions, electrical load management, and existing building electrification programs and incentives.

Buildings have various systems that can be electrified, and in multi-family setups, residents have diverse priorities. For instance, while one resident might want heat pumps for cooling, another could be focused on having a Level 2 charger in their parking stall for an EV. The decision-makers for Multi-Unit Residential Buildings (MURBs) face the challenge of balancing these resident requests with necessary electrification upgrades driven by changing regulations or equipment reaching its end of useful life.

In practice, all building upgrades and retrofits compete for the same resources in terms of capital expenditure budget as well as building electrical capacity. Facilitating building owners in crafting a long-term electrification plan is a strategic approach that involves optimizing electrical loads, as well as spreading capital expenditures across a timeline that makes sense for that particular building. Such planning contributes to a more thoughtful and manageable electrification process.

Some of the benefits of this integrative and holistic approach include:

**Promoting awareness of all electrification opportunities.** The framework focuses on enhancing awareness among building owners and residents regarding the benefits and considerations associated with building electrification, energy efficiency, EV charging, and available programs, rebates and incentives to help fund them. This allows building owners to make well-informed decisions and strategically plan for the future needs of their buildings.

**Ensuring sufficient electrical capacity for all upgrades.** By assessing the building's electrical capacity early in the process, a long-term plan can be developed to determine how the existing capacity can be allocated and electrical loads optimized and managed, as well as when and by how much the electrical infrastructure needs to be upgraded. Long-term integrated planning avoids having to do costly upgrade iterations and ensures a consistent and reliable power supply for all current and future systems.

**Optimizing financial resources.** Strategic planning in advance facilitates the effective allocation of financial resources by prioritizing budget allocation. This approach allows decision-makers to prioritize upgrades based on critical needs and available funding and ensures that the upgrades are implemented in the order that makes sense financially, technically, and for the benefit of the building owner and residents. It also promotes the efficient use of rebates, incentives and grant funds by reducing redundant studies.

**Providing adequate lead times for electrification planning.** Electrification upgrades require significant time, resources, and advanced planning. Providing sufficient planning time can avoid rushed decisions and bring more successful outcomes.

**Futureproofing buildings.** By planning for future regulatory requirements, and prioritizing the needs of the residents, the electrification ready planning strategy mitigates the risk of premature obsolescence and minimizes the need for costly rework.

**Facilitating electric modes of transportation.** Buildings can help save more energy by promoting and enabling electric modes of transportation, including EVs, e-bikes and e-scooters. Incorporating EV charging infrastructure, as well as electric transportation-sharing services (such as EV car or bike sharing), can contribute to the decarbonization and emission reduction of the transportation sector in synergy with the building sector. The electrification ready framework includes the creation of an electrical transportation strategy that also considers that the building needs to have the electrical capacity necessary to recharge them.

**Improving occupant comfort and safety.** Certain electrical equipment, such as heat pumps, can provide space cooling, enhancing occupant comfort, especially in the face of increasing summer temperatures. The precise temperature control offered by these technologies contributes to a healthier and more comfortable living environment, prioritizing the well-being of building residents.

**Supporting federal, provincial and local climate goals.** Integrative approaches like the Electrification Ready framework play an important role in advancing Canada's climate targets at federal, provincial, and local levels. Decarbonization of building and transportation sectors is crucial to achieving these targets, and strategic planning for building electrification that integrates EVs, energy efficiency, load management, etc. is crucial for realizing these ambitious goals.

#### **3.2 Opportunities for Building Electrification**

The Electrification Ready framework can capitalize on several strategic entry points for building electrification. These include optimizing the end-of-life phase of mechanical systems, responding to the growing market demand for building cooling solutions, and proactively addressing upcoming regulatory requirements. These opportunities all open the door to introducing owners with low-to-moderate-cost planning tools that outline comprehensive electrification strategies as described in the framework (namely Phase 1 and 2). Beyond addressing these immediate needs, these tools promote a strategic and forward-thinking approach to building electrification. **Mechanical System End-of-Life** 

Mechanical system end-of-life upgrades are the most common, and cost-effective trigger of electrification. Space heating boilers, hydronic pipes, gas water heaters, or make-up air units and existing air conditioners have limited lifespan even with the best maintenance, and maintenance levels in MURBs are typically far lower than in other commercial building types. Emergency replacement of equipment as it fails is very common, and electrification is extremely difficult, and sometimes impossible, to implement under short time constraints.

Mechanical system end-of-life is a key trigger point for MURB electrification because:

- The decision-making process has been initiated; they will allocate capital to something to replace the existing failing heating, hot water and/or air conditioning system and are already considering options.
- Pipe leaks, airlocks and other equipment failures result in expensive ongoing maintenance and repair which creates pressure to force a capital replacement decision. Pipe and hydronic radiator replacement requires expensive and disruptive work in suites and throughout the building. It includes extensive drywall work which is complicated by the presence of asbestos in most buildings. Switching to a heat pump system at this time would be a great opportunity.
- Tenant complaints can result from failure of heating, hot water, and air conditioning. Complaints are stressful to property management staff and owners. This can include Residential Tenancies Board (RTB) cases, financial penalties, and warnings from municipal staff.

#### **Market Demand for Building Cooling**

Since the British Columbia 2021 heat wave and the realization that BC will continue to experience hotter weather, demand for air conditioning has greatly increased in the province. In addition to the general interest in accessing air conditioning for improving home comfort, cooling has been identified as an important life safety building upgrade. The British Columbia Coroners Service (BCCS) confirmed the heat-related deaths of 619 people who died because of the extreme heat event that occurred within one week, June 25–July 1, 2021.<sup>4</sup> Key recommendations of the BCCS include the implementation of extreme heat prevention and long-term risk mitigation strategies that include improving access to active cooling measures (like heat pumps) and passive cooling measures (improving building enclosure).

The building code will likely incorporate increased requirements for cooling based on future climate projections files that have been generated for the next 30-year period. BC Housing now requires cooling demand be recognized in all current projects based on projections, not just historical data. Mechanical equipment is typically expected to last ~15 to 25 years and a significant increase in cooling demand is expected over the lifetime of equipment installed today. New construction projects today typically consider air conditioning. Strata condos often offer options for built-in or roughed-in (electrical connections and enclosure penetrations are prepared) for cooling. Higher end private rentals sometimes include air conditioning.

Retrofitting air conditioning to existing MURBs is a topic on many owner's minds, but not a common practice yet. While air conditioning has been common in MURBs in the Okanagan since the 1960's, many of the systems are older and relatively inefficient. In the lower mainland and Vancouver Island, virtually all older buildings were built without air conditioning.

Capital spent on adding air conditioning as a separate system could be less economical option when a heat pump system can provide both heating and cooling and may reduce long term overall capital, maintenance, and utility costs.

For buildings that use electric baseboard heating or have lower efficiency air conditioning equipment, air source heat pumps offer the opportunity to reduce both electric heating and cooling loads, potentially freeing up electrical capacity for the addition of electric vehicle charging infrastructure.

#### Regulations

Anticipated regulations are expected to drive the widespread adoption of electrification in the multifamily building sector. Various regulatory bodies are actively pursuing building electrification initiatives. These leverage specific regulatory frameworks designed to diminish reliance on fossil fuels for building power and enhance overall building efficiency. The implementation of these regulations is expected to unfold gradually across different levels of government.

While the impact of these regulations will be felt across MURBs, certain regions, like the City of Vancouver (CoV), and specific building types, such as strata corporations, may experience more targeted policies that aim to accelerate the electrification of the building stock. The success of these

<sup>&</sup>lt;sup>4</sup> "Extreme Heat and Human Mortality: A Review of Heat-Related Deaths in B.C.in Summer 2021.", June 7, 2022, https://www2.gov.bc.ca/assets/gov/birth-adoption-death-marriage-and-divorce/deaths/coroners-service/death-review\_panel/extreme\_heat\_death\_review\_panel\_report.pdf

regulations' hinges on the proactive ability of building owners to anticipate and plan for the upcoming changes regulations will mandate for their buildings.

To facilitate this adaptability within the MURB sector, there is a need for a program that offers an adaptable, long-term electrification plan. This program should feature customizable and flexible components capable of addressing building electrification requirements in the coming years.

Figure 4 illustrates the upcoming regulatory landscape, presenting the need for MURBs to undertake the electrification of specific components or entire buildings.



\*Disclaimer: The information used in this timeline has been developed based on planned regulations

**Figure 4:** Potential upcoming regulations likely to trigger building electrification.

#### 3.3 Jurisdictional Review of Building Electrification Initiatives

In examining building electrification retrofit initiatives in Canada and the USA, this jurisdictional analysis concentrated on the structural and operational aspects of existing programs. The primary goal was to evaluate how these initiatives are specifically designed to assist building owners in navigating the intricacies of retrofitting for electrification. A critical aspect of this analysis involved examining whether each program offered funding for the following features (see Table 1 – Program Features):

- a) Electrification of mechanical systems
- b) Integration with other energy saving measures
- c) Conduct studies, assessments, and/or benchmarking
- d) Measurement and verification (M&V)
- e) EV charging infrastructure
- f) Electrical capacity upgrades
- g) Load management strategies
- h) Education and awareness initiatives
- i) Short-term personalized support
- j) Long-term personalized support

The findings are clear: while certain programs, such as the Rental Apartment Retrofit Accelerator Program in Vancouver, Canada, encompass most of these features, none of the programs examined incorporate all of them. The assessed programs fall short of offering the holistic and long-term support advocated by the Electrification Ready framework. While building owners could try to combine specific programs to achieve more comprehensive coverage, there are restrictions to how programs can be combined and not all buildings will be eligible for all programs, making it more complex.

Typically, building electrification programs assist with immediate retrofit projects, concluding with installation or M&V. In contrast, the Electrification Ready framework emphasizes the importance of strategic planning prior or in parallel of implementing immediate electrification retrofits to optimize building performance and financial resources. The traditional method of program delivery overlooks the integration and alignment opportunities of retrofit projects. A significant gap exists in achieving a cohesive strategy that seamlessly integrates building electrification with EV charging installation, energy efficiency measures and electrical capacity upgrades. While existing programs serve as examples, they underscore the need for a comprehensive strategy aligned with the components outlined in the Electrification Ready framework.

Program Name	Summary	Program Features	Incentives
Social Housing Incentive Program (SHIP) *Complimentary: Low-carbon electrification Program (LCE) British Columbia	BC Hydro and the Province are focused on addressing affordability while making it easier for customers in the social housing sector to access energy efficiency and low carbon electrification opportunities	<ul> <li>a) Electrification of mechanical systems</li> <li>b) Integration with other energy saving measures</li> <li>c) Conduct studies, assessments, and/or benchmarking</li> <li>f) Electrical capacity upgrades</li> <li>i) Short-term personalized support</li> </ul>	Up to \$5000 for CleanBC SHIP study Up to \$7000 for BC Hydro Electrical Load Analysis *BCH Customers Up to \$7000 for implementation support CleanBC SHIP incentive \$70/tCO2 up to \$200,000 max per site \$750,000 lifetime maximum per customer
Rental Apartment Retrofit Accelerator Vancouver, British Columbia	Building owners with rental apartments in the City of Vancouver are eligible to access grants and support services available through a pilot program designed to accelerate the retrofit and decarbonization of buildings. The program will support a wide range of apartment retrofits that will reduce building greenhouse gas emissions and will prioritize retrofits that have co- benefits for tenants (i.e., have minimal impact on existing tenants, improve livability and indoor comfort, or provide summer cooling).	<ul> <li>a) Electrification of mechanical systems</li> <li>b) Integration with other energy saving measures</li> <li>c) Conduct studies, assessments, and/or benchmarking (incl. capital plan).</li> <li>f) Electrical capacity assessment and upgrades</li> <li>g) Load management strategies</li> <li>i) Short-term personalized support (incl. 1 year post- retrofit review)</li> </ul>	Grants and other incentives up to a combined maximum of 100% of total costs and a maximum of \$500,000. Free retrofit implementation support (valued \$35,000). Free engineering and technical support to plan and implement retrofits, including energy benchmarking, screening assessments, decarbonization planning, electrical capacity assessments, and a capital plan. Ongoing building retrofit support from experienced professional engineers, project managers and retrofit assistants, including support accessing complementary funding and financing.

#### **Table 1:** Jurisdictional Review of Building Electrification Retrofit Programs

<u>Climate Friendly</u> <u>Homes Fund (CFHF)</u> New York, USA	This program is administered and delivered by the Community Preservation Corporation to provide financial incentives for multifamily buildings with 5 to 50 units. Incentives help owners electrify their homes and replace inefficient systems with highly efficient heat pumps.	<ul> <li>a) Electrification of mechanical systems</li> <li>b) Integration with other energy saving measures</li> <li>f) Electrical capacity upgrades</li> <li>i) Short-term personalized support</li> </ul>	Average \$24,200 per suite for electrification measures (where all suites in the building were retrofitted at once). Funds committed as 0% interests, forgivable loans.
Non-Profit Resilient Retrofit Grant Program Vancouver, British Columbia	The program is a City of Vancouver initiative and is administered in partnership with the BC Non- Profit Housing Association (BCNPHA). It is designed to effectively accelerate deep emissions reductions while also supporting the introduction of cooling measures and the implementation of heat pump retrofit projects.	<ul> <li>a) Electrification of mechanical systems</li> <li>b) Integration with other energy saving measures</li> <li>c) Conduct studies, assessments, and/or benchmarking</li> <li>d) M&amp;V</li> <li>f) Electrical capacity upgrades</li> <li>i) Short-term personalized support</li> </ul>	This program's capital incentives will top up to cover up to 100% of the incremental consultant, capital and replacement costs after grants/funds from others have been applied. Incremental capital cost will be calculated using the current code minimum efficiency system that can be installed in Vancouver.
Go Electric EV Charger Rebate Program British Columbia	Funded by the Ministry of Energy, Mines and Low Carbon Innovation (the Ministry) and administered by BC Hydro and FortisBC, the CleanBC – Go Electric EV Charger Rebate Program (the Program) provides rebates towards the cost of the purchase and installation of eligible electric vehicle (EV) charging equipment, and support services for multi- unit residential buildings (MURBs) and workplaces seeking solutions for their EV charging needs.	e) EV charging infrastructure f) Electrical Capacity upgrades	The Program includes rebates for SFH EV charging installations. The offer will reimburse eligible purchase and installation costs of eligible, new, Level 2 charging equipment up to 50% of costs, up to a maximum of \$350 per approved station. All work must be completed, and applications submitted no later than 90 days after the installation of the charging station. Rebates will be issued until program funds are fully expended.

Charging Infrastructure and Rebate Program California, USA	Make EV charging equipment more affordable for decision makers owning or operating multi-family properties. This Charging Infrastructure and Rebate Program offers program funded electric distribution system infrastructure upgrades and EV charging equipment rebates to those seeking to install EV charging equipment at their property site.	e) EV charging infrastructure f) Electrical capacity upgrades	The program provides a rebate of up to \$10,000 per port for qualified sites installing up to four EV charging ports.
Hi-Rise Retrofit Improvement Support Program (HI- RISE) <sup>114</sup> Toronto, Ontario	This program is managed and delivered by the City of Toronto and in collaborating with Toronto Hydro. The program offers low interest loans (between 2% to 5% interest rate) to buildings with three storeys and more to support energy efficiency measures and renewable technology installation costs in the whole building. Over eight years, this program could complete 15 projects, which results in 19% energy savings and 3,500 tonnes of GHG emissions reduction.	a) Electrification of mechanical systems b) Integration with other energy saving measures	10% value of property or up \$2 million from City of Toronto and up to \$100,000 in incentives available from Toronto Hydro.

Multifamily Buildings Low- Carbon Pathways Program New York, USA	Whole-building incentive program, offering financial incentives for improving enclosure, ventilation, heating and cooling, and DHW. Open to buildings with 5+ units where at least 50 percent of the building's gross heated area is residential space. Funding for this program is through the State's 10-year, Clean Energy Fund <sup>116</sup> . Saving data is not available for this program.	<ul> <li>a) Electrification of mechanical systems</li> <li>b) Integration with other energy saving measures</li> <li>i) Short-term personalized support</li> </ul>	Enclosure: \$3,750 per dwelling unit and \$1,250/dwelling unit if this is first package implemented. Ventilation: \$750 per dwelling unit. Heating and cooling: \$750 per dwelling unit. DHW: \$700-\$750 per dwelling unit. In addition, the program offers \$50 per dwelling unit for air sealing.
Multifamily Ductless Heat Pumps and Packaged Terminal Heat Pumps Oregon, USA	Cash incentives to all Oregon multifamily residential properties to help them replace inefficient heating systems with highly efficient heat pumps. Saving data is not available for this program.	a) Electrification of mechanical systems	Cash incentives up to \$250,000 per building. \$800 cash back per ductless heat pump outdoor unit. \$200 cash back per unit replacing electric resistance heat (electric furnace, baseboard, in-wall unit) with heat pump heating.

#### **3.4 Recommended Next Steps**

The following recommendations seek identify potential options to utilize and build on the proposed Electrification Ready framework:

- Explore how the principles, phases, and components of the proposed Electrification Ready framework could form the foundation for, or be integrated into, a MURB electrification program. This would include exploring options to integrate or align, support offers and rebate programs for building system electrification, EV charging equipment and electrical capacity upgrades in a way that allows stakeholders to plan for, budget for and adequately prioritize their short-and-long-term building electrification needs.
- 2. Streamline the process for making electrical capacity data available from BC Hydro with standardized guidelines to ensure efficient and consistent use by contractors and consultants. This would include:
  - a. Providing easy access to all available electrical capacity information.
  - b. Building peak demand (kW), to determine available electrical capacity to electrify.
  - c. MURB aggregated consumption (kWh), to analyze existing usage and actual loads needed.
  - d. Grid capacity from BC Hydro side to accommodate load increases and evaluate the feasibility of adding load at the neighbourhood level.
- 3. Develop standardized guidelines, and/or prescriptive calculations, for a wide range of services that would form the foundation of Electrification Ready planning. This would include, but not be limited to:
  - a. Standardized prescriptive calculations to get a preliminary assessment of the available electrical capacity and estimate new electrification loads for high-level planning purposes.
  - b. In-suite heat pump system sizing.
- 4. Explore how data collected and produced within an electrification program can be stored and managed for convenient sharing among relevant stakeholders, with privacy of data taken into consideration.
  - a. The long-term cost-effectiveness of electrification ready planning programs can be enhanced through having a data sharing process that allow buildings to re-enter a program and updating past reports and analysis.
  - b. Access to costing data from real retrofit implementation projects can support the development of industry-wide benchmarks. Despite the fast-paced market and technology evolution, having accessible costing data allows for efficient high-level cost estimates to be included in an Electrification Ready Plan, saving time and ensuring greater accuracy.