Charged and Ready: EV-Ready Residential Building Experiences in BC

Technical Report

WATT CONSULTING GROUP and INTROBA
October 31, 2025

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CHARGED AND READY: EV-READY RESIDENTIAL BUILDING EXPERIENCES IN BC

Technical Report

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- Strata Property Agents of BC
- Technical Safety BC*
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The views and opinions expressed in this report are those of the authors (WATT Consulting Group and Introba) and do not necessarily reflect the views or positions of the client organizations they represent.

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SUMMARY FOR POLICYMAKERS

Introduction

To support growing electric vehicle (EV) adoption in British Columbia, over 35 local governments have introduced EV-ready bylaws for new construction, requiring parking in new buildings to be equipped with infrastructure to support the future installation of EV charging. The *Charged and Ready: EV-Ready Residential Building Experiences* study evaluates the effectiveness of EV-ready bylaws in new residential buildings and provides recommendations to address barriers and challenges to successful implementation of these bylaws.

The study was conducted by WATT Consulting Group and Introba, with funding from BC Hydro. A project advisory team consisting of staff from City of New Westminster, City of Nanaimo, District of Saanich, Metro Vancouver, UBC, Community Energy Association, and BC Hydro, provided direction for the project. The study included a survey of EV-ready stakeholders in seven BC communities, and engagement workshops with industry and other relevant EV-ready stakeholders, to support the development of findings and recommendations.

This summary for policymakers is intended to share key information about the project. More information, including background on EV-ready bylaws, study methodology and limitations, and detailed results and recommendations, can be found in the full technical report.

Background

Home EV Charging is Critical to EV Adoption

BC is among the leading jurisdictions in North America for EV adoption, with EVs accounting for over 20% of all new vehicle sales in 2024. Strong uptake is expected to continue, with the provincial Zero-Emission Vehicles Act legislating 100% of new light-duty vehicle sales to be zero-emission by 2035. Ensuring reliable access to home EV charging is a critical factor in supporting EV adoption. Home charging is the most convenient and affordable option, and plays the largest role in EV charging, with studies showing that about 75% of charging happens at home. In multi-unit residential buildings (MURBs), EV charging can be challenging to provide due to legal, financial, technical, and logistical barriers. This can impede EV adoption, with a recent study

finding that 75% of people living in MURBs in Canada identified access to home charging as a barrier to switching to an EV.[1]

The Summary for Policymakers and the full technical report assume the reader has a general understanding of EV charging infrastructure. Readers can find more background in the following resources:

- BC Hydro's *Charging Your EV at Home*: https://www.bchydro.com/powersmart/electric-vehicles/charging-at-home.html
- Metro Vancouver's *Keeping It Current: Primer on EV Charging Infrastructure*: https://metrovancouver.org/services/air-quality-climate-action/Documents/charging-technology-brief.pdf
- BC Local Government EV Peer Network's *EV Ready New Construction Requirements: A Best Practice Guide for Local Governments*: https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/power-smart/business/programs/ev-ready-requirements-for-new-buildings.pdf

The full technical report for *Charged and Ready* includes an overview of **types of strata plans in BC** and the variety of parking allocation methods in strata developments, which may add complexity to the implementation of EV-ready bylaws. The technical report also includes additional information on **EV-ready requirements in the BC context** and background information on **EV-ready permitting**.

EV-Ready Bylaws in BC

To support growing EV adoption and reduce these barriers, local governments across BC have implemented EV-ready bylaws for new developments. EV-ready bylaws typically require new developments to include energized electrical outlets capable of providing Level 2 EV charging for parking stalls. As of 2025, over 35 local governments in BC have adopted EV-ready bylaws to ensure new residential buildings have the electrical capacity and infrastructure to enable residents to charge their vehicles. A

[1] Clean Energy Canada. (2025). *Empowering Households*. Retrieved from: https://cleanenergycanada.org/wp-content/uploads/2025/09/Report_EmpoweringHouseholds_2025_V5.pdf

number of these bylaws meet the best practice of requiring 100% of residential parking spaces in new developments to be EV-ready. This standard ensures equitable access to EV charging for all building residents.

Research shows that equipping a parking space to be EV-ready during construction is three to four times cheaper than upgrading an existing parking space, highlighting the importance of EV-ready bylaws in helping homeowners to avoid unnecessary future upgrade costs.[2]

EV-Ready Stakeholder Groups

From building design to completion then occupancy, EV-ready infrastructure involves a diverse set of stakeholders to be successful:

- **Electrical engineers** design EV charging systems and oversee compliance, while **electrical contractors** handle installation, commissioning, and coordination with inspectors.
- **Municipal plan reviewers** and **building inspectors** ensure EV-ready elements meet code and bylaw requirements, with engineers assuming responsibility for complex buildings.
- **Electrical field safety representatives and safety officers** enforce provincial electrical safety standards but do not regulate municipal EV-ready bylaws. Technical Safety BC oversees regulated electrical work, including the installation of EV charging equipment, under the Safety Standards Act and the BC Electrical Code.
- **Residents and strata councils** are end-users and managers within residential buildings, with owners typically initiating EV charger installation and tenants requiring landlord approval. Strata councils govern EV charging through bylaws and rules by a vote of the owners.
- **EV charging service providers** support deployment and management of charging infrastructure, offering services like billing, maintenance, and energy management, to simplify implementation for developers and strata corporations.

[2] Low Carbon Cities Canada. (2024). *Futureproofing Multifamily Buildings for EV Charging*. Retrieved from: https://media.fcm.ca/sites/GMF/resources/Report/futureproofing-multifamily-buildings-for-ev-charging.pdf

Study Overview and Methodology

The *Charged and Ready: EV-Ready Residential Building Experiences* study evaluated the experience of residents in EV-ready residential buildings and surveyed stakeholders to identify challenges and barriers to implementation of EV-ready bylaws. The study covered strata MURBs, as well as strata and non-strata single-family detached and multiplex homes. The research objectives were as follows:

1. Assess the level of EV infrastructure compliance and use in EV-ready residential buildings
2. Identify barriers and challenges to installing and operating EV charging in EV-ready residential buildings
3. Assess the level of awareness and participation in BC Hydro's demand-response program in EV-ready single-family and multiplex buildings
4. Document the current state of EV power management devices in EV-ready single-family and multiplex buildings

Survey of EV-Ready Building Stakeholders

The study included a survey of residents, strata council members, building professionals, and municipal staff responsible for EV-ready bylaws in seven BC communities: City of Nanaimo, City of Victoria, City of Vancouver, City of Richmond, Township of Langley, City of New Westminster, and the University of British Columbia. These communities were selected based on several criteria, including having an EV-ready bylaw in place since 2021 or earlier, the proportion of stalls that are required to be EV-ready, and to reflect a diversity of geographies and population, as well as availability of EV-ready building data.

Follow-up interviews were conducted with interested respondents of the survey questionnaires to provide an opportunity for them to share additional details on their EV-ready experience.

Industry Stakeholder Engagement

In addition to conducting a survey, the study included focus groups with industry representatives from organizations involved in EV-ready and charging infrastructure:

Building Officials

- Building Officials Association of BC
- Technical Safety BC

Property Management and Strata Associations

- Condominium Home Owners Association
- Vancouver Island Strata Owners Association
- Strata Property Agents of BC
- Professional Association of Managing Agents

Development Industry

- Canadian Home Builders Association of BC
- Urban Development Institute

Electrical Utilities

- BC Hydro

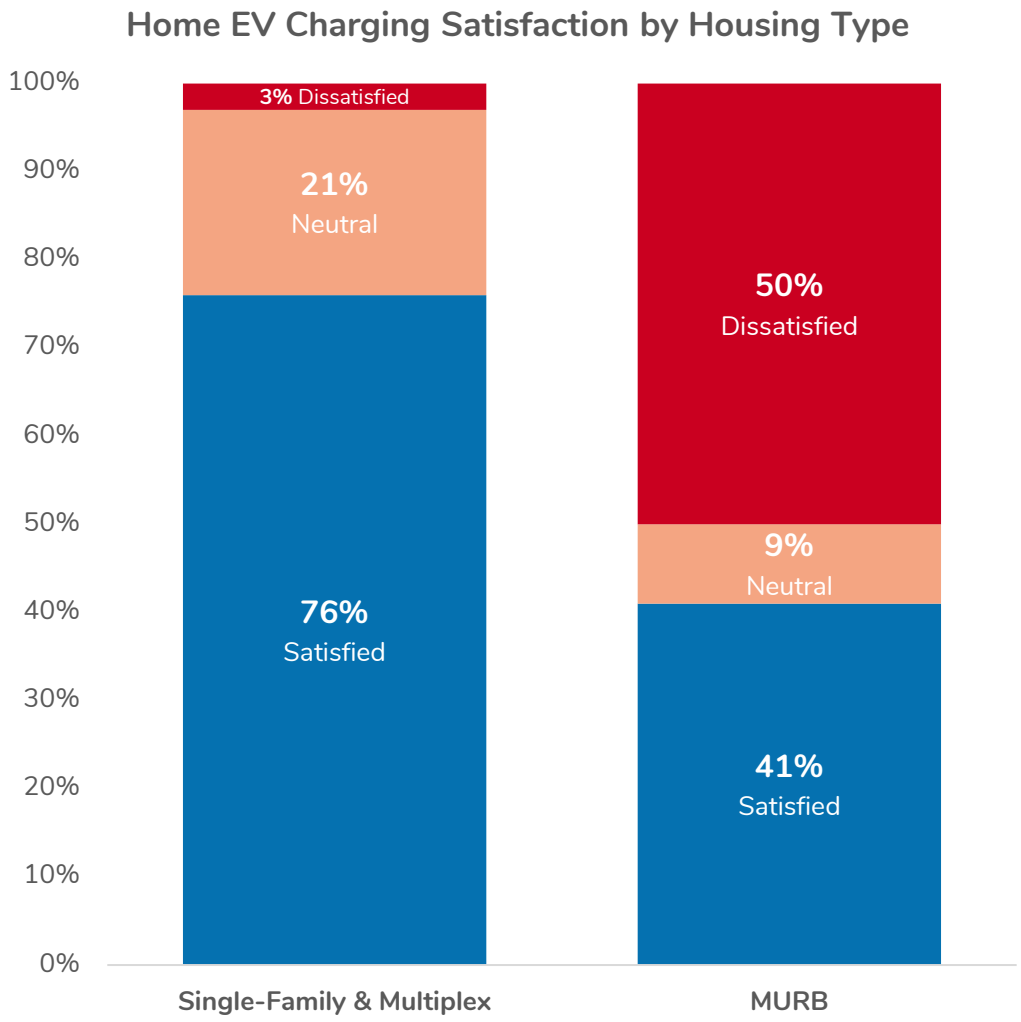
Non-Profit EV Support Industry

- Fraser Basin Council

The first round of engagement informed survey development and gathered initial insights on barriers, challenges, and opportunities for EV-ready requirements and EV energy management systems in new residential buildings. Follow-up engagement consisted of distributing draft findings and recommendations to study stakeholders for feedback.

Key Findings

1. The majority of survey respondents living in EV-ready single-family and multiplex housing are generally satisfied with their home EV charging experience, but EV drivers living in MURBs are less satisfied with their home charging experience.



2. Buildings that are not 100% EV-ready (i.e., where some residents do not have an EV-ready parking stall) create barriers for residents who are not assigned an EV-ready parking stall and who wish to charge their EV at home.

3. EV charging infrastructure may not be constructed to a compliant standard for some EV-ready buildings due to:
    a. Gaps and oversights during the development process
    b. Lack of coordination or unclear division of responsibilities between Authorities Having Jurisdiction (e.g., municipal plan reviewers, Technical Safety BC)
4. Tenants living in strata housing lack the decision-making power to install EV chargers in EV-ready residential buildings.
5. EV charging hardware incompatibility prevents or makes it cost prohibitive for residents to install EV chargers of a different brand.
6. Hiring an EV charging service provider prior to creation of the strata corporation can result in challenges for stratas and residents, locking them into restrictive contracts, fees, and hardware limitations.
7. Residents and strata councils may lack knowledge about EV charger installation and operation, and may not receive critical documentation on their EV charging system upon handover from the developer

More information on the study results and findings can be found in the full technical report.

Recommendations

The report includes seven recommendations to address barriers and challenges identified in the study that would help improve the EV charging experience for residents in EV-ready buildings. These actions could be led by various agencies and organizations, including local governments, the Province, electrical utilities, Technical Safety BC, Engineers and Geoscientists of BC, BC Local Government EV Peer Network, and others.

1. Strengthen EV-ready requirements and design standards

Local governments should update bylaws to require 100% EV-ready parking (or at least one stall per unit) with Level 2 outlets. Design guidelines should promote brand-agnostic hardware, installation specifications, and alignment with the Safety Standards Act and the BC Electrical Code.

2. **Explore the feasibility of a province-wide EV-ready requirement**

The Province should assess the feasibility and benefits of a BC-wide, EV-ready requirement for new residential buildings similar to the BC Energy Step Code, which could offer harmonized yet flexible implementation.

3. **Enhance EV-ready permitting and review processes**

The Province should work to clarify municipal authorities' and Technical Safety BC's role in EV-ready permitting. Local governments should develop coordinated checklists, model drawings, and specifications, and ensure required on-site field reviews are completed. Industry stakeholders can support by developing trade certifications and expanding education for contractors and inspectors, especially in rural and remote regions in BC.

4. **Establish an EV charging operational plan requirement for EV-ready buildings**

Local governments should require developers to submit EV-ready preliminary and final operational plans for strata MURBs authored by electrical engineers at the building permit and occupancy permit stages. These plans should detail EV charging system capacity and compatible chargers, ensuring strata corporations receive essential technical documentation.

5. **Develop and enhance education on EV charging infrastructure for EV-ready stakeholders**

BC Hydro, Technical Safety BC, Engineers and Geoscientists of BC, and strata associations (e.g., CHOA, VISOA) should develop outreach and training tailored for residents, strata councils, and professionals. Residents need clarity on what EV-ready means, how EV charging operates, and what costs to expect. Strata councils require governance support. Engineers and contractors will benefit from training on best practices and EV energy management systems.

6. **Consult with EV charging service providers to improve EV charging service agreements and communications**

Developers, strata associations, local governments, and/or the Province should engage with EV charging service providers to identify how to improve flexibility in contracts and shift industry practices towards brand agnostic hardware, allowing strata corporations to choose the most appropriate EV charging solutions that best serve the interest of strata owners. Improved communication between EV charging service providers and building professionals would streamline design and installation and support a better EV charging experience for residents.

7. **Conduct cost-benefit analyses of financial rebates for EV Energy Management Systems in new EV-ready single-family homes**

EV Energy Management Systems (EVEMS) help to optimize the timing and rate of EV charging to prevent overloading an electrical circuit and can help homeowners avoid costly electrical capacity upgrades. Uptake of EVEMS in single family homes is relatively low, potentially due to lack of information being available to residents. To determine if mandating the use of EVEMS as part of EV-ready requirements is more cost-effective than incentivizing use through rebates, BC Hydro should conduct a cost-benefit analysis to make an informed decision on potential program changes.

Conclusion

The *Charged and Ready: Evaluating EV-Ready Residential Building Experiences* study confirmed that EV-ready bylaws are generally effective in supporting home EV charging, but that EV drivers living in MURBs are less satisfied with their home EV charging experience compared to those living in single-family or multiplex housing. Further, gaps in bylaw design and implementation, added technical and governance complexities, and lack of knowledge or relevant documentation for residents and stratas in MURBs can limit equitable charging access for some residents. The report offers seven recommendations to improve the EV-ready experience in residential buildings and inform work to improve the EV-ready residential building experience across BC.

1.0 INTRODUCTION

Charged and Ready: EV-Ready Residential Building Experiences aims to evaluate the effectiveness of local government electric vehicle (EV)-ready requirements for new residential buildings in British Columbia and to understand the experience of residential EV-ready requirements from the perspectives of six stakeholder groups: residents; strata council members; electrical contractors; electrical engineers; municipal plan reviewers; and municipal building inspectors.

BC is a North American leader in EV adoption, with EVs accounting for approximately 25% of all new light-duty vehicle sales in 2024. The provincial Zero-Emission Vehicles Act legislates 100% of new light-duty vehicle sales to be zero-emission by 2035 to reduce greenhouse gas emissions from the transportation sector. Ensuring reliable access to home EV charging is a critical factor in supporting EV adoption, as the majority of charging takes place at home. For example, 75% of surveyed people living in an apartment or townhouse in the Vancouver and Toronto metro regions reported a lack of home charging options prevented them from buying an EV.[3] Over 35 local jurisdictions in BC have adopted EV-ready bylaws as of 2025 to ensure new residential buildings have the electrical capacity and infrastructure to enable residents to charge their vehicles.[4] However, the effectiveness of these bylaws has not been evaluated to date, and some residents and industry organizations have reported barriers and challenges with EV-ready requirements.

The purpose of this study is to support improvements to EV-ready requirements and outcomes through two research goals. First, it seeks to uncover barriers and challenges that residents face in accessing EV charging in newly-constructed EV-ready residential buildings. Second, it contextualizes residents' barriers and challenges with consideration of the roles that strata councils, building professionals, and building officials play as part of the implementation of EV-ready requirements.

The scope of the study has a primary focus on strata multi-unit residential buildings (MURBs) with a secondary focus on strata/non-strata single-family and multiplex homes, including duplexes, triplexes, fourplexes, and other townhomes. Purpose-built rental MURBs and housing cooperatives are outside the scope of the study. This is the

[3] Clean Energy Canada. (2025). *Empowering Households*. Retrieved from: https://cleanenergycanada.org/wp-content/uploads/2025/09/Report_EmpoweringHouseholds_2025_V5.pdf

[4] The term "local government" and "local jurisdiction" is used interchangeably throughout this report.

first study of its kind in the Canadian and United States context according to the authors' knowledge.

The research questions were as follows:

1. What are the experiences of residents, strata council members, building professionals, and building officials with new residential buildings that are subject to EV-ready requirements?
2. How effective are EV-ready requirements in a residential strata context?
3. Are financial incentives for EV power management devices beneficial for new single-family and multiplex homes that are subject to EV-ready requirements?

The research objectives were as follows:

1. Assess the level of EV infrastructure compliance and use, with a focus on strata MURBs with shared parking facilities
2. Identify barriers and challenges with EV charging in new EV-ready residential buildings, with a focus on strata MURBs with shared parking facilities, in terms of:
    a. EV charging infrastructure installation, commissioning, and operation
    b. EV charging infrastructure awareness
    c. Residential strata governance as it relates to EV charging infrastructure
3. Assess the level of awareness and participation in BC Hydro's demand-response program in new EV-ready single-family and multiplex buildings
4. Document the current state of EV power management devices in new EV-ready single-family and multiplex buildings

2.0 BACKGROUND

This report assumes the reader has a general understanding of electric vehicle charging infrastructure. Readers are directed to the following resources for further background where needed:

- BC Hydro's *Charging Your EV at Home*: https://www.bchydro.com/powersmart/electric-vehicles/charging-at-home.html
- Metro Vancouver's *Keeping It Current: Primer on EV Charging Infrastructure*: https://metrovancouver.org/services/air-quality-climate-action/Documents/charging-technology-brief.pdf

BC Local Government EV Peer Network's *EV Ready New Construction Requirements: A Best Practice Guide for Local Governments*: https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/power-smart/business/programs/ev-ready-requirements-for-new-buildings.pdf

For the purposes of this report, the term **"EV charging infrastructure"** refers to the electrical distribution supply (e.g., electrical panels, breakers, transformers, etc.). The term **"EV charging systems"** refers to the hardware and software of the electric vehicle supply equipment (i.e., EV charger and EV charging energy management software) together.

2.1 Parking in Strata Developments

Strata housing is a form of legal ownership and tenure that is created when a strata plan is filed at the Land Title Office. Owners own their individual strata lots and a proportional interest in the common property (see **Appendix A** for details on types of strata plans). Vehicle parking stalls (also known as off-street vehicle parking spaces) in residential strata developments can be allocated under three different methods to strata lot owners:[5]

[5] Government of British Columbia (2023). *Strata parking stalls and storage lockers*. https://www2.gov.bc.ca/gov/content/housing-tenancy/strata-housing/renting-buying-selling/buying-and-selling-strata/parking-and-storage

1. **Part of the strata lot:** parking stalls share the same strata lot number as the residential unit. In other words, the strata lot owner automatically owns the parking stall as part of the purchase of their residential unit and the owner has exclusive ownership and use of the stall.
2. **Limited common property:** parking stalls are owned by all owners in the strata corporation, but the parking stall on the strata plan is designated by the developer in connection with a particular strata lot for the exclusive use of the strata lot owner. In other words, individual strata lot owners do not own limited common property parking stalls, but they have the exclusive right to use their designated parking stall.
3. **Common property:** parking stalls are owned by all owners in a strata corporation or the developer in the case where there is a developer lease. The strata corporation or developer can allocate common property parking stalls to strata lot owners in three ways:
    a. **Grant of short-term exclusive use:** an exclusive use or privilege is granted to an owner or tenant, may be subject to conditions, cannot exceed one year, and can be renewed. However, if the parking stall is specifically equipped with EV charging infrastructure at the request of an owner, then exclusive use may be granted for up to 5 years and can be renewed.
    b. **Assignment of rights under a lease or license:** the developer of the strata development grants a lease or license to itself as the developer or to an organization (e.g., property manager, parking operator), who is then able to assign its lease or license interest to owners. The owner or tenant has a right of exclusive use of a parking stall until the lease expires.
    c. **Shared use:** parking is not allocated to the use of any specific owner and is typically accessed on a first-come, first-served basis.

The use and allocation of parking stalls in strata developments is a common source of confusion. Strata homeowner associations, real estate professionals, and legal professionals provide information and education online, in print, or at events on the topic of legal designation and allocation of parking stalls. The variety of parking allocation methods in residential strata developments adds significant complexity to how parking is governed compared to non-strata purpose-built rental developments, and can complicate the implementation of EV-ready bylaws in strata developments.

2.2 EV-Ready Requirements

EV-ready parking refers to a vehicle parking stall that is equipped with an adjacent electrical outlet (also referred to as an energized outlet) that features either an electrical junction box or an energized receptacle that is suitable for EV charging. EV-Ready does not mean a parking stall is equipped with electric vehicle supply equipment (EVSE; colloquially known as an EV charger or EV charging station). However, some developers/builder may opt to install the EV charger as well, going above and beyond the EV-ready requirement.

The purpose of requiring EV-ready parking in new residential buildings is to ensure equitable access to EV charging for building residents and avoid costly renovations to add EV charging infrastructure in the future. EV-ready requirements are an important tool for ensuring buildings are equipped with the infrastructure needed to enable residents to choose an EV as their next vehicle. EV-ready requirements are typically adopted as a local government bylaw within a zoning bylaw or standalone parking bylaw that aims to:[6]

- Provide complete futureproofing of on-site EV charging electrical infrastructure and avoid an expensive retrofit in the future.
- Defer the cost of the EV charger and its installation to the homeowner, which often represents more than half of the capital expenditure to implement Level 2 charging.
- Create requirements that are relatively simple for jurisdictions to administer (e.g., building officials check for presence of an electrical outlet; engineers provide professional assurance that requirements are adhered to, etc.).

A model EV-ready bylaw for the BC context is available as a resource for local governments wishing to adopt and/or update their bylaws (see **Appendix B** for additional details). The proportion of parking stalls that are required to be electrified vary by jurisdiction.[7] For example, some local governments require less than 100% of

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[6] BC Local Government EV Peer Network and Dunsky (2025). *EV Ready New Construction Requirements: A Best Practice Guide for BC Local Governments (Version 2)*. https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/power-smart/business/programs/ev-ready-requirements-for-new-buildings.pdf

[7] While a detailed review of how EV-ready bylaws in the province compare against the model bylaw is outside the scope of this work, understanding the model requirement provides helpful context when evaluating the effectiveness of current EV-ready bylaws that forms the subject of the Charged and Ready study.

parking stalls to be EV-ready in contrast to the model requirement suggestion of 100%. Key aspects of the model bylaw include the following:

- Number of parking spaces to be equipped with an energized outlet (100% for residential land uses)
- Labelling of energized outlets
- EV charging performance requirements
- EV management system guidelines, such as strata rules/bylaws and use of networked hardware

The City of Richmond was among the first local jurisdictions in BC to develop and adopt an EV-ready bylaw in 2017. In the years since, there have been anecdotal reports of barriers and challenges with residential buildings subject to EV-ready requirements, reported to local governments from residents and industry organizations. Some of these barriers and challenges include:

- **Infrastructure:** EV charging infrastructure was not installed to the standard of the local government requirement; EV energy management systems were not set up appropriately
- **Awareness:** residents are not aware that their building is EV-ready
- **Governance:** high fees for residents to charge; undefined or poorly defined strata policy around charging installation, usage, and pricing; EV charging usage restrictions related to third-party EV provider contract with strata building

2.3 EV-Ready Permitting

The design of EV charging infrastructure is regulated by the Canadian Electrical Code (CSA C22.1, Part 1), the Safety Standards Act (which references the BC Electrical Code), and a local jurisdiction's EV-ready bylaw and applicable electrical requirements. Local governments/jurisdictions and Technical Safety BC are the two Authorities Having Jurisdiction (AHJs) that permit of EV charging infrastructure.

Technical Safety BC is an agency that regulates electrical equipment and systems in accordance with the provincial Safety Standards Act and the Electrical Safety Regulation, except in the following municipalities, which regulate electrical permitting in their jurisdiction: City of Burnaby, City of Maple Ridge, City of North Vancouver, District

of North Vancouver, City of Surrey, City of Vancouver, City of Victoria, and District of West Vancouver.[8]

There are three types of permits that pertain to EV charging installations:

- **Development permits** are issued by local jurisdictions for developments that are subject to development permit guidelines to ensure developments are compliant with a jurisdiction's various forms of development control such as zoning. This includes the provision of off-street parking and the associated number of EV-ready parking stalls, which is typically housed within the off-street parking section in a zoning bylaw or as a standalone parking bylaw.
- **Building permits** are issued by local jurisdictions to ensure developments are compliant with the requirements of the applicable building code (e.g., BC Building Code, Vancouver Building By-law), including the electrical works associated with EV charging infrastructure.
- **Electrical permits** are issued by Technical Safety BC (or exempt municipalities listed above with delegated powers) to ensure the electrical works associated with EV charging infrastructure are designed and installed in accordance with the provincial Safety Standards Act and the Electrical Safety Regulation.

2.4 EV-Ready Stakeholder Groups

This section outlines the roles and responsibilities of the EV-ready stakeholder groups considered in this study:

- **Residents and strata council members** are the end-users and managers within an EV-ready building.
- **Electrical engineers and contractors** are building professionals responsible for the design, installation, or commissioning of EV charging infrastructure.
- **Municipal plan reviewers, municipal building inspectors, electrical field safety representatives, and safety officers** are professionals responsible for the permitting review of EV charging infrastructure.
- **EV charging service providers** support deployment and management of EV charging infrastructure.

[8] The eight exempt municipalities have separate administrative agreements with the provincial government that delegate portions of the Safety Standards Act and permit the municipalities to issue electrical permits and perform assessments.

2.4.1 Residents

Residents can be either an owner-occupant or tenant of a dwelling unit in an EV-ready residential building. Residents may be an existing EV driver who currently owns or leases an EV, or a prospective EV driver who is considering an EV in the future.

In an EV-ready context, owner-occupants have decision-making authority whether or not to pursue the installation of EV chargers in their EV-ready parking stall, subject to any limitations established by the Strata Property Act, strata bylaws, and strata rules. In contrast, tenants who rent their dwelling unit do not have decision-making authority on installing EV charging and must consult with their landlord if they wish to install an EV charger.

2.4.2 Strata Council Members

A strata council is the elected executive body for a strata corporation. Strata councils manage the day-to-day operations of the strata corporation accordance with the Strata Property Act, Strata Property Regulation, strata bylaws and rules, and as directed by resolutions passed by strata owners at general meetings. A strata council may manage the corporation themselves (known as a self-managed strata) or, if approved by owners, hire a professional strata management company to perform certain services. If a strata management company is hired, the strata council is still ultimately responsible for ensuring its obligations under the provincial Strata Property Act are fulfilled.

In an EV-ready context, strata corporations may, by a vote of the owners, adopt bylaws and rules that govern EV charging:[9]

- Bylaws are about "the control, management, maintenance, use and enjoyment of the strata lots, common property and common assets of the strata corporation and for the administration of the strata corporation."
- Rules are about "governing the use, safety and condition of the common property and common assets." Rules cannot govern individual strata lots.

For example, a strata bylaw may establish user fees for EV charging or require a strata lot owner to request permission from the strata council to install an EV charger.

[9] Province of British Columbia. (2025). *Strata Property Act, Chapter 43, Part 7 — Bylaws and Rules.* Retrieved from: https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/98043_07

2.4.3 Electrical Contractors

Electrical contractors, also known as electricians, are building professionals responsible for the design, construction, installation, and commissioning of EV charging systems for simple Part 9 buildings (e.g., single-family homes) and construction, installation, and commissioning of complex Part 3 buildings (e.g., MURBs) as regulated under the BC Building Code or Vancouver Building By-law.

General contractors are responsible for coordinating various trades to undertake construction of a new building. This includes supervising the base electrical contractor who is responsible for the fundamental electrical works, such as the installation of distribution electrical equipment, utility requirements, receptacles, lights, lighting controls, connection to mechanical loads. The base electrical contractor may also provide rough-in services for more specialized trades such as security, data, audiovisual, and EV charging. This may be followed by a secondary electrical contractor who is specifically responsible for the installation of the EV charging hardware. The construction and installation of EV charging infrastructure is completed as per the design specifications provided by the electrical engineer in their capacity as the Engineer of Record.

During the construction process, electrical contractors have two major notification responsibilities. First, they are responsible for notifying the electrical inspectors from the Authorities Having Jurisdiction for any applicable inspections, such as during the electrical rough-in stage and during final inspection. Second, both the electrical contractors and their general contractor must notify the electrical Engineer of Record about all progress field reviews completed and questions that may arise.

Electrical contractors are regulated by SkilledTradesBC under the provincial Skilled Trades BC Act.

2.4.4 Electrical Engineers

Electrical engineers are building professionals responsible for the design of EV charging systems for complex Part 3 buildings (e.g., MURBs) as regulated under the BC Building Code or Vancouver Building By-law. Electrical engineers, in their capacity as the Engineer of Record, act as the Registered Professional of Record and take responsibility for the design and field review of EV charging systems. Responsibility is confirmed through the provision of a Letter of Assurance authored by the electrical engineer, which is a legal document that outlines their responsibility and confirms that the work

meets applicable requirements. Letters of Assurance are submitted to local governments at the time of building permit, before construction, and after project completion but before an occupancy permit or final inspection.

During the construction process, electrical engineers must comment on any deficiencies or variations from the design drawings and what was noted on site during a progress field review. The electrical contractor is then responsible for correcting any deficiencies noted by the engineer. Electrical engineers may assist the developer upon request with finalizing operational aspects of EV charging systems prior to the developer's handover to the strata corporation, such as providing recommendations on appropriate strata bylaws.

Electrical engineers are regulated by Engineers and Geoscientist BC (EGBC) under the provincial Engineers and Geoscientists Act.

2.4.5 Municipal Plan Reviewers

Municipal plan reviewers are a type of building official responsible for reviewing building plans to ensure a development is compliant with the applicable building code and local government bylaws, regulations, and technical standards before a building permit is issued. In BC, plan reviewers are responsible for reviewing simple Part 9 buildings (e.g., single-family homes) and complex Part 3 buildings (e.g., MURBs) as regulated under the BC Building Code or Vancouver Building By-law.

In an EV-ready context, the level of review for Part 3 and Part 9 buildings may vary depending on the local government. At minimum, the review generally consists of ensuring the number of EV-ready parking spaces and an EV energy management system (where required) are provided as per the EV-ready bylaw. For Part 3 buildings, local governments typically defer responsibility of assuring the design of an EV charging system is in accordance with the EV-ready bylaw to the electrical engineer in their capacity as the Engineer of Record. This is confirmed through the Letter of Assurance issued by the electrical engineer identifying they are the Registered Professional of Record responsible for the design of the EV charging system.

Plan reviewers are regulated by the Building Officials' Association of BC (BOABC) under the provincial Building Officials' Association Act.

2.4.6 Municipal Building Inspectors

Municipal building inspectors are a type of building official responsible for ensuring the work described under a building permit matches the work that is done by verifying building conditions before an occupancy permit is issued. In BC, building inspectors are responsible for reviewing simple Part 9 buildings (e.g., single-family homes) and complex Part 3 buildings (e.g., MURBs) as regulated under the BC Building Code or Vancouver Building By-law.

In an EV-ready context, municipal building inspectors have varying responsibility for Part 9 and Part 3 buildings. For Part 9 buildings, the level of review may vary and be minimal. At minimum, this generally consists of ensuring the number of EV-ready parking spaces and an EV energy management system (where required) are provided as per the EV-ready bylaw. For Part 3 buildings, local governments typically defer responsibility of the field review for an EV charging system to the electrical engineer acting in their capacity as the Engineer of Record.[10] This is confirmed through the Letter of Assurance issued by the electrical engineer identifying they are the Registered Professional of Record responsible for the design and field review of the EV charging system.

Building inspectors are regulated by the Building Officials' Association of BC (BOABC) under the provincial Building Officials' Association Act.

2.4.7 Electrical Field Safety Representatives and Safety Officers

Electrical field safety representatives and Technical Safety BC safety officers are responsible for reviewing and ensuring that the work described under an electrical permit complies with the Safety Standards Act and Electrical Safety Regulation. An electrical field safety representative is a person who is certified to make declarations on behalf of a general or electrical contractor that the work described in an electrical installation or operating permit complies with the Safety Standards Act and Electrical Safety Regulation. In other words, the electrical field safety representative has delegated authority from Technical Safety BC and their safety officers.

[10] For some local governments (e.g., City of Nanaimo), planning professionals may also review plans and undertake a field inspection to ensure compliance as part of the development permit and building permit compliance referral process.

In an EV-ready context, the contractor's field safety representative is responsible for ensuring the EV charging system complies with the applicable safety requirements. Technical Safety BC safety officers may opt to inspect installations to verify compliance in addition to the assessment already performed by the field safety representative. However, neither the field safety representative nor safety officer are responsible for enforcing a local government's EV-ready bylaws.

2.4.8 EV Charging Service Provider

EV charging service providers sell and/or manage EV charging infrastructure. They can manage public and private charging for site hosts, including residential properties, governments, businesses, and fleet owners. Examples of EV charging service providers in BC include FLO, ChargePoint, Tesla, Shell Recharge, SWTCH Energy, Electrify Canada, Petro-Canada, and BC Hydro, among others. Not all the aforementioned organizations provide management services to private site hosts and may instead focus exclusively on public charging.

Services that EV charging service providers may offer to site hosts include:

- User apps and administrator dashboards
- Access controls and reservation platforms
- User/customer billing
- EV energy management services
- Operations and maintenance, including warranties
- Customer assistance and support
- Reporting of electricity provided by EV chargers to the BC Low Carbon Fuel Standard (LCFS) program, and aggregating and selling resulting LCFS credits on behalf of the strata corporation to generate revenue and pay for common operating expenses

In an EV-ready context, the EV charging service providers that work with private site hosts such as MURBs provide a service to developers, strata corporations, and EV drivers themselves. They can simplify the process around the procurement, installation, management, and maintenance of EV charging systems through the various services they offer. This offloads significant complexity from the developers and strata corporations to a specialist third-party organization.

3.0 STUDY METHODOLOGY

3.1 Study Population

Several BC communities were selected to participate in the *Charged and Ready* study to research the experiences of their residents, strata council members, building professionals, and building officials. The communities were selected based on the following criteria, ordered by priority:

- EV-ready bylaw for new residential buildings in force since January 1, 2021 or earlier (to ensure a sufficient number of completed and occupied EV-ready buildings)
- Number of potential eligible EV-ready buildings
- Diversity in type of EV-ready requirement (100% and less than 100% EV-ready parking)
- Diversity of community population and geographic location within the province
- High electric vehicle adoption numbers (measured as the number of vehicles registered to the Insurance Corporation of British Columbia as of 2023)
- Presence of a BC Hydro Community Energy Manager employed at the local government
- Authority over electrical permits, whether local government or Technical Safety BC
- Adoption of the BC Energy Step Code

The communities included in the study were:

- Vancouver
- Richmond
- Langley Township
- New Westminster
- The University of British Columbia
- Victoria
- Nanaimo City

The study focused on the following building types, with occupancy granted by the local jurisdictions before September 2024:

- Strata multi-unit residential buildings (MURBs), also known as condo buildings
- Strata single-family detached (SFD) and multiplex homes, including duplexes, triplexes, fourplexes, and sixplexes
- Non-strata single-family detached and multiplex homes

Purpose-built rental MURBs and housing cooperatives were outside of scope of the *Charged and Ready* study.

3.2 Survey Questionnaire

Four survey questionnaires were developed by the project consultants with input from the project advisory group and industry stakeholders (see **Appendix C** for a copy of the surveys). Questions sought to collect the following information:

- **Residents**: EV access and interest; EV charging infrastructure; EV charging behaviour; barriers and challenges to EV charging; strata bylaws and rules on EV charging; and demographics
- **Strata Council Members:** barriers and challenges of EV charging infrastructure; and strata operations and management on EV charging
- **Building Professionals:** barriers and challenges to EV charging design, installation, and commissioning
- **Building Officials:** barriers and challenges to EV charging review and inspection

All study participant groups were also asked about suggestions for improving EV-ready bylaws. The surveys were distributed to the study participant groups through the following means:

- **Residents and Strata Council Members:** Postcards were mailed out to eligible households via Canada Post in May 2025, directing residents and strata council members to complete an online survey (see **Appendix D** for a copy of the postcard).
- **Building Professionals:** Email invitations were sent out via email lists through Engineers and Geoscientist BC, Zero Emissions Innovation Centre, and via WATT Consulting Group and Introba's personal networks.
- **Building Officials:** Email invitations were sent directly to a local government staff representative at each participating community (e.g., community energy manager) to either directly respond to the survey or to distribute among relevant staff in their organization.

3.3 Survey Respondent Focus Groups and Interviews

Follow-up focus groups and/or interviews were conducted with interested respondents of the survey questionnaires to provide an opportunity for them to share additional details on their EV-ready experience. The sessions were held virtually in July and August 2025 and facilitated by the project consultants.

3.4 Industry Stakeholder Engagement

Focus groups were held with industry representatives from organizations involved in EV-ready bylaws and EV charging infrastructure including:

Building Officials

- Building Officials Association of BC
- Technical Safety BC

Property Management and Strata Associations

- Condominium Home Owners Association
- Vancouver Island Strata Owners Association
- Strata Property Agents of BC
- Professional Association of Managing Agents

Development Industry

- Canadian Home Builders Association of BC
- Urban Development Institute

Electrical Utilities

- BC Hydro

Non-Profit EV Support Industry

- Fraser Basin Council

The first round of stakeholder engagement consisted of two focus groups that were held virtually in March 2025; the sessions were facilitated by the project consultants and Metro Vancouver. The objectives of the focus groups were to:

- Introduce the research project to stakeholders.
- Gather initial insights on barriers, challenges, and opportunities for EV-ready requirements and energy management systems in new residential buildings.
- Inform the development of the survey questionnaire to be distributed to residents, strata council members, building professionals, and building officials.

The second round of stakeholder engagement consisted of distributing draft findings and recommendations to the same industry organizations for feedback in September and October 2025.

4.0 RESEARCH FINDINGS

4.1 Overview

The findings were synthesized from survey responses and follow-up focus groups/interviews with **study participant groups** (residents, strata council members, building professionals, and building officials) and focus groups with **industry stakeholders** (representatives from the building officials; property management and strata associations; development industry; electrical utilities; and non-profit EV support industry). For further details on the data used to inform the findings, refer to **Appendix D** for survey results and **Appendix E** for representative quotes.

There are seven key findings that highlight barriers to installing EV charging in EV-ready residential buildings, and challenges that negatively affect the EV-ready experience:

- **Finding #1:** The majority of survey respondents living in EV-ready single-family and multiplex housing are generally satisfied with their home EV charging experience, but EV drivers living in MURBs are less satisfied with their home charging experience
- **Finding #2:** Buildings that are not 100% EV-ready (i.e., where some residents do not have an EV-ready parking stall) create barriers for residents who are not assigned an EV-ready parking stall and who wish to charge their EV at home
- **Finding #3:** EV charging infrastructure may not be constructed to a compliant standard for some EV-ready buildings due to: (a) gaps and oversights during the development process; and (b) lack of coordination or unclear division of responsibilities between Authorities Having Jurisdiction
- **Finding #4:** Tenants living in strata housing lack the decision-making power to install EV chargers in EV-ready residential buildings
- **Finding #5:** EV charging hardware incompatibility prevents or makes it cost prohibitive for residents to install EV chargers of a different brand
- **Finding #6:** Hiring an EV charging service provider prior to the creation of the strata corporation can result in challenges for strata councils and residents, locking them into restrictive contracts, fees, and hardware limitations
- **Finding #7:** Residents and strata councils may lack knowledge about EV charger installation and operation, and may not receive critical documentation on their EV charging system upon handover from the developer

4.2 Study Participants

A total of 109 resident responses were received out of approximately ~5,250 distributed resident surveys, a response rate of ~2.1%. Overall, 103 responses met the following criteria to be included in the study's analysis:

- Resident that was either an owner-occupant or tenant of the property.
- Resident that lived in one of the target communities of Vancouver, Richmond, Langley Township, New Westminster, the University of British Columbia, Victoria, or Nanaimo City.
- Resident that lived in a household that owned or leased an EV ("current EV driver") or was considering an EV in the future ("prospective EV driver").[11]

For the other EV-ready stakeholders, responses were received from 11 strata council members[12], 11 electrical engineers, 23 electrical contractors, 13 municipal plan checkers, and 5 municipal building inspectors. Response rates were not calculated due to the manner of survey distribution.

Attendance at the focus groups and interviews among the study participant groups consisted of the following:

- **Resident:** 6 MURB attendees, 1 SFD & multiplex attendee
- **Strata Council Member:** 1 attendee
- **Building Professional:** 2 engineer attendees; 2 contractor attendees

  Building Official: 1 attendee

[11] Prospective EV drivers indicated one of the following response options when asked, "If you do not own or lease a battery electric or plug-in hybrid electric vehicle (EV), are you planning or considering purchasing/leasing an EV as your next vehicle?": "*I am definitely planning to acquire an EV*", "*I am strongly considering an EV*", or "*I have some interest in an EV.*"

[12] Strata council members completed the survey questionnaire in both their capacity as a resident and as a strata council member. For this reason, the 11 responses received by strata council members are inclusive of the 78 responses received by strata residents.

4.3 Study Limitations

The *Charged and Ready* study had the following limitations:

- **Property managers** and **EV charging service providers** represent important EV-ready stakeholder groups that directly impact the resident EV-ready experience. However, they were not included as a target group as part of the survey questionnaire:
    - For professional strata management companies, surveys were distributed but no responses were received. However, industry representatives from the property management and strata associations provided context on their role.
    - For EV charging service providers, they were outside of the scope of this study.
- **Eligible EV-ready developments** were determined based on building permit records provided by the participating communities. Record keeping for EV-ready developments is not standardized among local governments. As a result, some developments may have been inadvertently excluded. Alternatively, some developments may have been incorrectly classified as EV-ready.
- **Survey response rate:** the response rate of 2.1% for residents was sufficient to inform the findings, but the low rate may limit the ability to generalize the findings to all residential EV-ready buildings.
- **Self-selection bias:** EV drivers that have lower satisfaction with their home EV charging experience may have been more inclined to respond to the survey compared to those who had higher satisfaction.
- **Classification of strata** for non-strata single-family and multiplex homes were based on the respondent's self-reporting of the status of their property.

4.4 Findings

4.4.1 Finding #1: The majority of survey respondents living in EV-ready single-family and multiplex housing are generally satisfied with their home EV charging experience, but EV drivers living in MURBs are less satisfied with their home charging experience

EV drivers living in EV-ready single-family and multiplex homes reported higher satisfaction with their home EV charging experience compared to drivers living in MURBs. 76% of single-family and multiplex EV drivers were satisfied, while only 41% of MURB EV drivers were satisfied (see **Figure 1**).

EV charging in a MURB context is more complex to design, install, operate, govern, and manage. The subsequent research findings illustrate the reason for this gap between MURBs and single-family and multiplex developments in the EV-ready context.

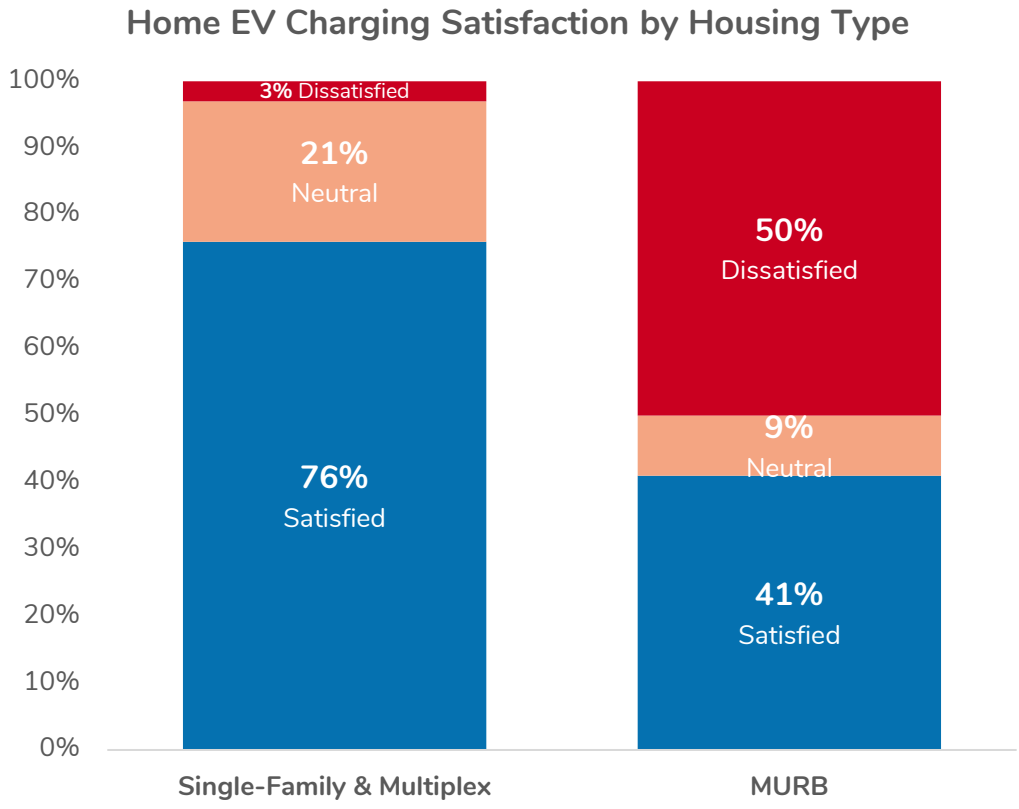

Figure 1: Home EV Charging Satisfaction

4.4.2 Finding #2: Buildings that are not 100% EV-ready (i.e., where some residents do not have an EV-ready parking stall) create barriers for residents who are not assigned an EV-ready parking stall and who wish to charge their EV at home

One important best practice for residential EV-ready bylaws is mandating 100% of parking stalls or at least one parking stall per dwelling unit to be EV-ready (see **Appendix B** for the model bylaw). For EV-ready buildings that were covered by the study, developments that were not 100% EV-ready occurred under two possible circumstances. First, the EV-ready bylaw adopted by the local government specified less a required provision of less than 100%. Second, there was an in-stream exemption period where the local government partially exempted the development from needing to comply with the full 100% EV-ready provision during the development permit stage.

Residents living in these non-100% EV-ready developments were more likely to report lower satisfaction with home EV charging. Specifically for these developments, there was a greater share of drivers who had to either use a common property parking stall with a shared EV charger or rely on community charging options, as the cost of retrofitting their stall to be EV-ready was cost prohibitive. One contributing reason for why survey respondents cited cost as a barrier is that current rebates for EV chargers supported through the CleanBC Home and Workplace Charger programs only support buildings constructed prior to the onset of EV-ready requirements, with the exception of single-family homes. This means that despite living in an EV-ready building, MURB residents are not eligible to apply for an EV charger rebate.

Another best practice for EV-ready bylaws is mandating the provision of an energized outlet, such as a junction box or Level 2 receptacle. Some building professionals reported working with local government EV-ready bylaws that require a lesser standard such as only empty conduits, with wiring runs needing to be done at a later date. These requirements are more reflective of an "EV-capable" standard rather than a truly "EV-ready". As a result, residents who are assigned these parking stalls would need to arrange additional electric work, adding further costs to their EV charger installation.

> Electrical Contractor: "*Some bylaws only require 'EV prepared' and not 'EV Ready' so no wiring in pipework or the communication system for proper load management isn't planned out correctly. If it isn't installed 100% to be EV Ready then the building/strata has a very difficult time moving forward. Stratas at this stage don't have contingency funds, etc.*"

Options available to residents who are not assigned an EV-ready parking stall are limited. The variety of parking allocation methods in a strata context adds significant

complexity to how parking is governed and used by residents, which is further complicated when needing to take into account EV charging infrastructure. Residents who do not have access to an EV-ready parking stall typically cannot be assigned a different parking stall for buildings where stalls are designated as limited common property or part of a strata lot. Changes to limited common property parking stalls require a unanimous vote of the owners and filing a reference or explanatory plan and forms at the Land Title Office. Changes to parking stalls that are part of a strata lot would need a strata subdivision; however, the Strata Property Act currently restricts parking stalls that are used in conjunction with a residential strata lot to be designated as a separate strata lot. Even if this method was feasible, a property transfer would be required to be filed at the Land Title Office which involves retaining a legal professional and paying a fee.

However, if the parking stall is common property that has not been designated as limited common property, it may be possible for the strata council or developer to change parking stall assignments if there were remaining unassigned stalls available or there was an owner/tenant of another parking stall that was willing to transfer their assigned stall.

4.4.3 Finding #3: EV charging infrastructure may not be constructed to a compliant standard for some EV-ready buildings due to: (a) gaps and oversights during the development process; and (b) lack of coordination or unclear division of responsibilities between Authorities Having Jurisdiction

EV charging infrastructure may not be constructed to a compliant standard for some EV-ready developments due to two reasons:

a. Gaps and oversights during the development process
b. Lack of coordination between multiple Authorities Having Jurisdiction

A non-compliant construction means that the energized outlet (e.g., electrical junction box or receptacle) was missing or in the case for single-family and multiplex homes, there was inadequate electrical capacity. Similar to residents not being assigned an EV-ready parking stall in a less than 100% EV-ready building (see Finding #2), drivers reported changing the assignment of their parking stall was onerous or the cost of retrofitting their stall to be EV-ready was cost prohibitive. As a result, drivers were limited to using a communal parking stall with a shared charger or relying on community charging options.

Finding #3a: EV charging infrastructure may not be constructed to a compliant standard for some EV-ready buildings due to gaps and oversights during the development process

MURBs and SFD & Multiplex

Building professionals adopt varying design and installation solutions to ensure compliance with an EV-ready bylaw for several reasons:

- Lack of industry standards and guidance for calculations, hardware, and design solutions for EV charging, particularly for EV energy management systems
- EV-ready bylaws with varying requirements depending on the local jurisdictions
- Different site conditions that must be accounted for in a design solution

The variety of design and installation solutions can inadvertently lead to gaps and oversights during permitting and review. This is due to the many actors involved in the development process and the various hand-off points across the multiple stages of building design and construction.

> Electrical Contractor: "*Some EV-ready installations are completed and some are not; we can't spend all day to determine if wiring is done correctly. The division of scope makes it difficult. If a contractor didn't know what they are doing and install just one charger, and the next person goes gets a different contractor and installs a different charger, those chargers can't load-share on a branch circuit. Engineers should include provide [sic] guidance or install EVEMS in advance so chargers can be brand agnostic.*"
>
> Electrical Engineer: "*There is often a disconnect between the initial building designs provided by developers and the current EV-ready requirements. Developers frequently lack the technical expertise needed to align their designs with evolving EV charging standards. As a result, compliance issues are often only identified late in the project—sometimes not until just before occupancy—leading to costly delays, last-minute modifications to meet the necessary requirements and disagreements on the definition of EV Ready with the Strata.*"
>
> Municipal Plan Reviewer: "*The electrical contractor installing the electrical system is often blind to the requirements imposed on the architect or builder and will simply install in accordance with min provincial code requirements. Anything prescribed by zoning, policy, bulletins, can easily*

be overlooked by the electrical contractor who is not privy to the same information as the builder."

Municipal Building Inspector: "*Electrical contractor will never think about the building permit. There are many parameters for MURBs that affect EV charging. Does it impact fire separation? Is it impacting path of egress? Does it affect fire response? These are things not considered by electrical contractors installing these systems.*"

Examples of gaps and oversights that contribute to non-compliant EV-ready installations include:

- The division of responsibilities between base electrical contractors and secondary EV charging infrastructure contractors can result in incomplete or incorrect installations (e.g., missing or incorrect wiring).
- Electrical contractors that install EV charging systems may be unaware of the building permit requirements that apply to the development or documentation from the electrical engineer, and will simply install in accordance with minimum code requirements.
- Lack of design guidance supplementing a local government's EV-ready requirement may create deficiencies with EV-ready designs. For example, there are multiple methods available to facilitate communication between EV charging hardware to enable functionality like load sharing or customer billing. This includes the use of Wi-Fi, ethernet cables, or radio. The lack of design guidance can lead to sub-optimal design outcomes or important design details being missed, resulting in post-occupancy operational challenges for strata councils and residents.

It is noted that gaps and oversights that result in defects, meaning there was a deviation between the electrical engineer's drawings and the electrical contractor's construction/installation, are eligible for a warranty claim. However, gaps and oversights due to deficiencies in the underlying electrical design may be challenging and costly to correct, with limited recourse available to developers, residents, or strata corporations.

SFD & Multiplex Only

A small number of residents reported the electrical capacity for their EV-ready single-family or multiplex home was at capacity on day one. This meant the electrical load associated with Level 2 EV charging was not properly accounted for in the load calculations and the electrical hardware was not appropriately sized, despite there being an energized outlet.

> Resident: "*The electrical service at my new duplex was at capacity from day 1 in 2021 with basically zero spare capacity on my panel. Electricians (I've tried engaging with 3) have not wanted to do the (permitted) work to install capacity for a charger. … Electricians have told me it is very difficult/painful process to get permits from [local government] for this type of work (installing capacity for L2 charger on residential panel near capacity).*"

Retrofitting a single-family home or strata multiplex to accommodate Level 2 EV charging would thus require significant electrical work or if feasible, the purchase and use of an EV power management device. Additional electrical work may consist of retrofitting the electrical panel, distribution board, or main switchboard, or potentially upgrading the electrical service with the electrical utility (e.g., BC Hydro). The scale and magnitude of the additional electrical work may be even greater if the issue is present in a strata multiplex relative to a single-family home, as the retrofit would need to consider the electrical needs for all strata lots.

> Electrical Contractor: "*Townhouses are very challenging because people want load management device as suite-panel service, but when you factor in all the units into main load calculation for the service, it might be OK for the first few units but eventually, its becoming a problem.*"

For new construction, the electrical contractor plays an important role as they can inform the builder/developer about what is feasible from an electrical perspective. Incremental additions to overall electrical loads over the course of building construction (e.g., through requests from the buyer/homeowner) can inadvertently reduce available electrical capacity, which can impact the feasibility of EV charging even though the building is intended to be built to an EV-ready standard. The minimum standard for new home construction as reported by stakeholders is 200-amp service to strike a balance between electrical demand and construction costs. However, the push towards decarbonization and growing electrical loads means there have been an increasing share of requests for 320 or 400-amp service among customers. The current adoption of power management devices to reduce electrical load in single-family and multiplex

buildings is relatively low in the province (industry stakeholders reported approximately 3% to 5% and the survey sample was 7% of respondents).

> Municipal Building Inspector: "*When we are getting rid of gas, 200 amp, 320 amp, or even 400 amp [are triggered], which represents onerous electrical code requirements that developers are avoiding. More infill properties that go beyond 200 amp is starting to tip the scale of a transformer in a neighbourhood, which means BC Hydro is having to redesign their neighbourhood distribution. That is resulting a lot of anxiety among development community because we are building more homes than BC Hydro can change distribution, meaning people can't move into their homes.*"
>
> Building Official Industry Representative: "*People who install [energy management systems] usually are starting with a 200 amp system, and then install the [EMS] because they want more and more amenities. The electrician is pulling hair and have to redesign to keep everything going. … The ~3% of single-family homes upgrading to power management system are doing so due to a cost decision to prevent upgrading service beyond 200 amp—usually a typical 2,000 to 3,000s sq. ft., 2-level building with 3 to 4 bedrooms and a garage.*"

The evolving need for a more integrated approach to development to achieve climate objectives such as electrification means more involvement by electrical professionals at stages of a project (e.g., from the onset of a design) that may not have been necessary in the past. A municipal building inspector noted that even energy advisors may not be sufficiently skilled to provide advice to builders and homeowners due to their focus on overall energy consumption and not necessarily maximum load.

With the expected growth of multiplex developments in BC, shared parking facilities may be more common in the future resulting in more complex EV charging infrastructure installations. There may also not be a builder-homeowner relationship as the builder was not directly commissioned by a singular homeowner.

Finding #3b: EV charging infrastructure may not be constructed to a compliant standard for some EV-ready buildings due to lack of coordination between multiple Authorities Having Jurisdiction

Local jurisdictions and Technical Safety BC are the two main Authorities Having Jurisdiction involved in the permitting of EV charging infrastructure. Municipal plan reviewers and building inspectors reported that during plan review and inspections, they may assess if a required energized outlet or conduit is installed, but they do not assess whether the installation itself is adequate in terms of electrical performance or electrical safety as they do not consider themselves to be responsible. The reasoning cited by survey respondents is that EV charging is not a BC Building Code matter, and Technical Safety BC instead has the mandate of ensuring EV charging works are compliant with applicable electrical regulations.

> Municipal Plan Reviewer: "*We are not qualified to know or understand if the electrical system installed meets the expectations of the EV charging system. We can only assess if an outlet exists. Cannot assess if it is a dedicated circuit or not.*"

Simultaneously, Technical Safety BC representatives indicated that Technical Safety BC's primary focus during inspection is to ensure installations follow the Safety Standards Act and Electrical Safety Regulation and not compliance with a local government's EV-ready bylaw. These two pieces of legislation mandate compliance with the BC Electrical Code, which form the basis of review during inspection by an electrical contractor's electrical field safety representative. Technical Safety BC safety officers may opt to inspect installations to verify compliance in addition to the assessment already performed by the field safety representative. However, neither the field safety representative nor safety officer are responsible for enforcing a local government's EV-ready bylaws.

The lack of coordination between municipal building officials and Technical Safety BC means there may be gaps in the permitting review of EV-ready charging installations in communities where Technical Safety BC is the Authority Having Jurisdiction.

4.4.4 Finding #4: Tenants living in strata housing lack the decision-making power to install EV chargers

Tenants living in EV-ready homes must seek permission from their landlord (i.e., owner of the strata lot) if they wish to install a hardwired EV charger in their designated parking stall. A landlord has no obligation to grant permission and if permission is granted, the landlord has no obligation to fund the installation. Tenants may not have the financial means or it may not financially make sense for them to incur the capital cost of installing an EV charger during their tenancy. A strata association representative noted that EV chargers are typically owned by the owner of the strata lot or the strata corporation itself depending on the strata bylaws.[13] That means tenants who purchase an EV charger may not be able to recoup the costs of the charger in the event they move or are evicted as the charger may not be compatible in their new building or they do not actually own the charger.

> Resident: "*As a tenant, I can't make the decision to have a contractor install EV charging infrastructure to my stall, and it also wouldn't make sense to bear the cost if I only have the charger for the length of my rental.*"

> Resident: "*My parking stall doesn't even have a junction box, so they would need to pull cables to install charger. I tried to reach out to strata to see what it would be to install and they want me talk to the landlord. Landlord would not talk to me as the tenant, so I got stonewalled.*"

Parking can be allocated in different ways in strata developments. This means if a tenant is assigned a parking stall that is not appropriate for EV charging, it may not be possible for the strata council or developer to assign a different parking stall. While this is the case for owner-occupants, this is more impactful for tenants as the options for stall reassignment, if feasible, would still require the involvement of their landlord who may not want to participate in the process.

[13] Under section 90.1 of the Strata Property Act, an owner may request that the strata corporation approve proposed alterations to common property that are necessary for the purposes of installing EV charging infrastructure for use at a parking stall. The Strata Property Act Standard Bylaw 6 says an owner must request written permission before making an alteration to common property including limited common property.

4.4.5 Finding #5: EV charging hardware incompatibility prevents or makes it cost prohibitive for residents to install personal chargers of a different brand

Open Charge Point Protocol (OCPP) provides an industry standard and uniform method of communication between EV charging hardware such as EV chargers and EV energy management systems. This protocol makes it possible to connect an EV energy management system with any EV charger, regardless of the brand. However, some manufacturers lock their EV chargers using software to limit hardware communication only within their product line. This creates closed, proprietary systems that result in compatibility issues between networked hardware from different manufacturers.

This issue becomes evident when attempting to install hardware of various brands within a single EV charging system in a MURB. For example, under a load sharing arrangement where four EV chargers are installed on a single circuit, if a proprietary system is installed with a specific manufacturer, every installation on that circuit must use the same brand of EV charger.

> Electrical Engineer: "*The industry needs to catch up as there is a lack of available hardware that is brand agnostic. Government regulation can push the industry in a certain way.*"

The use of proprietary hardware can also create uncertainty and challenges for strata corporations and residents in the event an EV charging service provider ceases to operate. For example, the 2024 withdrawal of Enel X Way and their JuiceBox product line from the North American market meant owners of their EV chargers lost their smart charging functionality (e.g., load management, demand response, Low Carbon Fuel Program credit generation) without a proper migration plan in place.[14]

A developer's choice of hardware can intentionally or unintentionally lock a building into using proprietary EV charging systems. Strata councils and residents may not understand the full ramification of early decisions made prior to their creation and move-in. For example, a resident's request to install a different brand of EV charger may be denied by the strata corporation, as proprietary systems often make such installations impossible or prohibitively expensive. For example, one strata council member reported the cost for a non-proprietary installation was $32,000 as quoted by their EV charging service provider. These hardware limitations may not be communicated clearly or effectively by relevant parties (e.g., strata councils, property managers, electrical

[14] Juicebox North America (2024). *Statement of Enel X Way USA, LLC.* https://www.juiceboxnorthamerica.com/

contractors), creating an impression among residents they are being mistreated by the strata council or EV charging service provider.

> Resident: "*The strata council is refusing to let owners install private chargers and I don't know who I can turn to.*"

4.4.6 Finding #6: Hiring an EV charging service provider prior to the creation of the strata corporation can result in challenges for strata councils and residents, locking them into restrictive contracts, fees, and hardware limitations

Strata corporations regularly enter into service agreements with third-party organizations that provide services to the strata, such as waste collection or common area cleaning. Retaining an EV charging service provider can simplify the process around the procurement, installation, and management of EV charging systems. This offloads significant complexity from the developers and strata corporations. However, retaining an EV charging service provider, especially before the creation of the strata corporation, can come with trade-offs and challenges such as:

- Lack of flexibility with the EV charging service provider
- High fees
- Poor customer service

Lack of Flexibility with EV Charging Service Provider

Unlike waste collection or cleaning service contracts, strata corporations do not necessarily have the ability to easily change EV charging service providers or make substantial alterations to pre-installed EV charging hardware due to the following reasons:

- **Permitting and Technical:** any potential changes to EV charging infrastructure may affect the development or building permit issued by the local government and/or electrical permit issued by Technical Safety BC or the local government (where applicable). A strata corporation would also have to retain the services of qualified professionals to undertake the required works.
- **Legal:** service agreements with EV charging service providers are legally binding and may be lengthy (e.g., 20 years) with no mechanism available to the strata corporation to exit a contract.

- **Financial:** the cost to change hardware may be prohibitive to the strata corporation. In the case where there is a proprietary system installed, it is unclear what recourse may be available for strata owners who have already purchased a proprietary EV charger if the strata decides to change provider. For example, one strata council member reported that their strata corporation was granted the option to exit from their contract with an EV charging provider at the first strata meeting, but given the significant investment made already with hardware installed and EV chargers purchased by residents, it was in the strata corporation's financial interest to retain the existing provider.

These reasons can effectively lock strata corporations to a specific service provider (see Section 4.4.5 regarding limitations practices around Open Charge Point Protocol), impacting the ability of the strata council to manage the corporation according to the interest of the strata owners.

> Strata Council Member: "*Original developer signed the contract with our provider before move-in, and the strata corporation has to live with it. The developer does not inform the strata corporation what its rights and responsibilities are in respect to the contract.*"
>
> Strata Association Representative: "*[Stratas corporations] are inheriting an expensive system [and] have pulled out systems because the charging company's product cost is too high with the processing fees and contracts. Where is the consumer protection for this? Owners have no say in this.*"

High Fees

The use of an EV charging service provider adds various fees that are charged to strata corporations and residents. For strata corporations, this can consist of flat service fees, a monthly or annual fee per charger, and other fees (e.g., payment processing fees). The cumulative costs of these fees can be punitive if there are an inadequate number of EV drivers in the building for the strata corporation to recover costs through user fees at a breakeven point. As a result, strata corporations overseeing EV-ready buildings in communities with low EV adoption or waiting for a greater share of EV drivers to move into the building during the first years of occupancy can experience financial stress.

> Strata Association Industry Representative: "*The number of [EV charging] users are so low [when new owners first move in], and the service model is based off of 30% or more usage, so the strata corporation subsidizes in the beginning.*"

User fees adopted by strata corporations to recover costs can take different forms. The Strata Property Regulation allows various methods of calculating user fees which must first be approved during a general meeting as a valid strata bylaw or rule. The Regulation permits the strata corporation (which may be contracted to a service provider) to:

- Charge a monthly or annual flat rate regardless of the number of EV drivers
- Divide expenses equally among the number of users
- Charge a fee based on time or electricity consumption

For residents, this can consist of a monthly service fee to the EV charging service provider regardless of usage, in addition to the purchase cost of the EV charger, the installation fee of the EV charger, and a strata user fee.

> Resident Participant: "*I pay for charging my vehicle but the strata is gouging me for $13.00 per month for absolutely nothing. I paid for the unit, paid for installation, pay for the use of electricity and they want [$13] on top of that even if I don't use the charger.*"

Poor Customer Service

Poor customer service such as long response times with EV charging service providers can result in delayed installations and maintenance. EV charging service providers may designate an approved external electrical contractor to facilitate the installation and maintenance of EV chargers for the strata after occupancy. The EV charging service provider and/or their electrical contractor will typically provide notice of an installation to strata corporation in most circumstances.

> Resident: "*I purchased a hybrid car knowing that the building would be EV ready. Unable to charge because don't have charger installed as I didn't purchase from the developer 2 years ago [when I moved in]. Whenever you want to make changes to the common area, [we] need to get council approval. They said that anyone can install charger but have to use the same charger at the strata and have to use the same electrician to install, but the electrician is not answering the phone.*"

However, when the EV charging service provider and/or their contractor cannot be contacted, residents may be unable to proceed further with installation or maintenance for an extended period of time until contact can be made. This can delay the ability for a resident to install a charger when they move in, or if the charger needs to be repaired, the resident is unable to charge at home until the charger is repaired. This challenge also extends to electrical engineers and contractors that experience challenges in communicating with EV charging service providers during installation, commissioning, and maintenance.

> Electrical Contractor: "*The time difference between technical teams of the service provider on the East Coast can be an issue for commissioning chargers. In other words, if we install a charger at 2 pm here, it will not be able to be commissioned until the following business day. Incurring additional travel costs and time.*"

4.4.7 Finding #7: Residents and strata councils may lack knowledge about EV charger installation and operation, and may not receive critical documentation on their EV charging system upon handover from the developer

General consumer understanding on what the term "EV-ready" means and how EV charging operates in a strata and MURB context is mixed. The Fraser Basin Council and strata associations such as the Condominium Home Owners Association and Vancouver Island Strata Owners Association provide education to stratas about EV charging. However, the proliferation of EV-ready buildings means a growing number of newly-formed stratas are having to navigate a complex topic in an evolving industry that outpaces current educational and support initiatives. These gaps in knowledge among residents and strata councils include:

- Confusion about EV-ready definition
- Cost of EV charging installation and usage
- Lack of EV charging system documentation
- Unexpected post-occupancy costs and ongoing costs

Residents: Confusion About EV-Ready Definition

There is a lack of consumer understanding on what "EV-ready" means. Industry stakeholders reported from their experience that the general layperson understanding is that EV-ready means EV charging is feasible from day one of move-in and no electrical

work is required, which is not the case in many circumstances. One prospective EV driver resident reported that they understood the definition of EV-ready to be "the ability to do EV charging without the need to hire an electrician" based on the marketing from the builder. As a result, when residents move in and are not able to immediately access EV charging (e.g., due to additional electrical work required, hardware incompatibility, the need to hire an electrician), they may feel that EV charging amenities that were advertised have been misrepresented.

> Strata Association Representative: "*Municipalities all have varying bylaws and definitions of EV-ready, but they all use the same terminology. Developers use this in marketing language, and ultimately the consumer confused with these different terms. When people buy, they expect to either plug in or immediately be able to add their station, which may not be the case.*"

Residents: Cost of EV Charging Installation and Usage

The cost of EV charging installations and usage for residents in MURBs can be more expensive and challenging to determine relative to single-family and multiplex homes.

Current rebates for EV chargers supported through the CleanBC Home and Workplace Charger program focus on retrofits, and support only buildings built prior to EV-ready requirements with the exception of single family homes. Installation quotes as reported by study participants can range from $5,000 to $15,000 for a single EV charger installation in a MURB.

> Resident: "*Price quoted from [service provider for an installation] was $15k—double what was expecting to pay. I don't have the extra money [as I'm] still paying for the car. Thankful that I bought a hybrid and not fully electric because otherwise would be hooped.*"

EV charging service providers are typically used in MURBs but not single-family and multiplex homes, so there are also the addition of service fees. Strata corporations are not necessarily privy to the purchase and installation costs of EV chargers, as that is a matter between the resident and the electrical contractor (and by extension, the EV charging service provider). This can create gaps in communications and expectations on the cost between strata corporations and residents.

MURBs are often classified as a business (general service) customer by an electrical utility, which means they are billed the same as commercial, institutional, and industrial properties. For business customers, electricity costs are dependent on peak annual

demand and unless that demand is managed, costs can be higher for MURB residents compared to residential customers living in a single-family or multiplex property.

These cumulative costs from installations, service fees, and lack of rebates may not be immediately evident to residents when purchasing and moving into an EV-ready MURB. Costs can be further increased when there are deficiencies with the EV charging system that are discovered after occupancy, potentially disproportionately affecting residents wishing to install an EV charger after occupancy compared to residents who purchased prior to occupancy and had a correct EV charging set-up upon move-in.

Strata Corporations: Lack of Documentation

Under the Strata Property Act, the developer is required to provide documentation to the strata corporation at the first annual general meeting. This includes plans for permits, schematic drawings, manuals, operating instructions, service guides, warranties, contracts, and names and addresses of all contractors, subcontractors, and suppliers. However, strata corporations may not receive critical pieces of information during the handover from the developer, including:

- Information on the EV charging service provider selected by the developer, such as the length of the contract or the strata corporations' rights and responsibilities
- Information on how the EV charging system operates and is administered, particularly for EV energy management systems when present
- The cost of EV charging installations for residents

This can create a significant time lag for a strata corporation to adequately understand their EV charging system, which impacts their ability to manage the system appropriately and communicate necessary information to strata lot owners as they are trying to get set-up with EV charging.

> Strata Association Representative: "*The strata council is not handed over all the details about EV charging on day one. You have a brand new council without bylaws and rules yet, and the developer does not create rules for EV charging as they want the owners to develop them. But it takes time, so owners are frustrated when its not already in place.*"

Other related situations include the loss of documentation when there are changes to the strata council or the professional strata management company.

Strata Corporations: Unexpected Post-Occupancy Costs and Ongoing Costs

There are multiple sources of unexpected additional and ongoing costs related to EV charging in stratas. These costs can include:

- Deficiencies with the EV charging system due to permitting and construction gaps and oversights (e.g., lack of breakers, wiring, and other circuity; incorrect set-ups such as 50 amp receptacles on 40 amp breakers that contravene electrical code) that can result in the need to remove or alter the installation. These deficiencies may potentially be eligible for a warranty claim if there was a deviation between the electrical engineer's drawings and the electrical contractor's construction/installation, but the claim process can be cumbersome for strata corporations.
- EV energy management systems, which can help manage peak loads, may not have been installed as part of the initial EV-ready design. The need to minimize peak loads is important as utility demand charges can be costly for strata corporations who usually pay a commercial rate.

5.0 RECOMMENDATIONS

5.1 Overview

The recommendations from the Charged and Ready study provide early guidance on actions that may address barriers and challenges of EV-ready bylaws. The recommendations are informed by input from **study participant groups** (residents, strata council members, building professionals, and building officials), input from **industry stakeholders** (representatives from the building official industry; property management and strata associations; development industry; electrical utilities; and non-profit EV support industry), and the **professional judgement of the authors**.

The primary research focus of this study was to uncover barriers and challenges that residents face in accessing EV charging in EV-ready residential buildings, and contextualize the challenges with consideration of the roles that strata councils, building professionals, and building officials play as part of implementation of EV-ready requirements. Further work will be required to advance these recommendations in partnership with stakeholders.

Seven recommendations are proposed to improve EV-ready outcomes in the province:

- **Recommendation #1**: Strengthen EV-ready requirements and design standards
- **Recommendation #2:** Explore the feasibility of a province-wide EV-ready requirement
- **Recommendation #3:** Enhance EV-ready permitting and review processes
- **Recommendation #4:** Establish an EV charging operational plan requirement for EV-ready buildings
- **Recommendation #5:** Develop and enhance education on EV charging infrastructure for EV-ready stakeholders
- **Recommendation #6:** Consult with EV charging service providers to improve EV charging service agreements and communications
- **Recommendation #7:** Conduct cost-benefit analyses of financial rebates for EV power management systems in new EV-ready single-family homes

The subsequent sections provide further details of each recommendation, and organizations who could be responsible for implementation. **Table 1** compares how each research finding is addressed by the recommendations.

Table 1: Study Recommendations

Research Finding		Recommendation	
1	The majority of survey respondents living in EV-ready single-family and multiplex housing are generally satisfied with their home EV charging experience, but EV drivers living in MURBs are less satisfied with their home charging experience	All recommendations	
2	Buildings that are not 100% EV-ready (i.e., where some residents do not have an EV-ready parking stall) create barriers for residents who are not assigned an EV-ready parking stall and who wish to charge their EV at home	1	Strengthen EV-ready requirements and design standards
		2	Explore the feasibility of a province-wide EV-ready requirement
3	EV charging infrastructure may not be constructed to a compliant standard for some EV-ready buildings due to: (a) gaps and oversights during the development process; and (b) lack of coordination or unclear division of responsibilities between Authorities Having Jurisdiction	1	Strengthen EV-ready requirements and design standards
		2	Explore the feasibility of a province-wide EV-ready requirement
		3	Enhance EV-ready permitting and review processes
		5	Develop and enhance education on EV charging infrastructure for EV-ready stakeholders
		7	Conduct cost-benefit analyses of financial rebates for EV power management systems in new EV-ready single-family homes
4	Tenants living in strata housing lack the decision-making power to install EV chargers	1	Strengthen EV-ready requirements and design standards
		5	Develop and enhance education on EV charging infrastructure for EV-ready stakeholders

Table 2: Study Recommendations (continued)

Research Finding		Recommendation	
5	EV charging hardware incompatibility prevents or makes it cost prohibitive for residents to install personal chargers of a different brand	5	Develop and enhance education on EV charging infrastructure for EV-ready stakeholders
		6	Consult with EV charging service providers to improve EV charging service agreements and communications
6	Hiring an EV charging service provider prior to the creation of the strata corporation can result in challenges for strata councils and residents, locking them into restrictive contracts, fees, and hardware limitations	5	Develop and enhance education on EV charging infrastructure for EV-ready stakeholders
		6	Consult with EV charging service providers to improve EV charging service agreements and communications
7	Residents and strata councils may lack knowledge about EV charger installation and operation, and may not receive critical documentation on their EV charging system upon handover from the developer	4	Establish an EV charging operational plan requirement for EV-ready buildings
		5	Develop and enhance education on EV charging infrastructure for EV-ready stakeholders

5.2 Recommendations

5.2.1 Recommendation #1: Strengthen EV-ready requirements and design standards

Implementation Responsibility: Local Governments, BC Local Government EV Peer Network

Different bylaw requirements and definitions of "EV-ready" among local governments creates varying infrastructure outcomes and generates confusion among stakeholders and consumers. Key areas of improvement include:

- Update bylaw requirements to be 100% EV-ready, or at least one parking stall per dwelling unit.
- Explore a regulatory approach to require brand agnostic EV charging hardware and software to maximize compatibility across installations and promote adoption of unlocked OCPP chargers. This action requires further scoping with industry partners, but at minimum, could consist of determining if EV-ready bylaws can include requirements that EV hardware must be unlocked and compatible with several EV software management companies.
- Specify the energized outlet to be in the form of Level 2 receptacles to facilitate portable plug-in chargers to avoid the need to install a hardwired EV charger. This would particularly benefit tenants by simplifying the process to obtain permission from the landlord and strata corporation.[15]
- Develop supplementary technical design guidelines that are published by a provincial body or local government and that define preferred design specifications and solutions (e.g., similar in intent to BC Housing Design Guidelines, but in an EV charging context), including, but not limited to:
    - Hardwired or wireless internet connection to facilitate communication between hardware
    - Labelling of wiring
    - Consistency with latest Technical Safety BC bulletins on NEMA 14-50 receptacles requiring a standard of protection with exactly a 50-amp rated overcurrent device

[15] Strata corporations can continue to facilitate billing using portable plug-in chargers using energy-based (per kWh) or time-based (per hour) fee models, similar to permanent hardwired chargers. First option is to use private digital metering that entails metering all circuits independently. The second option is to mandate the plug-in charger to be OCCP-compliant, coupled with the use of third-party software to monitor usage and manage billing.

- Advocate that the CSA Group, the standards development organization in Canada, consider development of relevant and appropriate standards.

Further work is required to determine the market feasibility of encouraging brand-agnostic EV charging systems and all the desirable aspects that should be contained in supplementary design guidelines.

5.2.2 Recommendation #2: Explore the feasibility of a province-wide EV-ready requirement

Implementation Responsibility: Province of British Columbia

One suggestion that consistently came up in discussions with industry stakeholders and study participants was the idea of a province-wide EV-ready requirement. The Charged and Ready study is not scoped to address this question, but given it was identified by study participants and its relevance to the research findings, a recommendation has been developed to support further work to assess a potential approach.

A province-wide approach to an EV-ready requirement could be designed to emulate the structure of the BC Energy Step Code, i.e., by establishing standardized steps of EV-ready that can be voluntarily adopted by local governments that is tailored to their context (e.g., available electrical capacity, EV mode share, etc.). This would ensure local governments that have EV-ready bylaws already in place do not need to potentially decrease their requirements, while recognizing other local governments need to start somewhere. Potential steps within a performance-based approach could consist of the following which are illustrative in nature:

- Step 1: EV-prepared panel in an electrical room (i.e., accounted in load calculations) with breakers with the need to run conduits
- Step 2: Step 1 plus empty conduits to each parking stall with the need to run wiring
- Step 3: Step 2 plus hardwired junction box (i.e., EV-ready)
- Step 4: Step 3 plus panel-based EV energy management system and receptacles (i.e., EV-ready)
- Step 5: Fully built system with EV energy management systems and chargers (i.e., EVSE-installed)

Alternatively, there are merits with developing a single mandatory requirement that applies province-wide, as the study specifically found that EV-capable installations (e.g.,

empty conduits), rather than a true EV-ready installation, is associated with poorer outcomes for residents and strata councils.

Further work would be required to understand the feasibility and determine details of a potential province-wide approach. Key principles to consider based on the outcomes of this study would be to create a harmonized and consistent requirement based on best practice that strikes a balance between upfront development costs given the ongoing and acute industry challenges in the construction of new housing and ease of EV charger installation for residents.

5.2.3 Recommendation #3: Enhance EV-ready permitting and review processes

Implementation Responsibility: Province of British Columbia, Local Governments, BC Local Government EV Peer Network, Technical Safety BC, other partners to be determined

While EV-ready bylaws have been very successful, there remain outstanding issues that require improvement or clarification to maximize their effectiveness. These suggested actions are intended to clarify responsibilities between Authorities Having Jurisdiction and address inadvertent gaps and oversights during the development process.

- **Clarify division of responsibilities** among municipal planning professionals, municipal building officials (e.g., plan reviewers, building inspectors), electrical field safety representatives, and Technical Safety BC safety officers by the Province to determine what gaps need to be addressed with respect to the permitting of EV-ready designs and construction.
- **Develop checklist submissions** that are coordinated between local governments and Technical Safety BC to ensure the electrical engineer, plan reviewers, and building inspectors have addressed and reviewed all relevant bylaw requirements and design criteria and factors. For example, this includes reviewing and confirming there is adequate electrical capacity to accommodate EV charging.
- **Develop model drawings and specifications** to ensure electrical engineers are providing clear and informative documentation that can be relied upon accurately by electrical contractors. For example, this can include documenting the preferred method of hardware communication for and between EV chargers and energy management systems; wiring and other circuity installation methods; labelling of wiring; etc.

- **Ensure required on-site field reviews** are completed by the electrical Engineer of Record for both the base and secondary installation, and **on-site inspections** by the electrical field safety representatives or Technical Safety BC inspectors.
- **Explore potential industry trade certification program (e.g., micro-credentials) for EV-ready** to ensure relevant professionals are trained and can provide the assurance that EV charging systems are designed, installed, and/or inspected properly.

Industry stakeholders can support expanded education for contractors and inspectors to ensure readiness for EV-ready implementation, particularly in rural and remote communities where there may be fewer qualified professionals.

An ongoing pilot program as of September 2025 between BC Hydro and the City of Vancouver to improve the electrical service connection process for multiplexes among builders will provide lessons learned on ensuring EV-ready compliance and reducing electrical capacity needs of multiplex buildings.

Further work is required to determine and confirm all the necessary details for checklist submissions, model drawings and specifications, and the topics for trade certification programs.

5.2.4 Recommendation #4: Establish EV charging operational plan requirement for EV-ready buildings

Implementation Responsibility: Local Governments, BC Local Government EV Peer Network

Strata council members and representatives from property management and strata associations reported there can be inadequate information provided to strata corporations on how their EV charging system operates and should be managed. A major contributor to this is the lack of information during handover from the developer to the strata corporation.

Establishing a documentation requirement in the form of a preliminary EV charging operational plan during building permit and a final EV charging operational plan during occupancy permit that is authored by the electrical engineer can ensure strata corporations receive adequate information. The operational plan should align with the developer's obligations under the Strata Property Act and provide the following:

- Specified documents already required, including the allocation of parking stalls on the strata plan; contact information of the EV charging service provider (if applicable); and contact information of the approved electrical contractor

- Capacity of the EV charging system (e.g., amperage of chargers)
- Eligible chargers that the EV charging system can accept

An EV charging operational plan would be distinct from strata bylaws and rules that specify the management of EV charging and instead focus on technical operational details.

Further work is needed to determine which additional helpful documentation could be included as part of the operational plan, in addition to those specified under the Strata Property Act.

5.2.5 Recommendation #5: Develop and enhance education on EV charging infrastructure for EV-ready stakeholders

Implementation Responsibility: BC Hydro, Fraser Basin Council, Management and Strata Associations, Engineers and Geoscientists BC, Technical Safety BC

Lack of education and training on implementing EV-ready bylaws and EV charging was a major factor influencing poor EV-ready outcomes in new buildings as reported by study participants and industry stakeholders. Key areas of outreach and education to address these information gaps include:

- For **residents**, clarify what EV-ready means, how EV charging operates in a strata context, the importance of EV charging hardware compatibility, and what costs to expect. In particular, tenants would benefit from targeted resources to navigate EV-ready due to their limited rights afforded to them in the strata context; further work is needed to understand the nature of tenant-specific resources. Educational initiatives could be achieved with broad marketing from BC Hydro and others on what EV-ready means, and standard resources that can be used by builders and developers when marketing and selling homes.
- For **strata councils**, provide information on how to navigate the use of charging systems in new EV-ready buildings. This could be achieved through promotion of existing resources (e.g., Plug In BC, strata associations) adapted to an EV-ready context and through the deployment of concierge support programs, that provide direct and individualized support to strata councils.
- For **electrical engineers and contractors**, expand professional development opportunities to include training workshops and bulletins administered or distribution by relevant bodies. These opportunities should focus on promoting industry best practices on EV-ready design and installation solutions and the

available products on the market, particularly for EV energy management systems.

Further work is needed to determine and confirm the scope and content of the educational initiatives.

5.2.6 Recommendation #6: Consult with EV charging service providers to improve EV charging service agreements and communications

Implementation Responsibility: BC Local Government EV Peer Network, Province of British Columbia, Local Governments, Development Industry, Strata Associations

Strata corporations can become locked into long-term contracts with EV charging service providers. Issues such as high service fees, poor customer service, and limitations on type of hardware that can be used, can contribute to a negative experience with EV charging.

However, removing the involvement of EV charging service providers is not recommended. Service providers play an important role in supporting the implementation of EV-ready requirements as they remove complexity for developers and strata corporations with the procurement, installation, and management of EV charging systems. Further work is needed to determine how to improve EV charging service agreements and customer service, and the potential roles of different stakeholders, with two desired outcomes identified in this study:

- Improve flexibility for strata corporations to select alternative EV charging service providers following the strata's creation that minimize significant costs or impacts to existing EV charging infrastructure. For example, the Strata Property Act allows a strata corporation to exit from a property management contract with a ¾ vote. For this approach to be successful, there requires a shift in industry practices towards brand-agnostic hardware that allow strata corporations to choose the most appropriate EV charging solutions that best serve the interest of strata owners.
- Improve customer service and reduce response times between building professionals/strata corporations and EV charging service providers

5.2.7 Recommendation #7: Conduct cost-benefit analyses of financial rebates for EV power management systems in new EV-ready single-family homes

Implementation Responsibility: BC Hydro

A primary research question for the Charged and Ready study was to determine whether financial incentives for EV power management devices are beneficial for new single-family and multiplex homes that are subject to EV-ready requirements.

The minimum standard for new single-family and multiplex homes as reported by stakeholders is 200-amp service to strike a balance between electrical demand and construction costs. However, the push towards decarbonization and growing electrical loads means there have been an increasing share of requests for 320 or 400-amp service among customers. The greater the service size, the greater the fees charged to the developer/builder by BC Hydro. Adopting demand-side management solutions to promote the adoption of EV energy management systems such as power management devices for new EV-ready single-family and multiplex homes may reduce the need for higher electrical service sizes. The current adoption of power management devices is relatively low in the province as reported by industry stakeholders (approximately 5%). Given EV charging in single-family and multiplex homes can represent a significant load, the addition of energy management systems to maintain 200-amp service and reduce the need to upgrade to 320 or 400-amp service would be beneficial for BC Hydro, builders/ developers, and ultimately residents.

However, it may be more cost-effective to mandate the use of EV energy management systems in new EV-ready single-family construction and particularly among multiplex developments rather than incentivizing it through the use of financial rebates. Education directed towards the buyer/homeowner to purchase a power management device may have limited impact due to the complexity of the subject matter and conflicting sources of information available to residents. For example, survey respondents indicated that independent research through search engines, BC Hydro's online website, YouTube or other video platforms, and blogs or online articles are the most popular sources of information that current EV drivers would use to inform a purchase decision on EV power management devices. Current marketing by manufacturers of power management devices is misleading as they promote "plug and play" functionality, when in fact, a qualified contractor is required to safely install the device and verify there is sufficient electrical capacity via a load calculation. Power management devices do not facilitate equal load sharing between an EV charger with a dryer or other appliances. While BC Hydro outlines the need of this in their communications, there are conflicting

sources of information accessed by current or prospective EV drivers living in single-family and multiplex homes, including townhomes.

There may be merit though for providing financial incentives to homes that were intended to be EV-ready, but still require a retrofit due to their non-compliant design. However, the number of single-family and multiplex homes potentially affected by insufficient electrical capacity is unknown and would require further investigation to determine the potential cost to BC Hydro.

Further work is required in the form of a cost-benefit analysis that compares financial rebates to expanding EV-ready requirements to make an informed decision on any potential program. However, at minimum, improved education and communication on EV power management devices would be beneficial for residents living in retrofit and new EV-ready homes.

6.0 CONCLUSION

The Charged and Ready study sought to uncover barriers and challenges that residents face in accessing EV charging in newly constructed EV-ready residential buildings, and contextualize the barriers and challenges residents face with consideration of the roles that strata councils, building professionals, and building officials play as part of the implementation of EV-ready requirements.

The development and adoption of EV-ready requirements led by BC local governments are widely considered international best practice. The study confirmed that EV-ready bylaws are generally effective in supporting home EV charging, but that EV drivers living in MURBs are less satisfied with their home EV charging experience compared to those living in single-family or multiplex housing. Further, gaps in bylaw design and implementation, added technical and governance complexities, and lack of knowledge or relevant documentation for residents and strata councils in MURBs can limit equitable charging access for some residents. These barriers and challenges represent an unforeseen implementation gap, which is when the outcomes of a policy do not match exactly the planned intent of the policy. Specifically, seven key research findings were identified:

1. The majority of survey respondents living in EV-ready single-family and multiplex housing are generally satisfied with their home EV charging experience, but EV drivers living in MURBs are less satisfied with their home charging experience
2. Buildings that are not 100% EV-ready (i.e., where some residents do not have an EV-ready parking stall) create barriers for residents who are not assigned an EV-ready parking stall and who wish to charge their EV at home
3. EV charging infrastructure may not be constructed to a compliant standard for some EV-ready buildings due to: (a) gaps and oversights during the development process; and (b) lack of coordination or unclear division of responsibilities between Authorities Having Jurisdiction
4. Tenants living in strata housing lack the decision-making power to install EV chargers in EV-ready residential buildings
5. EV charging hardware incompatibility prevents or makes it cost prohibitive for residents to install EV chargers of a different brand
6. Hiring an EV charging service provider prior to the creation of the strata corporation can result in challenges for strata councils and residents, locking them into restrictive contracts, fees, and hardware limitations

7. Residents and strata councils may lack knowledge about EV charger installation and operation, and may not receive critical documentation on their EV charging system upon handover from the developer

Following the adoption of the first local government EV-ready bylaw in 2017 and ongoing changes to market conditions in the EV sector, now is the ideal time to review and refine EV-ready requirements and implementation. The study offers seven recommendations to improve the EV-ready experience in residential buildings across BC:

1. Strengthen EV-ready requirements and design standards
2. Explore the feasibility of a province-wide EV-ready requirement
3. Enhance EV-ready permitting and review processes
4. Establish an EV charging operational plan requirement for EV-ready buildings
5. Develop and enhance education on EV charging infrastructure for EV-ready stakeholders
6. Consult with EV charging service providers to improve EV charging service agreements and communications
7. Conduct cost-benefit analyses of financial rebates for EV power management systems in new EV-ready single-family homes

APPENDIX A: PRIMER ON STRATA PROPERTY

Strata housing encompasses many different types of housing forms, including apartment-style condominiums (multi-unit residential buildings), multiplexes (e.g., duplexes and townhouses), and single-family detached houses. There are two types of strata plans in BC:[16,17]

1. **(Conventional) building strata plans:** Buildings are shown on the strata plan. Any areas that are not part of a strata lot are common property. Common property may include roads, lobbies, yards, roofs, exterior building finishes, common hallways, and stairwells. Building strata plans may contain any housing form:
    a. **Townhouses, multiplexes, and detached houses:** Each strata lot typically has a separate, ground-oriented, residential entrance. Parking stalls can be in a covered carport, attached garage, or in a shared structured parkade. Stalls may be shown on the strata plan as part of the strata lot, common property, or limited common property for the exclusive use of a specified strata lot.
    b. **Apartments (low or high-rise):** These buildings typically have common property entrances, hallways, and stairwells. Parking is in a shared surface or structured parkade and may be shown on the strata plan as part of the strata lot, common property, or limited common property for the exclusive use of a specified strata lot.
2. **Bare land strata plans:** Buildings are not shown on the strata plan. The boundaries of strata lots are defined by survey markers and buildings are constructed at a later time. Typically, these are detached houses with a garage, parking area, or driveway within the boundaries of the strata lot. Common property may include roads, underground services, and shared amenities such as a clubhouse. If there are common property parking areas, parking stalls may or may not be designated as limited common property for the exclusive use of specified strata lots.

[16] Land Title Registry (2023). *Strata Corporations and the Land Title Registry*. https://ltsa.ca/our-stories/strata-corporations-and-the-land-title-registry/
[17] Condominium Home Owners Association of BC (2023). *Parking Spaces and Storage Lockers*. https://choa.bc.ca/wp-content/uploads/600-001-Parking-Storage-Lockers_updated-Feb-2023.pdf

APPENDIX B: MODEL EV-READY BYLAW

Source: BC Local Government EV Peer Network and Dunsky (2025). *EV Ready New Construction Requirements: A Best Practice Guide for BC Local Governments (Version 2)*. https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/power-smart/business/programs/ev-ready-requirements-for-new-buildings.pdf

The following language is provided for local government consideration as they integrate EV Ready requirements into their parking requirements:

Residential Uses: For major renovations and new multifamily buildings, each residential parking space, excluding visitor parking, shall be provided with an energized outlet installed adjacent to the space, for the purpose of EV charging. The energized outlet shall be capable of supporting connection of Level 2 charging.

Labeling: Energized outlets shall be labelled for the intended use for electric vehicle charging.

Charging Performance Requirements: The Director of [NOTE: Designate appropriate official, e.g. Director of Planning; Director of Transportation; etc.] may specify minimum charging performance requirements and management guidelines for designs using an electric vehicle energy management system. For designs where an electric vehicle energy management system is intended, the electrical infrastructure shall include all communications equipment, control systems installation, licensing, and permitting required to operate.

Management Guidelines: Where an electric vehicle energy management system is implemented, provisions for management and maintenance are to be provided to the strata or dwelling unit owner. The following are recommended to be included in the strata rules or bylaws:

- The party (Strata or dwelling unit owner) responsible for electric vehicle supply equipment purchase and installation is clearly delineated, and appropriate permissions and procedures outlined to ensure accessibility to energized outlets for the purposes of EV charging.
- Electric vehicle supply equipment ownership is established as a fixture, chattel or lease.
- Billing rules and procedures for electricity use are established.
- Designation that where an electric vehicle energy management system is implemented, the electric vehicle supply equipment must be compatible with that electric vehicle energy management system.

It is recommended (but not required) that buildings install networked EV supply equipment and/or EV energy management systems that allow for load management, utility rate structure responsiveness and cost optimization to future proof the implementation and allow the building to maximize their future benefits. Load management capable systems may also allow buildings to maximize their existing on-site capacity and mitigate some expensive electrical infrastructure investments.

APPENDIX C: SURVEY QUESTIONS

Residential EV-Ready Requirement Study: Residents

Page description:
Residential EV-Ready Requirement Study ("Charged and Ready")

Residents and Strata Council Members

About the Survey
Your municipality or local government is participating in a study to better understand how electric vehicles (EV) are charged in homes. New homes in many communities across the province are required to be built EV-ready, which means that an electrical outlet is available at or near a resident's parking stall. This survey will identify issues and challenges that residents face in accessing EV charging at home to improve the experience for current and future EV drivers in British Columbia.

This project is being led by Metro Vancouver and the City of New Westminster, with support from BC Hydro, and in partnership with the District of Saanich, the University of British Columbia, the City of Nanaimo, and the Community Energy Association, with additional support from the City of Vancouver, City of Richmond, Township of Langley, and City of Victoria.

How will I benefit from completing the survey?
You will have the opportunity to enter into a prize draw to win one of three **$150 Visa gift cards** upon completion of this survey. Your participation is important as it will help policymakers better plan for future needs related to electric vehicles in British Columbia and ensure residents living in new homes will have better, more reliable access to EV charging.

How long does it take to complete the survey?
The survey will take up to 10 minutes to complete if you are a resident, and up to 15 to 20 minutes if you are also a member of your building's strata council.

When do I need to complete the survey by?
The survey will be open until **11:59 pm on June 22, 2025**, or **4 weeks after receipt in your mailbox** due to the potential Canada Post strike.

What kind of survey questions are asked?
The survey asks questions about whether your household currently owns/leases an electric vehicle or are considering acquiring an electric vehicle in the future; current usage, barriers, and challenges related to electric vehicle charging in your home/building; and information about your demographic characteristics.

Who is conducting this research?
WATT Consulting Group, a research firm, has been contracted by Metro Vancouver and the City of New Westminster to conduct this research.

Will my privacy be protected?
Yes, your survey responses will be combined with others' responses before they are analyzed. Your contact information will only be used to contact you for follow-up research if you provide consent. The collection of any personal information you provide is permitted in accordance with section 26(e) of the Freedom of Information and Protection of Privacy Act. This information is collected for purposes related and necessary for planning and evaluating local government programs and activities. In your responses, please avoid providing any information that would identify yourself to others.

How was I selected for the survey?
Your household was selected as you live in one of the participating communities of the study that have adopted bylaw requirements to support home EV charging for residents, specifically Vancouver, Richmond, Langley Township, Victoria, Nanaimo, and New Westminster. You likely live in a home/building that was built to be EV-ready, which means that an electrical outlet may be available near or in your parking stall.

Who do I contact for more information or for help?
Questions about this survey, research project, and/or the collection and use of your personal information can be directed to Maya Korbynn (mkorbynn@wattconsultinggroup.com or 778-309-1253 ext. 432) at WATT Consulting Group.

Identity

Page exit logic: Skip / Disqualify Logic
IF: #4 Question "Is the house/building you live in part of a strata corporation?*If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("I do not know") **THEN:** Jump to page 24 -

1. Please confirm the city written on the survey postcard you received in the mail. *

- Langley or Aldergrove
- Nanaimo
- New Westminster
- Richmond
- Vancouver
- Victoria

2. Please confirm your address written on the survey postcard you received in the mail. *(example: 10-100 Main St; 123 Broad St)**

Page exit logic: Skip / Disqualify Logic
IF: #3 Question "What is your connection to the address written on the survey postcard you received in the mail?" is one of the following answers ("I own the property but do not live there.","I am staying at the property temporarily as a guest.") **THEN:** Jump to page 25 -

LOGIC Show/hide trigger exists.

3. What is your connection to the address written on the survey postcard you received in the mail? *

- I live at the property. I am the owner or living with the owner.
- I live at the property. I am a tenant or roommate.
- I own the property but do not live there.
- I am staying at the property temporarily as a guest.

LOGIC Show/hide trigger exists. Hidden unless: #3 Question "What is your connection to the address written on the survey postcard you received in the mail?" is one of the following answers ("I live at the property. I am the owner or living with the owner.","I live at the property. I am a tenant or roommate.")

4. Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building* *

- Yes
- No
- I do not know

LOGIC Show/hide trigger exists. Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

5. Are you a current member of the strata council? *

- Yes
- No

LOGIC Show/hide trigger exists. Hidden unless: #3 Question "What is your connection to the address written on the survey postcard you received in the mail?" is one of the following answers ("I live at the property. I am the owner or living with the owner.","I live at the property. I am a tenant or roommate.")

6. What type of home do you live in? *

- Single-detached house, including basement suites and laneway houses
- Semi-detached house, including basement suites (e.g., duplex, triplex)
- Townhouse or rowhouse (connected side-by-side or back-to-back)
- Townhouse or rowhouse (fully or partially stacked up/down)
- Apartment or condo in a low-rise building (5 floors or less)
- Apartment or condo in a high-rise building (more than 5 floors)

EV Access & Interest

Page exit logic: Skip / Disqualify Logic
IF: Question "ELECTRIC: Battery Electric or Plug-in Hybrid (e.g., Tesla Model S, Chevrolet Volt)" is one of the following answers ("1","2","3+") **THEN:** Jump to page 5 - Home Charging Location & Connection

LOGIC Show/hide trigger exists.

7. Does your household currently own or lease at least one vehicle (whether electric or non-electric)?

Think about all cars, vans, or light trucks that are brought home and parked overnight but exclude motorcycles/scooters, bicycles, and carshare vehicles. *

- Yes
- No

LOGIC Hidden unless: #7 Question "Does your household currently own or lease at least one vehicle (whether electric or non-electric)?
Think about all cars, vans, or light trucks that are brought home and parked overnight but exclude motorcycles/scooters, bicycles, and carshare vehicles." is one of the following answers ("Yes")

8. How many of the following vehicles does your household own or lease?
Include all cars, vans, or light trucks that are brought home and parked overnight but exclude motorcycles/scooters, bicycles, and carshare vehicles.
Please ensure you provide a response for all four available options, even if you own/lease 0 vehicles (i.e., check off "0"). *

	0	1	2	3+
ELECTRIC: Battery Electric or Plug-in Hybrid (e.g., Tesla Model S, Chevrolet Volt)	○	○	○	○
NON-ELECTRIC: Gas- or Diesel-Powered (e.g., Toyota Corolla)	○	○	○	○
NON-ELECTRIC: Hybrid (e.g., Toyota Prius)	○	○	○	○
NON-ELECTRIC: Hydrogen Fuel Cell (e.g., Toyota Mirai)	○	○	○	○

EV Interest

LOGIC Show/hide trigger exists.

9. If you do not own or lease a battery electric or plug-in hybrid electric vehicle (EV), are you planning or considering purchasing/leasing an EV as your next vehicle? *

- ○ I am definitely planning to acquire an EV
- ○ I am strongly considering an EV
- ○ I have some interest in an EV
- ○ I have no interest in an EV
- ○ I do not anticipate acquiring any type of vehicle (EV or non-EV) in the foreseeable future

Home Charging Location & Connection

Page entry logic:
This page will show when: Question "ELECTRIC: Battery Electric or Plug-in Hybrid (e.g., Tesla Model S, Chevrolet Volt)" is one of the following answers ("1","2","3+")

10. Where does your household usually **park** your vehicle(s) overnight? Select all that apply. *

- [ ] At home - inside my private garage
- [ ] At home - outside on my private driveway
- [ ] At home - in my building's parking lot, carport, or parkade: my assigned parking stall is limited common property or long-term lease
- [ ] At home - in my building's parking lot, carport, or parkade: my assigned parking stall is assigned in another way
- [ ] At home - in an unassigned parking stall that is shared and first-come, first-serve among residents in my building's parking lot, carport, or parkade
- [ ] On a street near my home
- [ ] In a nearby parking lot/garage
- [ ] Other - please specify:

LOGIC Show/hide trigger exists.

11. Where does your household usually **plug in and charge** your vehicle? Select all that apply. *

- [ ] At home - inside my private garage
- [ ] At home - outside on my private driveway
- [ ] At home - outside on the street/curb by running a plug from my home to my EV
- [ ] At home - in my assigned parking stall in my building's parking lot, carport, or parkade
- [ ] At home - in a parking stall equipped with an outlet or EV charging station for shared use in my building's parking lot, carport, or parkade
- [ ] At a public EV charging location on a street near my home
- [ ] At a public EV charging location in the community (e.g., grocery store, community centre, car dealership, parkade, etc.)
- [ ] At my workplace
- [ ] Other - please specify:

LOGIC Hidden unless: #11 Question "Where does your household usually **plug in and charge** your vehicle? Select all that apply." is one of the following answers ("At home - inside my private garage","At home - outside on my private driveway","At home - outside on the street/curb by running a plug from my home to my EV","At home - in my assigned parking stall in my building's parking lot, carport, or parkade","At home - in a parking stall equipped with an outlet or EV charging station for shared use in my building's parking lot, carport, or parkade")

Please review the image above before answering the next question.

LOGIC Show/hide trigger exists. Hidden unless: #11 Question "Where does your household usually **plug in and charge** your vehicle? Select all that apply." is one of the following answers ("At home - inside my private garage","At home - outside on my private driveway","At home - outside on the street/curb by running a plug from my home to my EV","At home - in my assigned parking stall in my building's parking lot, carport, or parkade","At home - in a parking stall equipped with an outlet or EV charging station for shared use in my building's parking lot, carport, or parkade")

12. When you plug in and charge your vehicle at **home**, what is the typical method of charging you use? *Chargers are also known as charging stations.* *

- Permanent Level 2 charger (non-portable charger hardwired to my house/building's electrical system and/or bolted to the wall)
- Portable Level 2 charger (charger that plugs into a wall outlet that I can take with me)
- Portable Level 1 charger (charger that plugs into a wall outlet that I can take with me)

LOGIC Hidden unless: #11 Question "Where does your household usually **plug in and charge** your vehicle? Select all that apply." is one of the following answers ("At home - inside my private garage","At home - outside on my private driveway","At home - outside on the street/curb by running a plug from my home to my EV","At home - in my assigned parking stall in my building's parking lot, carport, or parkade","At home - in a parking stall equipped with an outlet or EV charging station for shared use in my building's parking lot, carport, or parkade")

			
120V (Level 1) Outlet with Receptable	*240V (Level 2) Outlet with Receptable*	*Electrical Junction Box*	*Hardwired Charger*

Please review the image above before answering the next question.

LOGIC Hidden unless: #11 Question "Where does your household usually **plug in and charge** your vehicle? Select all that apply." is one of the following answers ("At home - inside my private garage","At home - outside on my private driveway","At home - outside on the street/curb by running a plug from my home to my EV","At home - in my assigned parking stall in my building's parking lot, carport, or parkade","At home - in a parking stall equipped with an outlet or EV charging station for shared use in my building's parking lot, carport, or parkade")

13. What type of electrical wall equipment was included in your parking area when you first moved into your house/building? Select all that apply. *

- [ ] 120V (Level 1) outlet with a receptable (standard wall plug)
- [ ] 240V (Level 2) outlet with a receptable (similar to electric stove or dryer plug)
- [ ] Electrical junction box only that is dedicated for EV charging
- [ ] Hardwired EV charger/charging station
- [ ] Other - please specify:
- [ ] None; there was no equipment installed
- [ ] I do not know/I do not remember

LOGIC Hidden unless: #12 Question "When you plug in and charge your vehicle at**home**, what is the typical method of charging you use? *Chargers are also known as charging stations.*" is one of the following answers ("Permanent Level 2 charger (non-portable charger hardwired to my house/building's electrical system and/or bolted to the wall)")

14. If you use a **permanent hardwired charger at home**, was the charger already pre-installed in your parking area when you first moved into your house/building? *

- Yes, the charger was pre-installed
- No, I had to purchase a charger for my parking area after I moved in
- Other - please specify:
- I do not remember

Home Charging Importance

Page entry logic:
This page will show when: Question "ELECTRIC: Battery Electric or Plug-in Hybrid (e.g., Tesla Model S, Chevrolet Volt)" is one of the following answers ("1","2","3+")

15. How important do you think it is to be able to charge an electric vehicle at home? *

- Extremely important
- Very important
- Fairly important
- Not so important
- Not important at all

16. Overall, how satisfied are you with your experience charging your vehicle at home? *

- Very satisfied
- Satisfied
- Neutral
- Dissatisfied
- Very dissatisfied

Home Charging Barriers & Challenges

Page entry logic:
This page will show when: Question "ELECTRIC: Battery Electric or Plug-in Hybrid (e.g., Tesla Model S, Chevrolet Volt)" is one of the following answers ("1","2","3+")

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

Please answer the next set of questions through the perspective of a<u>RESIDENT</u> in the building you live in.

We want to understand the full range of barriers and challenges that you, as a current electric vehicle (EV) driver and strata resident, experience or have experienced in the past, as it relates to charging an EV at home.

The next set of questions will ask you to indicate and describe these issues, grouped around the following four topics:

- **Infrastructure:** installing and using EV outlets and chargers in your strata building, including hardware- and performance-related issues
- **Awareness:** awareness, understanding, and etiquette of EV charging options in your strata building from EV and non-EV drivers
- **Governance:** bylaws and rules in your strata building that govern EV charging (e.g., access and usage, user fees, billing, etc.)
- **Other:** any other barrier or challenge related to home EV charging in your strata building not captured by the above

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

17. **Challenges: Infrastructure**

What issues do you experience or have experienced in the past as it relates to installing and using EV outlets and chargers including hardware- and performance-related issues in your strata building? Select all that apply. *

- [ ] No outlet with a receptacle or electrical junction box is provided by my parking stall, so I cannot install or plug in a charger
- [ ] The outlet is for Level 1 charging only so it takes a long time to charge
- [ ] The charger receives inconsistent or insufficient power to charge according to a Level 2 charging standard
- [ ] The parking stall I have access to charge my EV is physically not suitable for my vehicle (e.g., stall is too small, etc.)
- [ ] The outlet or charger I use is frequently out of service and needs maintenance
- [ ] Purchasing a charger is too expensive
- [ ] I need to hire an electrical contractor to install a charger
- [ ] Additional work is required before a charger can be installed or plugged in
- [ ] Other issue not mentioned above
- [ ] None; there have been no issues so far

Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to **infrastructure** of EV charging in your building.

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

18. **Challenges: Awareness**

What issues do you experience or have experienced in the past as it relates to awareness, understanding, and etiquette of EV charging options from EV and non-EV drivers in your strata building? Select all that apply. *

- [ ] I do not know if I am allowed to or how to request permission to use an outlet or install a charger
- [ ] I do not know if the Strata Property Act gives me any rights to charge my EV or install a charger
- [ ] I do not know how or where to find a qualified electrical contractor to install a charger
- [ ] The parking stall I have access to charge my EV is frequently occupied by other vehicles
- [ ] Other issue not mentioned above
- [ ] None; there have been no issues so far

Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to **awareness** of EV charging in your building.

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

19. **Challenges: Governance**

The owners in strata corporations adopt bylaws, rules, and user fees by voting at general meetings. What issues do you experience or have experienced in the past as it relates to bylaws and rules that govern EV charging (e.g., access and usage, user fees, billing, etc.) in your strata building? Select all that apply. *

- [ ] Challenges with getting approval from the strata to use an outlet or install a charger
- [ ] I am restricted to the model of charger I can install and use
- [ ] I must purchase the charger, but the strata will own it once it is installed
- [ ] The cost to install my own charger is high and discourages me from charging at home
- [ ] The cost or fee to charge my vehicle is high and discourages me from charging at home
- [ ] There are strata bylaws or rules that restrict when or how long I can charge my vehicle
- [ ] Other issue not mentioned above
- [ ] None; there have been no issues so far

Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to **governance** (e.g., bylaws, rules, user fees) of EV charging in your building.

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

20. **Challenges: Other**

Are there any **other** specific issue, challenge, or barrier related to home EV charging in your strata building that has not been mentioned yet? If so, please describe:

Home Charging Rules

Page entry logic:
This page will show when: Question "ELECTRIC: Battery Electric or Plug-in Hybrid (e.g., Tesla Model S, Chevrolet Volt)" is one of the following answers ("1","2","3+")

LOGIC Show/hide trigger exists. Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

21. The Strata Property Act allows strata corporations to charge user fees for costs associated with EV charging. These fees may be paid to the strata, a management company, a service provider, or a combination of those. If you pay fees, how are the fees calculated? Select all that apply. *

- [ ] The fee is a fixed (flat) rate, regardless of how often residents charge their EV
- [ ] The fee is calculated equally by the number of users in the billing period
- [ ] The fee is based on the amount of time residents are charging their EV (i.e., $/hour)
- [ ] The fee is based on how much electricity the resident uses to charge their EV (i.e., $/kWh)
- [ ] There is no fee for residents to charge their EV
- [ ] Other - please specify:
- [ ] I do not know

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

22. If you pay fees for EV charging, what expenses do the fees cover? Select all that apply. *

- [ ] Electricity
- [ ] Operating permit
- [ ] Service contract
- [ ] Maintenance
- [ ] Other - please specify:
- [ ] I do not know

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

23. Who are the EV charging fees paid to? Select all that apply.*

- [ ] Strata corporation
- [ ] Strata/property management company
- [ ] Electric vehicle charging service provider
- [ ] Other - please specify:
- [ ] I do not know

LOGIC Hidden unless: #21 Question "The Strata Property Act allows strata corporations to charge user fees for costs associated with EV charging. These fees may be paid to the strata, a management company, a service provider, or a combination of those. If you pay fees, how are the fees calculated? Select all that apply." is one of the following answers ("The fee is a fixed (flat) rate, regardless of how often residents charge their EV")

24. How long is the billing cycle for the payment of EV charging fees in your building for a **fixed (flat) rate**? *

- Per use/charging session
- Every week
- Every month
- Every two months
- Every year
- Other - please specify:
- I do not know

LOGIC Hidden unless: #21 Question "The Strata Property Act allows strata corporations to charge user fees for costs associated with EV charging. These fees may be paid to the strata, a management company, a service provider, or a combination of those. If you pay fees, how are the fees calculated? Select all that apply." is one of the following answers ("The fee is calculated equally by the number of users in the billing period")

25. How long is the billing cycle for the payment of EV charging fees in your building for a fee that is **calculated equally by the number of users**? *

- Per use/charging session
- Every week
- Every month
- Every two months
- Every year
- Other - please specify:
- I do not know

LOGIC Hidden unless: #21 Question "The Strata Property Act allows strata corporations to charge user fees for costs associated with EV charging. These fees may be paid to the strata, a management company, a service provider, or a combination of those. If you pay fees, how are the fees calculated? Select all that apply." is one of the following answers ("The fee is a fixed (flat) rate, regardless of how often residents charge their EV","The fee is calculated equally by the number of users in the billing period")

26. What was the approximate cost for EV charging in your last billing cycle?*

- Please specify:
- I do not know

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

27. Is the electric vehicle (EV) charging in your building provided and managed through a third-party EV charging service provider (e.g., FLO, ChargePoint, SWTCH)? *

- Yes
- No
- Other - please specify:
- I do not know

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

28. Do the strata bylaws, rules, or type of infrastructure installed place any restrictions on the types of chargers that can be installed? Select all that apply. *

- [ ] I must use a specific brand of chargers (e.g., FLO, ChargePoint)
- [ ] I must use a charger that is smart (i.e., connects to the internet, can view information about charging and electricity consumption)
- [ ] Other - please specify:
- [ ] None; there are no restrictions in my building on the type of chargers I must use
- [ ] I do not know

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

29. Do the strata bylaws, rules, or type of infrastructure installed place any restrictions on how chargers must be installed? Select all that apply. *

- [ ] I must notify or request permission from the strata before the installation
- [ ] I must use a specific contractor for the installation
- [ ] The strata facilitates the installation on my behalf
- [ ] Other - please specify:
- [ ] None; there are no restrictions in my building for how chargers are installed
- [ ] I do not know

Home Charging Scheduling

Page entry logic:
This page will show when: #11 Question "Where does your household usually **plug in and charge** your vehicle? Select all that apply." is one of the following answers ("At home - inside my private garage","At home - outside on my private driveway","At home - outside on the street/curb by running a plug from my home to my EV","At home - in my assigned parking stall in my building's parking lot, carport, or parkade","At home - in a parking stall equipped with an outlet or EV charging station for shared use in my building's parking lot, carport, or parkade")

30. What time do you usually charge your EV when it is parked at home? Select all that apply. *

- [ ] 7:00 am to 3:59 pm (morning to mid-afternoon)
- [ ] 4:00 pm to 8:59 pm (mid-afternoon to evening)
- [ ] 9:00 pm to 10:59 pm (evening)
- [ ] 11:00 pm to 6:59 am (overnight to morning)

LOGIC Show/hide trigger exists.

31. Do you usually schedule your charging session when your vehicle is charging at home? *Scheduling in this context means you pre-program your vehicle to draw energy from your charger and actively charge only during a defined scheduled time of the day.* *

- ○ Yes, I schedule my charging
- ○ No, I do not schedule my charging - my car starts charging as soon as I plug it in

LOGIC Hidden unless: #31 Question "Do you usually schedule your charging session when your vehicle is charging at home? *Scheduling in this context means you pre-program your vehicle to draw energy from your charger and actively charge only during a defined scheduled time of the day.*" is one of the following answers ("No, I do not schedule my charging - my car starts charging as soon as I plug it in")

32. Why do you not currently schedule your charging sessions when your vehicle is parked at home? Select all that apply. *

- [ ] I do not know what the benefit of scheduling is
- [ ] I do not know how to schedule charging
- [ ] I cannot schedule because I use a shared charger or outlet with other residents in my building
- [ ] There is no benefit to scheduling for me
- [ ] Other - please specify:

LOGIC Hidden unless: #31 Question "Do you usually schedule your charging session when your vehicle is charging at home? *Scheduling in this context means you pre-program your vehicle to draw energy from your charger and actively charge only during a defined scheduled time of the day.*" is one of the following answers ("Yes, I schedule my charging")

33. How do you usually set-up your charging schedule when your vehicle is parked at home? Select all that apply.
*

- [ ] Using my smart charger through its physical control panel or smartphone/mobile app
- [ ] Using my vehicle settings through its dashboard or smartphone/mobile app
- [ ] Other - please specify:

Home Charging Demand Management

Page entry logic:
This page will show when: #11 Question "Where does your household usually **plug in and charge** your vehicle? Select all that apply." is one of the following answers ("At home - inside my private garage","At home - outside on my private driveway","At home - outside on the street/curb by running a plug from my home to my EV","At home - in my assigned parking stall in my building's parking lot, carport, or parkade","At home - in a parking stall equipped with an outlet or EV charging station for shared use in my building's parking lot, carport, or parkade")

LOGIC Hidden unless: #6 Question "What type of home do you live in?" is one of the following answers ("Single-detached house, including basement suites and laneway houses","Semi-detached house, including basement suites (e.g., duplex, triplex)","Townhouse or rowhouse (connected side-by-side or back-to-back)","Townhouse or rowhouse (fully or partially stacked up/down)")

34. Are you aware of BC Hydro's optional time-of-day pricing plan for residential customers? *On this plan, electricity is more expensive from 4 to 9 pm and cheaper overnight from 11pm to 7am.* *

- Yes
- No
- Not applicable; I live in New Westminster and I am not a BC Hydro customer

LOGIC Hidden unless: #6 Question "What type of home do you live in?" is one of the following answers ("Single-detached house, including basement suites and laneway houses","Semi-detached house, including basement suites (e.g., duplex, triplex)","Townhouse or rowhouse (connected side-by-side or back-to-back)","Townhouse or rowhouse (fully or partially stacked up/down)")

35. Are you aware of BC Hydro's optional Peak Saver program? *In this program, you receive a financial reward every winter and summer season if your eligible electric vehicle charger is enrolled for BC Hydro to remotely delay charging during peak events—times of high electricity demand.* *

- Yes
- No
- Not applicable; I live in New Westminster and I am not a BC Hydro customer

LOGIC Hidden unless: #6 Question "What type of home do you live in?" is one of the following answers ("Single-detached house, including basement suites and laneway houses","Semi-detached house, including basement suites (e.g., duplex, triplex)","Townhouse or rowhouse (connected side-by-side or back-to-back)","Townhouse or rowhouse (fully or partially stacked up/down)")

36. Peak events are short periods where electricity use across the grid is expected to be highest, typically during very cold or hot weather. There is no set schedule and there can be up to 20 events each winter or summer, depending on changing conditions on the BC Hydro grid.

How often do you avoid or pause charging your electric vehicle during peak events? *

- Always
- Very often
- Sometimes
- Rarely
- Never
- I do not know when peak events occur
- Not applicable; I live in New Westminster and I am not a BC Hydro customer

Home Charging Energy Management

Page entry logic:
This page will show when: #11 Question "Where does your household usually **plug in and charge** your vehicle? Select all that apply." is one of the following answers ("At home - inside my private garage","At home - outside on my private driveway","At home - outside on the street/curb by running a plug from my home to my EV","At home - in my assigned parking stall in my building's parking lot, carport, or parkade","At home - in a parking stall equipped with an outlet or EV charging station for shared use in my building's parking lot, carport, or parkade")

LOGIC Show/hide trigger exists. Hidden unless: #6 Question "What type of home do you live in?" is one of the following answers ("Single-detached house, including basement suites and laneway houses","Semi-detached house, including basement suites (e.g., duplex, triplex)","Townhouse or rowhouse (connected side-by-side or back-to-back)","Townhouse or rowhouse (fully or partially stacked up/down)")

37. Electric vehicle power management devices control the electrical load from an electric vehicle (EV) charger to prevent overloads on your home's electrical panel. They are also known as energy management systems, energy or smart dividers, energy managers, smart splitters, smart switches, or load managers. They work in two ways:

- **Branch circuit sharing:** the device shares a circuit with another device, such as a clothes dryer. It automatically switches off the flow of electricity to the EV charger when the dryer turns on.
- **Feeder monitoring:** the device monitors your whole home's current power usage. It automatically turns off power to the EV charger as needed.

Do you currently have an EV power management device installed? *

- Yes
- No
- I do not know

LOGIC Show/hide trigger exists. Hidden unless: #37 Question "Electric vehicle power management devices control the electrical load from an electric vehicle (EV) charger to prevent overloads on your home's electrical panel. They are also known as energy management systems, energy or smart dividers, energy managers, smart splitters, smart switches, or load managers. They work in two ways:

- **Branch circuit sharing:** the device shares a circuit with another device, such as a clothes dryer. It automatically switches off the flow of electricity to the EV charger when the dryer turns on.
- **Feeder monitoring:** the device monitors your whole home's current power usage. It automatically turns off power to the EV charger as needed.

Do you currently have an EV power management device installed? " is one of the following answers ("Yes")

38. Was the power management device already installed when you first moved into your home? *

- Yes
- No
- I do not remember

LOGIC Hidden unless: #38 Question "Was the power management device already installed when you first moved into your home?" is one of the following answers ("No")

39. Which of the following sources did you use to learn more about power management devices to inform your purchase decision? Select all that apply. *

- [ ] Electrical contractor
- [ ] BC Hydro's online website
- [ ] BC Hydro customer representative or agent
- [ ] Blogs or online articles
- [ ] Search engines (e.g., Google) to find articles, videos, or explanations
- [ ] Online news websites or apps (e.g., CBC, Globe & Mail, CTV, Global News)
- [ ] YouTube or other video platforms for educational or informational content
- [ ] Social media platforms (e.g., Facebook, Instagram, TikTok, X/Twitter, LinkedIn)
- [ ] Podcasts
- [ ] Newsletters or email updates from organizations or thought leaders
- [ ] Other - please specify:
- [ ] None of the above

LOGIC Hidden unless: #37 Question "Electric vehicle power management devices control the electrical load from an electric vehicle (EV) charger to prevent overloads on your home's electrical panel. They are also known as energy management systems, energy or smart dividers, energy managers, smart splitters, smart switches, or load managers. They work in two ways:

- **Branch circuit sharing:** the device shares a circuit with another device, such as a clothes dryer. It automatically switches off the flow of electricity to the EV charger when the dryer turns on.
- **Feeder monitoring:** the device monitors your whole home's current power usage. It automatically turns off power to the EV charger as needed.

Do you currently have an EV power management device installed? " is one of the following answers ("No")

40. If you were to consider purchasing a power management device in the future, which of the following sources would you likely use to learn to inform your purchase decision? Select all that apply. *

- [ ] Electrical contractor
- [ ] BC Hydro's online website
- [ ] BC Hydro customer representative or agent
- [ ] Blogs or online articles
- [ ] Search engines (e.g., Google) to find articles, videos, or explanations
- [ ] Online news websites or apps (e.g., CBC, Globe & Mail, CTV, Global News)
- [ ] YouTube or other video platforms for educational or informational content
- [ ] Social media platforms (e.g., Facebook, Instagram, TikTok, X/Twitter, LinkedIn)
- [ ] Podcasts
- [ ] Newsletters or email updates from organizations or thought leaders
- [ ] Other - please specify:
- [ ] None of the above

LOGIC Hidden unless: #38 Question "Was the power management device already installed when you first moved into your home?" is one of the following answers ("No")

41. Where did you purchase your power management device after moving into your home? *

- Directly from a manufacturer or distributor
- Electrical contractor
- Car dealership
- Online retailer (e.g., Amazon)
- In-store retail (e.g., Best Buy)
- Second-hand (e.g., Facebook Marketplace, Craigslist)
- I do not remember
- Other - please specify:

LOGIC Hidden unless: #38 Question "Was the power management device already installed when you first moved into your home?" is one of the following answers ("No")

42. Why did you decide to purchase and install a power management device for charging your electric vehicle at home?

Home Charging Location & Connection

Page entry logic:
This page will show when: #9 Question "If you do not own or lease a battery electric or plug-in hybrid electric vehicle (EV), are you planning or considering purchasing/leasing an EV as your next vehicle?" is one of the following answers ("I am definitely planning to acquire an EV","I am strongly considering an EV","I have some interest in an EV")

LOGIC Hidden unless: #9 Question "If you do not own or lease a battery electric or plug-in hybrid electric vehicle (EV), are you planning or considering purchasing/leasing an EV as your next vehicle?" is one of the following answers ("I am definitely planning to acquire an EV","I am strongly considering an EV","I have some interest in an EV")

43. If you hope to own an electric vehicle in the future, where does your household anticipate **parking** your vehicle(s) overnight? Select all that apply *

- [ ] At home - inside my private garage
- [ ] At home - outside on my private driveway
- [ ] At home - in my building's parking lot, carport, or parkade (my assigned parking stall is limited common property or long-term lease)
- [ ] At home - in my building's parking lot, carport, or parkade (my assigned parking stall is assigned in another way)
- [ ] At home - in an unassigned parking stall that is shared and first-come, first-serve among residents in my building's parking lot, carport, and parkade
- [ ] On a street near my home
- [ ] In a nearby off-street parking lot/garage
- [ ] Other - please specify:

LOGIC Show/hide trigger exists. Hidden unless: #9 Question "If you do not own or lease a battery electric or plug-in hybrid electric vehicle (EV), are you planning or considering purchasing/leasing an EV as your next vehicle?" is one of the following answers ("I am definitely planning to acquire an EV","I am strongly considering an EV","I have some interest in an EV")

44. If you hope to own an electric vehicle in the future, where does your household anticipate **charging** your vehicle? Select all that apply. *

- [ ] At home - inside my private garage
- [ ] At home - outside on my private driveway
- [ ] At home - outside on the street/curb by running a plug from my home to my EV
- [ ] At home - in my assigned parking stall in my building's parking lot, carport, or parkade
- [ ] At home - in a parking stall equipped with an outlet or EV charging station for shared use in my building's parking lot, carport, or parkade
- [ ] At a public EV charging location on a street near my home
- [ ] At a public EV charging location in the community (e.g., grocery store, community centre, car dealership, parkade, etc.)
- [ ] At my workplace
- [ ] Other - please specify:

- [ ] I do not know

LOGIC Hidden unless: #44 Question "If you hope to own an electric vehicle in the future, where does your household anticipate **charging** your vehicle? Select all that apply." is one of the following answers ("At home - inside my private garage","At home - outside on my private driveway","At home - outside on the street/curb by running a plug from my home to my EV","At home - in my assigned parking stall in my building's parking lot, carport, or parkade","At home - in a parking stall equipped with an outlet or EV charging station for shared use in my building's parking lot, carport, or parkade")

Permanent Hardwired Charger | *Portable Plug-in Charger*

Please review the image above before answering the next question.

LOGIC Hidden unless: #44 Question "If you hope to own an electric vehicle in the future, where does your household anticipate **charging** your vehicle? Select all that apply." is one of the following answers ("At home - inside my private garage","At home - outside on my private driveway","At home - outside on the street/curb by running a plug from my home to my EV","At home - in my assigned parking stall in my building's parking lot, carport, or parkade","At home - in a parking stall equipped with an outlet or EV charging station for shared use in my building's parking lot, carport, or parkade")

45. How do you plan on charging your electric vehicle at home? *Chargers are also known as charging stations.* *

- Permanent Level 2 charger (non-portable charger hardwired to my house/building's electrical system and/or bolted to the wall)
- Portable Level 2 charger (charger that plugs into a wall outlet that I can take with me)
- Portable Level 1 charger (charger that plugs into a wall outlet that I can take with me)
- I do not know

LOGIC Hidden unless: #44 Question "If you hope to own an electric vehicle in the future, where does your household anticipate **charging** your vehicle? Select all that apply." is one of the following answers ("At home - inside my private garage","At home - outside on my private driveway","At home - outside on the street/curb by running a plug from my home to my EV","At home - in my assigned parking stall in my building's parking lot, carport, or parkade","At home - in a parking stall equipped with an outlet or EV charging station for shared use in my building's parking lot, carport, or parkade")

Please review the image above before answering the next question.

LOGIC Hidden unless: #44 Question "If you hope to own an electric vehicle in the future, where does your household anticipate **charging** your vehicle? Select all that apply." is one of the following answers ("At home - inside my private garage","At home - outside on my private driveway","At home - outside on the street/curb by running a plug from my home to my EV","At home - in my assigned parking stall in my building's parking lot, carport, or parkade","At home - in a parking stall equipped with an outlet or EV charging station for shared use in my building's parking lot, carport, or parkade")

46. What type of electrical wall equipment was installed in your parking area when you first moved into your house/building? Select all that apply. *

- [ ] 120V (Level 1) outlet with a receptable (standard wall plug)
- [ ] 240V (Level 2) outlet with a receptable (similar to electric stove or dryer plug)
- [ ] Electrical junction box only that is dedicated for EV charging
- [ ] Hardwired EV charger/charging station
- [ ] Other - please specify:
- [ ] None; there was no equipment installed
- [ ] I do not know/I do not remember

Home Charging Importance

Page entry logic:
This page will show when: #9 Question "If you do not own or lease a battery electric or plug-in hybrid electric vehicle (EV), are you planning or considering purchasing/leasing an EV as your next vehicle?" is one of the following answers ("I am definitely planning to acquire an EV","I am strongly considering an EV","I have some interest in an EV")

LOGIC Hidden unless: #9 Question "If you do not own or lease a battery electric or plug-in hybrid electric vehicle (EV), are you planning or considering purchasing/leasing an EV as your next vehicle?" is one of the following answers ("I am definitely planning to acquire an EV","I am strongly considering an EV","I have some interest in an EV")

47. How important is it to be able to charge an electric vehicle at home?*

- Extremely important
- Very important
- Fairly important
- Not so important
- Not important at all

LOGIC Hidden unless: #9 Question "If you do not own or lease a battery electric or plug-in hybrid electric vehicle (EV), are you planning or considering purchasing/leasing an EV as your next vehicle?" is one of the following answers ("I am definitely planning to acquire an EV","I am strongly considering an EV","I have some interest in an EV")

48. Being able to charge an electric vehicle (EV) at home is an important factor in whether I decide to own/lease an EV as my next vehicle. *

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Home Charging Barriers & Challenges

Page entry logic:
This page will show when: #9 Question "If you do not own or lease a battery electric or plug-in hybrid electric vehicle (EV), are you planning or considering purchasing/leasing an EV as your next vehicle?" is one of the following answers ("I am definitely planning to acquire an EV","I am strongly considering an EV","I have some interest in an EV")

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

Please answer the next set of questions through the perspective of a<u>RESIDENT</u> in the building you live in.

We want to understand the full range of barriers and challenges that you, as a prospective electric vehicle (EV) driver and strata resident, experience or may experience, as it relates to charging an EV at home.

The next set of questions will ask you to indicate and describe these issues, grouped around the following four topics:

- **Infrastructure:** installing and using EV outlets and chargers in your strata building, including hardware- & performance-related issues
- **Awareness:** awareness, understanding, and etiquette of EV charging options in your strata building from EV and non-EV drivers
- **Governance:** bylaws and rules in your strata building that govern EV charging (e.g., access and usage, user fees, billing, etc.)
- **Other:** any other barrier or challenge related to home EV charging in your strata building not captured by the above

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

49. **Challenges: Infrastructure**

What issues do you currently or anticipate experiencing as it relates to installing and using EV outlets and chargers including hardware- and performance-related issues in your strata building? Select all that apply. *

- [ ] No outlet with a receptacle or electrical junction box is provided by my parking stall, so I cannot install or plug in a charger
- [ ] The outlet is for Level 1 charging only so it takes a long time to charge
- [ ] The charger would receive inconsistent or insufficient power to charge according to a Level 2 charging standard
- [ ] The parking stall I have access to charge my EV is physically not suitable for the vehicle I want (e.g., stall is too small, etc.)
- [ ] Purchasing a charger is too expensive
- [ ] I need to hire an electrical contractor to install a charger
- [ ] Additional work is required before a charger can be installed or plugged in
- [ ] Other issue not mentioned above
- [ ] None; there are no known issues at this time
- [ ] I do not know yet

Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to **infrastructure** of EV charging in your building.

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

50. **Challenges: Awareness**

What issues do you currently or anticipate experiencing as it relates to awareness, understanding, and etiquette of EV charging options from EV and non-EV drivers in your strata building? Select all that apply. *

- [ ] I do not know if I am allowed to use an outlet or install a charger
- [ ] I do not know whether I need to or how to request permission to use an outlet or install a charger
- [ ] I do not know if the Strata Property Act gives me any rights to charge my EV or install a charger
- [ ] I do not know how or where to find a qualified electrical contractor to install a charger
- [ ] The parking stall I have access to charge an EV is frequently occupied by other vehicles
- [ ] Other issue not mentioned above
- [ ] None; there are no known issues at this time
- [ ] I do not know yet

Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to **awareness** of EV charging in your building.

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

51. **Challenges: Governance**

The owners in strata corporations adopt bylaws, rules, and user fees by voting at general meetings. What issues do you currently or anticipate experiencing as it relates to bylaws and rules that govern EV charging (e.g., access and usage, user fees, billing, etc.) in your strata building? Select all that apply. *

- [ ] Challenges with getting approval from the strata to install my charger
- [ ] I am restricted in the model of charger I can install or use
- [ ] I must purchase the charger, but the strata will own it once it is installed
- [ ] The cost or fee to install my own charger is high and discourages me from acquiring an EV
- [ ] The cost or fee to charge my vehicle is high and discourages me from acquiring an EV
- [ ] There are strata bylaws or rules that restrict when or how long I can charge my vehicle
- [ ] Other issue not mentioned above
- [ ] None; there are no known issues at this time
- [ ] I do not know yet

Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to **governance** (e.g., bylaws, rules, user fees) of EV charging in your building.

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

52. **Challenges: Other**

Are there any other specific issue, challenge, or barrier related to home EV charging in your strata building that has not been mentioned yet? If so, please describe:

Home Charging Rules

Page entry logic:
This page will show when: #9 Question "If you do not own or lease a battery electric or plug-in hybrid electric vehicle (EV), are you planning or considering purchasing/leasing an EV as your next vehicle?" is one of the following answers ("I am definitely planning to acquire an EV","I am strongly considering an EV","I have some interest in an EV")

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

53. The Strata Property Act allows strata corporations to charge user fees for costs associated with EV charging. These fees may be paid to the strata, a management company, a service provider, or a combination of those. If EV drivers in your building pay fees, how are the fees calculated? Select all that apply. *

- [ ] The fee is a fixed (flat) rate, regardless of how often residents charge their EV
- [ ] The fee is calculated equally by the number of users in the billing period
- [ ] The fee is based on the amount of time residents are charging their EV (i.e., $/hour)
- [ ] The fee is based on how much electricity the resident uses to charge their EV (i.e., $/kWh)
- [ ] There is no fee for residents to charge their EV
- [ ] Other - please specify:
- [ ] I do not know

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

54. If EV drivers pay fees for EV charging, what expenses do the fees cover? Select all that apply. *

- [ ] Electricity
- [ ] Operating permit
- [ ] Service contract
- [ ] Maintenance
- [ ] Other - please specify:
- [ ] I do not know

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

55. Who are the EV charging fees paid to? Select all that apply.*

- [ ] Strata corporation
- [ ] Strata/property management company
- [ ] Electric vehicle charging service provider
- [ ] Other - please specify:
- [ ] I do not know

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

56. Is electric vehicle (EV) charging in your building managed by a third-party EV charging service provider (e.g., FLO, ChargePoint, SWTCH)? *

- ○ Yes
- ○ No
- ○ Other - please specify:
- ○ I do not know

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

57. Do the strata bylaws, rules, or type of infrastructure installed place any restrictions on the **types of chargers** that can be installed? Select all that apply. *

- ☐ I must use a specific brand of chargers (e.g., FLO, ChargePoint)
- ☐ I must use a charger that is smart (i.e., connects to the internet, can view information about charging and electricity consumption)
- ☐ Other - please specify:
- ☐ None; there are no restrictions in my building on the type of chargers I must use
- ☐ I do not know

LOGIC Hidden unless: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("Yes")

58. Do the strata bylaws, rules, or type of infrastructure installed place any restrictions on **how** chargers must be installed? Select all that apply. *

- [ ] I must notify or request permission from the strata before the installation
- [ ] I must use a specific contractor for the installation
- [ ] The strata facilitates the installation on my behalf
- [ ] Other - please specify:
- [ ] None; there are no restrictions in my building for how chargers are installed
- [ ] I do not know

Building Charging Barriers & Challenges

Page entry logic:
This page will show when: #3 Question "What is your connection to the address written on the survey postcard you received in the mail?" is one of the following answers ("I live at the property. I am the owner or living with the owner.")

LOGIC Hidden unless: #5 Question "Are you a current member of the strata council?" is one of the following answers ("Yes")

Please answer the next set of questions through the perspective of a STRATA COUNCIL MEMBER in the building you live in.

LOGIC Hidden unless: #5 Question "Are you a current member of the strata council?" is one of the following answers ("Yes")

59. From your perspective as a council member, overall, how important do you think it is for residents to be able to charge their electric vehicle at home? *

- Extremely important
- Very important
- Fairly important
- Not so important
- Not important at all

LOGIC Hidden unless: #5 Question "Are you a current member of the strata council?" is one of the following answers ("Yes")

60. From your perspective as a council member, overall, how satisfied are your residents with the electric vehicle charging infrastructure provided in your building? *

- Very satisfied
- Satisfied
- Neutral
- Dissatisfied
- Very dissatisfied

Building Charging Barriers & Challenges (continued)

Page entry logic:
This page will show when: #3 Question "What is your connection to the address written on the survey postcard you received in the mail?" is one of the following answers ("I live at the property. I am the owner or living with the owner.")

LOGIC Hidden unless: #5 Question "Are you a current member of the strata council?" is one of the following answers ("Yes")

Please answer the next set of questions through the perspective of a STRATA COUNCIL MEMBER in the building you live in.

We want to understand the full range of barriers and challenges that the strata council that you are a member of, experience or have experienced in the past, as it relates to supporting residents to charge an EV in your building.

The next set of questions will ask you to indicate and describe these issues, grouped around the following four topics:

- **Infrastructure:** installing and using EV outlets and chargers in your strata building, including hardware- and performance-related issues
- **Awareness:** awareness, understanding, and etiquette of EV charging options in your strata building from EV and non-EV drivers
- **Governance:** bylaws and rules in your strata building that govern EV charging (e.g., access and usage, user fees, billing, etc.)
- **Other:** any other barrier or challenge related to home EV charging in your strata building not captured by the above

LOGIC Hidden unless: #5 Question "Are you a current member of the strata council?" is one of the following answers ("Yes")

61. Challenges: Infrastructure

In your role as a council member, what issues do you experience or have experienced in the past as it relates to installing and using EV outlets and chargers including hardware- and performance-related issues in your strata building? Select all that apply.

Developer
Handover

- [ ] There was missing or incomplete documentation of how to maintain and operate the EV charging infrastructure in the building

Installation

- [ ] Not all the parking stalls in the building were equipped with conduit in

- [ ] Not all the parking stalls in the building were equipped with an electrical outlet or electrical junction box suitable for EV charging
- [ ] The parking stalls were equipped with electrical junction boxes suitable for EV charging, but EV drivers want to use their portable plug-in chargers instead
- [ ] Additional work was required to ensure EV charging was feasible (e.g., wiring needs to be installed, junction boxes were too far away, chargers were incompatible)

Operations and Maintenance

- [ ] There is insufficient electricity provided during charging sessions according to a Level 2 standard
- [ ] Electrical contractors are inexperienced with maintaining and/or repairing the EV charging infrastructure in our building

EV Energy Management System (EVEMS)

- [ ] The EVEMS to share the electrical load of multiple vehicles charging was not installed properly
- [ ] The EVEMS experienced operating issues (e.g., loss in service connection, chargers cannot connect for system to properly distribute load)
- [ ] The EVEMS installed is not programmable to manage the power and time allocated to chargers to better meet the needs of residents

- [ ] Other issue not mentioned above
- [ ] None; there have been no issues so far

LOGIC Hidden unless: #5 Question "Are you a current member of the strata council?" is one of the following answers ("Yes")

62. Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to **infrastructure** of EV charging in your building.

LOGIC Hidden unless: #5 Question "Are you a current member of the strata council?" is one of the following answers ("Yes")

63. **Challenges: Awareness**

In your role as a council member, what issues do you experience or have experienced in the past as it relates to awareness, understanding, and etiquette of EV charging options from EV and non-EV drivers in your strata building? Select all that apply. *

- [ ] Residents are not aware they have access to a parking stall that can accommodate EV charging
- [ ] Residents do not request permission to use an outlet or to install a charger
- [ ] Residents or visitors are using parking stalls to charge their EV without permission or against strata bylaws and rules
- [ ] Residents or visitors are parking their gas/diesel-powered vehicle in EV-designated stalls without permission or against strata bylaws and rules
- [ ] Residents do not know about their rights and responsibilities under the Strata Property Act, strata bylaws, and/or strata rules
- [ ] Other issue not mentioned above
- [ ] None; there have been no issues so far

Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to **awareness** of EV charging in your building.

LOGIC Hidden unless: #5 Question "Are you a current member of the strata council?" is one of the following answers ("Yes")

64. **Challenges: Governance**

In your role as a council member, what issues do you experience or have experienced in the past as it relates to bylaws and rules that govern EV charging (e.g., access and usage, user fees, billing, etc.) in your strata building? Select all that apply.

Third-Party Technology/Service Provider (e.g., FLO, ChargePoint, SWTCH)

- ☐ The system installed or the service provider restricts the type of chargers that residents can install
- ☐ Fees for the services provided by the service provider are too expensive
- ☐ Terms and conditions are onerous
- ☐ The system is proprietary so the strata has no choice of service providers
- ☐ Customer service provided is poor

Strata Bylaws and Rules

- ☐ The strata council lacks information and/or are unaware of how we should best manage EV charging in our building.
- ☐ The strata council does not know what bylaws and rules it should have
- ☐ Owners do not agree on what a user fee should include and how it can be calculated
- ☐ Parking stalls are limited common property or long-term leases so parking stalls cannot be reassigned to optimize access to EV charging
- ☐ Managing EV charging in a parking area shared with other strata corporations is challenging
- ☐ There are concerns about fire safety and lack of understanding of what to do or how to prepare the building in the event of a fire related to EV charging

- ☐ Other issue not mentioned above
- ☐ None; there have been no issues so far

LOGIC Hidden unless: #5 Question "Are you a current member of the strata council?" is one of the following answers ("Yes")

65. Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to **governance** of EV charging in your building.

LOGIC Hidden unless: #5 Question "Are you a current member of the strata council?" is one of the following answers ("Yes")

66. **Challenges: Other**

Are there any **other** specific issue, challenge, or barrier related to home EV charging in your strata building that has not been mentioned yet? If so, please describe:

Building Charging Operations & Management

Page entry logic:
This page will show when: #5 Question "Are you a current member of the strata council?" is one of the following answers ("Yes")

LOGIC Show/hide trigger exists.

67. Does your strata corporation currently employ the services of a third-party EV charging service provider (e.g., FLO, ChargePoint, SWTCH)? *

- ○ Yes
- ○ No
- ○ I do not know

LOGIC Hidden unless: #67 Question "Does your strata corporation currently employ the services of a third-party EV charging service provider (e.g., FLO, ChargePoint, SWTCH)?" is one of the following answers ("Yes")

68. What are the reasons for your strata corporation having a third-party EV charging service provider? Select all that apply. *

- ☐ To process payments from residents for EV charging
- ☐ To reduce time and effort spent on managing EV charging
- ☐ Strata council lacks knowledge on how to best manage EV charging
- ☐ To obtain, aggregate, and sell low carbon fuel credits for the strata corporation
- ☐ Not voluntary; when the owner developer was acting as the strata corporation, they signed a contract with a service provider
- ☐ Other - please specify:

LOGIC Hidden unless: #67 Question "Does your strata corporation currently employ the services of a third-party EV charging service provider (e.g., FLO, ChargePoint, SWTCH)?" is one of the following answers ("Yes")

69.

What are the types of fees charged by your third-party provider? Are the fees charged to the user or to the strata corporation? How much are the fees?

☐ We cannot disclose this information

LOGIC Hidden unless: #67 Question "Does your strata corporation currently employ the services of a third-party EV charging service provider (e.g., FLO, ChargePoint, SWTCH)?" is one of the following answers ("Yes")

70. What is the length of the service agreement that your building has with the third-party provider?

- ○ 3 years or less
- ○ 4 to 9 years
- ○ 10 to 15 years
- ○ 16 to 19 years
- ○ 20 years or greater
- ○ Other - please specify:
- ○ We cannot disclose this information

71. Are you aware of the provincial government's Low Carbon Fuel Standard program? *Strata corporations can generate credits through the use of EV chargers in their building and sell these credits on a carbon market to generate and collect revenue.* *

- Yes
- No

LOGIC Show/hide trigger exists.

72. Is your strata corporation currently enrolled in the Low Carbon Fuel Standard program? *

- Yes
- No
- I do not know

LOGIC Hidden unless: #72 Question "Is your strata corporation currently enrolled in the Low Carbon Fuel Standard program?" is one of the following answers ("Yes")

73. Is your strata corporation planning on selling credits through the Low Carbon Fuel Standard program in the next three years? *

- Yes
- No
- I do not know

Suggestions & Other Comments

Page entry logic:
This page will show when: #3 Question "What is your connection to the address written on the survey postcard you received in the mail?" is one of the following answers ("I live at the property. I am the owner or living with the owner.","I live at the property. I am a tenant or roommate.")

74. Do you have any suggestions for local governments who are responsible for regulating the construction of new residential buildings to improve the experience of **home** electric vehicle charging? *Please indicate whether your suggestion is for single-detached, semi-detached homes (e.g., duplex), townhomes, or apartment/condo buildings.*

75. Do you have anything else you would like to share about home charging of electric vehicles in your house/building?

Strata Characteristics

Page entry logic:
This page will show when: #5 Question "Are you a current member of the strata council?" is one of the following answers ("Yes")

76. How many members are on the residential strata council in your building?*

- Less than 3
- 3
- 4
- 5
- 6
- 7
- Other - please specify:

77. Does the strata corporation receive services from a professional strata management company? If so, what is the name of the company? *

- Yes - please specify:
- No
- Other - please specify:

Resident Characteristics

The next four questions ask about your personal background. This information is kept private and will be used to ensure that our respondents are representative of the general population.

78. What age category do you belong to? *

- 15 or younger
- 16 to 24
- 25 to 34
- 35 to 44
- 45 to 54
- 55 to 64
- 65 to 74
- 75 or over
- Prefer not to answer

79. What gender do you identify as? *

- Man
- Woman
- Non-binary
- Other - please specify:
- Prefer not to answer

80. What is the highest level of education you have completed?*

- Less than high school graduation
- High school graduation
- Trade certificate or diploma from a vocational school or apprenticeship training
- Non-university certificate or diploma from a community college, CEGEP, or nursing school
- University certificate below Bachelor's level
- Bachelor's degree
- Graduate degree
- Prefer not to answer

81. What is your estimated household income, before taxes and deductions, from all sources for the last calendar (tax) year? *

- Under $20,000
- $20,000 to $39,000
- $40,000 to $59,999
- $60,000 to $79,999
- $80,000 to $99,999
- $100,000 to $119,999
- $120,000 to $139,999
- $140,000 to $159,999
- $160,000 to $179,999
- $180,000 to $199,999
- $200,000 and over
- I don't know
- Prefer not to answer

Other

Page entry logic:
This page will show when: #5 Question "Are you a current member of the strata council?" is one of the following answers ("Yes")

LOGIC Hidden unless: #5 Question "Are you a current member of the strata council?" is one of the following answers ("No")

82. What is the name of the company that provides strata management services for your strata corporation, if applicable?

Thank you for filling out the survey!

VALIDATION %s format expected

83. Please enter your email address if you wish to be included in a draw for a $150 Visa gift card.

By entering your email address for this draw, you are consenting to the collection and use of your personal information only for the purpose of enabling you to be contacted in relation to the draw. Your email address will be kept confidential. Questions about the collection of this information can be directed to Maya Korbynn, Transportation Planner (mkorbynn@wattconsultinggroup.com or 778-309-1253 ext. 432) at WATT Consulting Group.

LOGIC Show/hide trigger exists.

84. We will be conducting follow-up interviews or focus groups with residents in June/July 2025 as part of the second phase of this research project to learn more about barriers and challenges to EV charging at home.

Please indicate whether you would like to participate in this research: *

- Yes, I agree to be contacted for a follow-up interview/focus group
- No, I do not agree to be contacted for a follow-up interview/focus group

VALIDATION %s format expected

LOGIC Hidden unless: #84 Question "We will be conducting follow-up interviews or focus groups with residents in June/July 2025 as part of the second phase of this research project to learn more about barriers and challenges to EV charging at home.

Please indicate whether you would like to participate in this research:" is one of the following answers ("Yes, I agree to be contacted for a follow-up interview/focus group")

85. Please enter your email address so we can contact you to participate in a follow-up interview or focus group. *

Page entry logic:
This page will show when: #4 Question "Is the house/building you live in part of a strata corporation? *If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("I do not know")

Page exit logic: Skip / Disqualify Logic
IF: #4 Question "Is the house/building you live in part of a strata corporation?*If you are unsure, signs include, but are not limited to: there is a strata council, there are annual meetings, there is common property, you live in a high-rise building*" is one of the following answers ("I do not know") **THEN:** Jump to page 26 - Thank You!

Please check with your property manager or landlord if you live in a strata building.

LOGIC Hidden unless: #3 Question "What is your connection to the address written on the survey postcard you received in the mail?" is one of the following answers ("I own the property but do not live there.","I am staying at the property temporarily as a guest.")

Please have the person who lives at the property of the address written on the survey postcard complete this survey.

Thank You!

Thank you for taking our survey. Your response is very important to us.

Residential EV-Ready Requirements Study: Building Professionals

(untitled)

Residential EV-Ready Requirement Study ("Charged and Ready")

Building Professionals: Electrical Engineers & Electrical Contractors

About the Survey
Metro Vancouver and the City of New Westminster, with support from BC Hydro, are conducting a study to better understand how electric vehicles (EV) are charged in homes. New homes in many communities across the province are required to be built EV-ready, which means that an electrical outlet is available at or near a resident's parking stall. This survey will identify issues and challenges that residents face in accessing EV charging at home to improve the experience for current and future EV drivers in British Columbia.

This project is being led by Metro Vancouver and the City of New Westminster, with support from BC Hydro, and in partnership with the District of Saanich, the University of British Columbia, the City of Nanaimo, and the Community Energy Association, with additional support from the City of Vancouver, City of Richmond, Township of Langley, and City of Victoria.

How will I benefit from completing the survey?
You will have the opportunity to enter into a prize draw to win a **$50 Visa gift card** upon completion of this survey. Your participation is important as it will help policymakers better plan for future needs related to electric vehicles in British Columbia and ensure residents living in new homes will have better, more reliable access to EV charging.

How long does it take to complete the survey?
The survey will take 5 to 10 minutes to complete.

When do I need to complete the survey by?
The survey will be open until **12:00 pm on June 13, 2025**.

Will my privacy be protected?
Yes, your survey responses will be combined with others' responses before they are analyzed. Your contact information will only be used to contact you for follow-up research if you provide consent. The collection of any personal information you provide is permitted in accordance with section 26(e) of the Freedom of Information and Protection of Privacy Act. This information is collected for purposes related and necessary for planning and evaluating local government programs and activities. In your responses,

please avoid providing any information that would identify yourself to others.

How was I selected for the survey?
You were selected as you design or install EV charging infrastructure for Part 3 and 9 buildings, or provide Letters of Assurance for Part 3 buildings in British Columbia.

Who do I contact for more information or for help?
Questions about this survey, research project, and/or the collection and use of your personal information can be directed to Maya Korbynn, Transportation Planner (mkorbynn@wattconsultinggroup.com or 778-309-1253 ext. 432) at WATT Consulting Group

Characteristics

1. Please indicate where you currently perform electrical engineering or contract work, as of May 2025. Select all that apply. *

- [ ] Vancouver (City)
- [ ] Richmond (City)
- [ ] Langley (Township)
- [ ] New Westminster (City)
- [ ] Victoria (City)
- [ ] Nanaimo (City)
- [ ] None of the above

LOGIC Show/hide trigger exists.

2. What duties do you perform in your work position? Select all that apply. *

- [ ] I design building permit plans for construction (Engineer)
- [ ] I construct the electrical system in buildings (Contractor)

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I construct the electrical system in buildings (Contractor)")

3. What types of building, as defined by the governing building code in your jurisdiction, are you involved on? Select all that apply. *

- [ ] Part 3 (complex): all buildings over three storeys in height or over 600 square metres in footprint (e.g., condo tower)
- [ ] Part 9 (simple): most buildings three storeys and under in height and with a footprint of 600 square metres or less (e.g., single-detached house)

Charging Barriers & Challenges (Engineer)

Page entry logic:
This page will show when: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I design building permit plans for construction (Engineer)")

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I design building permit plans for construction (Engineer)")

4. What is your level of familiarity with electric vehicle (EV) charging in a residential setting? *

- Extremely familiar
- Moderately familiar
- Somewhat familiar
- Slightly familiar
- Not at all familiar

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I design building permit plans for construction (Engineer)")

5. What is your level of familiarity with electric vehicle (EV) energy management systems in a residential setting?

Energy management systems, also known as "load sharing" systems, control the electrical load from an EV charger to prevent overloads to provide access to multiple EV chargers. *

- Extremely familiar
- Moderately familiar
- Somewhat familiar
- Slightly familiar
- Not at all familiar

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I design building permit plans for construction (Engineer)")

6. How important do you think it is for strata residents to be able to charge an electric vehicle at home? *

- Extremely important
- Very important
- Fairly important
- Not so important
- Not important at all

Page entry logic:
This page will show when: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I design building permit plans for construction (Engineer)")

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I design building permit plans for construction (Engineer)")

Please answer the next set of questions through the perspective of an ENGINEER.

We want to understand the full range of barriers and challenges that you, as a design engineer, experience or have experienced in the past when designing building permit applications for residential EV-Ready developments.

The next set of questions will ask you to indicate and describe these issues, grouped around the following three topics:

- **Infrastructure:** designing the installation of EV chargers and hardware
- **Information & Communication:** access to applicable information (e.g., codes, standards, bulletins), contacting and communicating with external organizations
- **Other:** any other barrier or challenge related to home EV charging not captured by the above

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I design building permit plans for construction (Engineer)")

7. **Charging Challenges: Infrastructure**

We are interested only in EV charging in new home construction subject to EV-Ready requirements and not retrofits in already built homes.

What are typical issues that you see when designing the installation of EV charging chargers and hardware in buildings that are subject to residential EV-Ready requirements? Select all that apply.

Documentation and Design

- ☐ The EV-Ready bylaw requirements are not easily found or are unclear
- ☐ There is not enough physical space to accommodate the electrical equipment to support the EV-Ready requirements
- ☐ The electrical infrastructure needed to be upgraded to an unreasonable standard to accommodate the EV-Ready requirements
- ☐ The electrical utility does not have enough capacity to support the number of EV chargers to accommodate the EV-Ready requirements

EV Ready Requirements

- ☐ Electrical load increased such that the local distribution requires upgrades
- ☐ Electrical load increased such that the utility requires upgrades

EV Energy Management System

- ☐ The EV energy management systems on the market are unable to accommodate the EV-Ready requirements
- ☐ The EV energy management systems must be hard specified in design to accommodate the EV-Ready requirements, which leaves the residents/strata with limited options post occupancy

- ☐ Other issue not mentioned above

- [ ] None; there have been no issues so far

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I design building permit plans for construction (Engineer)")

8. **Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to infrastructure of residential EV charging in buildings you work on.**

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I design building permit plans for construction (Engineer)")

9. **Charging Challenges: Information & Communication**

We are interested only in EV charging in new home construction subject to EV-Ready requirements and not retrofits in already built homes.

What are typical issues that you experience or have experienced in the past as it relates to information & communication when designing the installation of EV chargers and hardware in new residential EV-Ready buildings? Select all that apply. *

- ☐ Access to applicable codes, standards, and bulletins
- ☐ Contacting and communicating with third-party EV charging service provider (e.g., FLO, ChargePoint, SWTCH)
- ☐ Contacting and communicating with authority having jurisdiction (e.g., local governments)
- ☐ Other issue not mentioned above
- ☐ None; there have been no issues so far

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I design building permit plans for construction (Engineer)")

10. **Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to information & communication of residential EV charging in buildings you work on.**

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I design building permit plans for construction (Engineer)")

11. **Are there any <u>other</u> issues related to buildings that are subject to residential EV-Ready requirements that has not been mentioned yet? If so, please describe:**

Charging Barriers & Challenges (Contractor)

Page entry logic:
This page will show when: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I construct the electrical system in buildings (Contractor)")

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I construct the electrical system in buildings (Contractor)")

12. What is your level of familiarity with electric vehicle (EV) charging in a residential setting?*

- Extremely familiar
- Moderately familiar
- Somewhat familiar
- Slightly familiar
- Not at all familiar

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I construct the electrical system in buildings (Contractor)")

13. What is your level of familiarity with electric vehicle (EV) energy management systems in a residential setting?

Energy management systems, also known as "load sharing" systems, control the electrical load from an EV charger to prevent overloads to provide access to multiple EV chargers. *

- Extremely familiar
- Moderately familiar
- Somewhat familiar
- Slightly familiar
- Not at all familiar

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I construct the electrical system in buildings (Contractor)")

14. How important do you think it is for strata residents to be able to charge an electric vehicle at home? *

- Extremely important
- Very important
- Fairly important
- Not so important
- Not important at all

Page entry logic:
This page will show when: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I construct the electrical system in buildings (Contractor)")

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I construct the electrical system in buildings (Contractor)")

Please answer the next set of questions through the perspective of a<u>CONTRACTOR</u>.

We want to understand the full range of barriers and challenges that you, as a contractor, experience or have experienced in the past when installing EV chargers and hardware for residential EV-Ready developments.

The next set of questions will ask you to indicate and describe these issues, grouped around the following three topics:

- **Infrastructure:** designing the installation of EV chargers and hardware
- **Information & Communication:** access to applicable information (e.g., codes, standards, bulletins), contacting and communicating with external organizations
- **Other:** any other barrier or challenge related to home EV charging not captured by the above

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I construct the electrical system in buildings (Contractor)")

15. **Charging Challenges: Infrastructure**

We are interested only in EV charging in new home construction subject to EV-Ready requirements and not retrofits in already built homes.

What are typical issues that you see when installing EV chargers and hardware in new residential EV-Ready buildings? Select all that apply.

Documentation and Design

- ☐ The drawings do not include sufficient information to properly install a system compliant with the EV-Ready requirements
- ☐ There is not enough physical space to accommodate the electrical equipment to support the EV-Ready requirements
- ☐ There is not enough physical space to install the required conduit systems to support the electrical drawings and/or EV Ready requirements.

EV Ready Requirements

- ☐ Electrical load increased such that the local distribution is oversized

EV Energy Management System

- ☐ The drawings do not include sufficient information to properly install a system compliant with the EV Ready requirements
- ☐ There is not enough physical space to accommodate the electrical equipment to support the EV Ready requirements
- ☐ There is not enough physical space to install the required conduit systems to support the electrical drawings and/or EV Ready requirements.

- ☐ Other issue not mentioned above
- ☐ None; there have been no issues so far

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I construct the electrical system in buildings (Contractor)")

16. **Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to infrastructure of residential EV charging in buildings you work on.**

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I construct the electrical system in buildings (Contractor)")

17. Charging Challenges: Information & Communication

We are interested only in EV charging in new home construction subject to EV-Ready requirements and not retrofits in already built homes.

What are typical issues that you experience or have experienced in the past as it relates to information & communication when installing EV chargers and hardware in new residential EV-Ready buildings? Select all that apply. *

- [ ] Access to applicable codes, standards, and bulletins
- [ ] Contacting and communicating with third-party EV charging service provider (e.g., FLO, ChargePoint, SWTCH)
- [ ] Contacting and communicating with authority having jurisdiction (e.g., local governments)
- [ ] Other issue not mentioned above
- [ ] None; there have been no issues so far

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I construct the electrical system in buildings (Contractor)")

18. **Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to information & communication of residential EV charging in buildings you work on.**

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I construct the electrical system in buildings (Contractor)")

19. **Are there any other issues related to buildings that are subject to residential EV-Ready requirements that has not been mentioned yet? If so, please describe:**

Suggestions and Other Comments

20. Do you have any suggestions for local governments who are responsible for regulating the construction of new residential buildings to improve the experience of **home** electric vehicle charging? *Please indicate whether your suggestion is for single-detached, semi-detached homes (e.g., duplex), townhomes, or apartment/condo buildings.*

21. Do you have anything else you would like to share about EV-Ready requirements for residential developments?

Thank You!

VALIDATION %s format expected

22. Thank you for filling out the survey. Please enter your email address if you wish to be included in a draw for a $50 Visa gift card.

By entering your email address for this draw, you are consenting to the collection and use ofyour personal information only for the purpose of enabling you to be contacted in relation to the draw. Your email address will be kept confidential. Questions about the collection of this information can be directed to Maya Korbynn, Transportation Planner (mkorbynn@wattconsultinggroup.com or 778-309-1253 ext. 432) at WATT Consulting Group.

LOGIC Show/hide trigger exists.

23. We will be conducting follow-up interviews or focus groups with building professionals in June/July 2025 as part of the second phase of this research project to learn more about barriers and challenges to EV charging at home.

Please indicate whether you would like to participate in this research. *

- Yes, I agree to be contacted for a follow-up interview/focus group
- No, I do not agree to be contacted for a follow-up interview/focus group

VALIDATION %s format expected

LOGIC Hidden unless: #23 Question "We will be conducting follow-up interviews or focus groups with building professionals in June/July 2025 as part of the second phase of this research project to learn more about barriers and challenges to EV charging at home.

Please indicate whether you would like to participate in this research." is one of the following answers ("Yes, I agree to be contacted for a follow-up interview/focus group")

24. Please enter your email address that we can contact you to participate in a follow-up interview or focus group. *

Thank You!

Thank you for taking our survey. Your response is very important to us.

Residential EV-Ready Requirements Study: Building Officials

(untitled)

Residential EV-Ready Requirement Study ("Charged and Ready")

Building Officials: Building Permit Plan Reviewers & Building Inspectors

About the Survey
Your municipality or local government is participating in a study to better understand how electric vehicles (EV) are charged in homes. New homes in many communities across the province are required to be built EV-ready, which means that an electrical outlet is available at or near a resident's parking stall. This survey will identify issues and challenges that residents face in accessing EV charging at home to improve the experience for current and future EV drivers in British Columbia.

This project is being led by Metro Vancouver and the City of New Westminster, with support from BC Hydro, and in partnership with the District of Saanich, the University of British Columbia, the City of Nanaimo, and the Community Energy Association, with additional support from the City of Vancouver, City of Richmond, Township of Langley, and City of Victoria.

How will I benefit from completing the survey?
Your participation is important as it will help policymakers better plan for future needs related to electric vehicles in British Columbia and ensure residents living in new homes will have better, more reliable access to EV charging.

How long does it take to complete the survey?
The survey will take 5 to 10 minutes to complete.

When do I need to complete the survey by?
The survey will be open until **12:00 pm on June 18, 2025**.

Will my privacy be protected?
Yes, your survey responses will be combined with others' responses before they are analyzed. Your contact information will only be used to contact you for follow-up research if you provide consent. The collection of any personal information you provide is permitted in accordance with section 26(e) of the Freedom of Information and Protection of Privacy Act. This information is collected for purposes related and necessary for planning and evaluating local government programs and activities. In your responses, please avoid providing any information that would identify yourself to others.

How was I selected for the survey?

You were selected as you perform duties of reviewing building permits and performing final building inspections prior to occupancy in one of the participating local governments of the study that have adopted bylaw requirements to support home EV charging for residents, specifically Vancouver, Richmond, Langley Township, Victoria, Nanaimo, and New Westminster.

Who do I contact for more information or for help?
Questions about this survey, research project, and/or the collection and use of your personal information can be directed to Maya Korbynn, Transportation Planner (mkorbynn@wattconsultinggroup.com or 778-309-1253 ext. 432) at WATT Consulting Group.

Characteristics

1. Please indicate which local government you are currently employed at, as of May 2025. *

- City of Vancouver
- City of Richmond
- Township of Langley
- City of New Westminster
- City of Victoria
- City of Nanaimo

LOGIC Show/hide trigger exists.

2. What duties do you perform in your work position? Select all that apply. *

- [ ] I review/check building permit plans
- [ ] I conduct final building inspections prior to occupancy

3. What type of buildings, as defined by the governing building code in your jurisdiction, do you review/check or inspect? Select all that apply. *

- [ ] Part 3 (complex): all buildings over three storeys in height or over 600 square metres in footprint (e.g., condo tower)
- [ ] Part 9 (simple): most buildings three storeys and under in height and with a footprint of 600 square metres or less (e.g., single-detached house)

Charging Barriers & Challenges (Plan Reviewer)

Page entry logic:
This page will show when: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I review/check building permit plans")

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I review/check building permit plans")

4. What is your level of familiarity with electric vehicle (EV) charging in a residential setting? *

- ○ Extremely familiar
- ○ Moderately familiar
- ○ Somewhat familiar
- ○ Slightly familiar
- ○ Not at all familiar

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I review/check building permit plans")

5. What is your level of familiarity with electric vehicle (EV) energy management systems in a residential setting?

Energy management systems, also known as "load sharing" systems, control the electrical load from an EV charger to prevent overloads to provide access to multiple EV chargers. *

- Extremely familiar
- Moderately familiar
- Somewhat familiar
- Slightly familiar
- Not at all familiar

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I review/check building permit plans")

6. How important do you think it is for strata residents to be able to charge an electric vehicle at home? *

- Extremely important
- Very important
- Fairly important
- Not so important
- Not important at all

Page entry logic:
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LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I review/check building permit plans")

Please answer the next set of questions through the perspective of anPLAN REVIEWER.

We want to understand the full range of barriers and challenges that you, as a plan reviewer, experience or have experienced in the past when reviewing building permit applications for residential EV-Ready developments.

The next set of questions will ask you to indicate and describe these issues, grouped around the following two topics:

- **Infrastructure:** installing EV chargers and hardware
- **Internal Barriers:** internal barriers in your local government and among staff (e.g., development review processes, possessing the adequate knowledge and skills
- **Other:** any other barrier or challenge related to home EV charging not captured by the above

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I review/check building permit plans")

7. **Charging Challenges: Infrastructure**

We are interested only in EV charging in new home construction subject to EV-Ready requirements and not retrofits in already built homes.

What are typical issues that you see when reviewing plans that are subject to residential EV-Ready requirements? Select all that apply.

Documentation and Compliance

- [ ] There was missing or incomplete documentation of how the EV-Ready parking spaces were distributed or supplied in the parking plan of the building
- [ ] The plans do not comply with applicable regulatory standards
- [ ] The plans do not comply with local EV-Ready bylaws: number of EV-Ready parking spaces
- [ ] The plans do not comply with local EV-Ready bylaws: insufficient charging power for each parking space

power for each parking space

- [ ] The plans do not comply with local EV-Ready bylaws: other requirement

EV-Ready Requirements

- [ ] Electrical load increased such that the local distribution requires upgrades
- [ ] Electrical load increased such that the utility requires upgrades

EV Energy Management Systems

- [ ] The EV energy management system to share the electrical load of multiple vehicles was not designed properly and may present operational issues.

- [ ] Other issue not mentioned above
- [ ] None; there have been no issues so far

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I review/check building permit plans")

8. **Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to infrastructure of residential EV charging in developments you review.**

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I review/check building permit plans")

9. **Charging Challenges: Internal Barriers**

We are interested only in EV charging in new home construction subject to EV-Ready requirements and not retrofits in already built homes.

What are typical issues that you experience or have experienced in the past as it relates to internal barriers (e.g., development review processes, possessing the adequate knowledge and skills) when reviewing plans that are subject to residential EV-Ready requirements? Select all that apply.

- [ ] EV-Ready bylaw and technical guidelines are not clearly worded and causes confusion for applicants and approval processes
- [ ] Internal development review processes are not clearly defined for EV-Ready requirements
- [ ] Insufficient training on reviewing EV-Ready requirements
- [ ] None; there have been no issues so far

Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to internal barriers when reviewing plans that are subject to residential EV-Ready requirements

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I review/check building permit plans")

10. **Are there any <u>other</u> issues related to reviewing of residential EV-Ready developments that has not been mentioned yet? If so, please describe:**

Charging Barriers & Challenges (Building Inspector)

Page entry logic:
This page will show when: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I conduct final building inspections prior to occupancy")

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I conduct final building inspections prior to occupancy")

11. What is your level of familiarity with electric vehicle (EV) charging in a residential setting? *

- Extremely familiar
- Moderately familiar
- Somewhat familiar
- Slightly familiar
- Not at all familiar

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I conduct final building inspections prior to occupancy")

12. What is your level of familiarity with electric vehicle (EV) energy management systems in a residential setting?

Energy management systems, also known as "load sharing" systems, control the electrical load from an EV charger to prevent overloads to provide access to multiple EV chargers. *

- Extremely familiar
- Moderately familiar
- Somewhat familiar
- Slightly familiar
- Not at all familiar

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I conduct final building inspections prior to occupancy")

13. How important do you think it is for strata residents to be able to charge an electric vehicle at home? *

- Extremely important
- Very important
- Fairly important
- Not so important
- Not important at all

Page entry logic:
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LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I conduct final building inspections prior to occupancy")

Please answer the next set of questions through the perspective of an BUILDING INSPECTOR.

We want to understand the full range of barriers and challenges that you, as a building inspector, experience or have experienced in the past when conducting final building inspections prior to occupancy for residential EV-Ready developments.

The next set of questions will ask you to indicate and describe these issues, grouped around the following two topics:

- **Infrastructure:** installing EV chargers and hardware
- **Internal Barriers:** internal barriers in your local government and among staff (e.g., development review processes, possessing the adequate knowledge)
- **Other:** any other barrier or challenge related to home EV charging not captured by the above

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I conduct final building inspections prior to occupancy")

14. Charging Challenges: Infrastructure

We are interested only in EV charging in new home construction subject to EV-Ready requirements and not retrofits in already built homes.

What are typical issues that you see when inspecting buildings that are subject to residential EV-Ready requirements? Select all that apply.

Documentation and Compliance

- [ ] There was missing or incomplete documentation of how the EV-Ready parking spaces were distributed or supplied in the parking plan of the building
- [ ] The plans do not comply with applicable regulatory standards
- [ ] The plans do not comply with local EV-Ready bylaws: number of EV-Ready parking spaces
- [ ] The plans do not comply with local EV-Ready bylaws: insufficient charging

power for each parking space

- [ ] The plans do not comply with local EV-Ready bylaws: other requirement

EV-Ready Requirements

- [ ] Electrical load increased such that the local distribution requires upgrades
- [ ] Electrical load increased such that the utility requires upgrades

EV Energy Management Systems

- [ ] The EV energy management system to share the electrical load of multiple vehicles was not designed properly and may present operational issues

- [ ] Other issue not mentioned above
- [ ] None; there have been no issues so far

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I conduct final building inspections prior to occupancy")

15. **Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to infrastructure of residential EV charging in buildings you inspect.**

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I conduct final building inspections prior to occupancy")

16. **Charging Challenges: Internal Barriers**

We are interested only in EV charging in new home construction subject to EV-Ready requirements and not retrofits in already built homes.

What are typical issues that you experience or have experienced in the past as it relates to internal barriers (e.g., possessing the adequate knowledge and skills) when inspecting buildings that are subject to residential EV-Ready requirements? Select all that apply.

- ☐ Lack of communication between plan reviewers and building inspectors on EV-Ready requirements and charging infrastructure
- ☐ EV-Ready bylaw and technical guidelines are not clearly worded and causes confusion for contractors
- ☐ Insufficient training on reviewing EV-Ready requirements
- ☐ None; there have been no issues so far

Describe any other issues and/or provide additional detail to your answer above that would be helpful for us to understand on challenges related to internal barriers when inspecting buildings that are subject to residential EV-Ready requirements.

LOGIC Hidden unless: #2 Question "What duties do you perform in your work position? Select all that apply." is one of the following answers ("I conduct final building inspections prior to occupancy")

17. **Are there any <u>other</u> issues related to inspecting buildings that are subject to residential EV-Ready requirements that has not been mentioned yet? If so, please describe:**

Suggestions and Other Comments

18. Do you have any suggestions for local governments who are responsible for regulating the construction of new residential buildings to improve the experience of **<u>home</u>** electric vehicle charging? *Please indicate whether your suggestion is for single-detached, semi-detached homes (e.g., duplex), townhomes, or apartment/condo buildings.*

19. Do you have anything else you would like to share about EV-Ready requirements for residential developments?

Thank You!

Thank you for filling out the survey.

We will be conducting follow-up interviews or focus groups with building officials in June/July 2025 as part of the second phase of this research project to learn more about barriers and challenges to EV charging at home.

LOGIC Show/hide trigger exists.

20. Please indicate whether you would like to participate in this research. *

- Yes, I agree to be contacted for a follow-up interview/focus group
- No, I do not agree to be contacted for a follow-up interview/focus group

VALIDATION %s format expected

LOGIC Hidden unless: #20 Question "Please indicate whether you would like to participate in this research." is one of the following answers ("Yes, I agree to be contacted for a follow-up interview/focus group")

21. Please enter your email address that we can contact you through to participate in a follow-up interview or focus group. *

Thank You!

Thank you for taking our survey. Your response is very important to us.

APPENDIX D: SURVEY MAILOUT POSTCARD

Do you own or lease an electric vehicle? Or are you thinking about one in the future?

Tell us more for a chance to win a $150 gift card!

We want to hear about your experience with charging your electric vehicle (EV):

1. **Own/lease an EV:** Issues and challenges you have had with charging at your residence.
2. **Do not own/lease an EV:** How having access to charging at home may influence your next vehicle decision.

** Local government partners include City of New Westminster, City of Richmond, City of Vancouver, Township of Langley, and The University of British Columbia.*

Your home/building is built to be EV-ready, which means that an electrical outlet may be available near your parking stall.

BC Hydro and partnering local governments* want to identify challenges that you face in accessing EV charging at home to improve the experience for current/future EV drivers across BC.

Scan the QR code or visit the website link to complete the survey for a chance to win! Refer to the back of the postcard for the survey deadline.

Survey website (visit or scan):
www.evreadystudy.com

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

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VANCOUVER, BC V6B 2W2

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8471668

Enter for a chance to win a $150 gift card!

Survey deadline is 11:59 pm on June 22, 2025 or 4 weeks after receipt in your mailbox due to the potential Canada Post strike.

Survey website (visit or scan):
www.evreadystudy.com

Contact:
Maya Korbynn
mkorbynn@wattconsultinggroup.com
778-309-1253 ext. 432

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CITY OF NANAIMO
THE HARBOUR CITY

BC Hydro
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1. **Own/lease an EV:** Issues and challenges you have had with charging at your residence.
2. **Do not own/lease an EV:** How having access to charging at home may influence your next vehicle decision.

Your home/building may be built to be EV-ready, which means that an electrical outlet may be available near your parking stall.

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CITY OF VICTORIA

BC Hydro
Power smart

RETURN TO:
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mkorbynn@wattconsultinggroup.com
778-309-1253 ext. 432

APPENDIX E: SURVEY RESPONDENT OVERVIEW

Table E1 provides a detailed breakdown of the responses by study participant group and community location. **Table E2** provides a breakdown of the number of buildings represented by the resident respondents.

Table E1: Survey Response Overview by Study Participant Group

Study Participant Group Type	Study Participant Group and Driver Status	Community							Sub-total	Total
		Metro Vancouver					Vancouver Island			
		Vancouver	Richmond	Langley Township	New West	UBC	Victoria	Nanaimo		
Resident	Strata Resident, MURB	2	4	5	15	1	5	2	34	103
	Current EV Driver	1	3	3	11	0	2	2	22	
	Prospective EV Driver	1	1	2	4	1	3	0	12	
	Strata Resident, SFD & MP	8	1	28	6	0	0	1	44	
	Current EV Driver	6	1	18	4	0	0	0	29	
	Prospective EV Driver	2	0	10	2	0	0	1	15	
	Non-Strata Resident, SFD & MP	14	2	3	1	0	1	4	25	
	Current EV Driver	7	2	3	0	0	1	2	15	
	Prospective EV Driver	7	0	0	1	0	0	2	10	
	Total	**24**	**7**	**36**	**22**	**1**	**6**	**7**	**103**	
Strata Council Member	Strata Council Member	4	2	5	2	0	0	0	11	11
Building Professional	Electrical Engineer	Not applicable							11	34
	Electrical Contractor								23	
Building Official	Municipal Plan Checker	2	0	3	2	0	3	5	13	18
	Municipal Building Inspector	1	1	2	2	0	1	0	5	

Notes: MURB = multi-unit residential building; SFD & MP = single-family dwelling and multiplex

Table E2: Survey Response Overview by Building Type

Study Participant Group Type	Building Type	Community							Sub-total	Total
		Metro Vancouver					Vancouver Island			
		Vancouver	Richmond	Langley Township	New West	UBC	Victoria	Nanaimo		
Resident	Strata MURB	2	2	2	3	1	3	1	14	64
	Strata SFD & MP	7	1	14	2	0	0	1	25	
	Non-Strata SFD & MP	14	2	3	1	0	1	4	25	
	Total	**23**	**5**	**19**	**6**	**1**	**4**	**6**	**64**	
Strata Council Member	Strata MURB	2	1	0	2	0	0	0	5	13
	Strata SFD & MP	2	1	5	0	0	0	0	8	
	Total	**4**	**2**	**5**	**2**	**0**	**0**	**0**	**13**	

Notes: MURB = multi-unit residential building; SFD & MP = single-family dwelling and multiplex. Strata council members completed the survey questionnaire in both their capacity as a resident and as a strata council member; that means the building count for strata council members are inclusive of the building count for residents.

APPENDIX F: SURVEY RESULTS

Resident Charging Satisfaction

Overall, how satisfied are you with your experience charging your vehicle at home?
5-point satisfaction scale, where 0 = very dissatisfied and 4 = very satisfied

Background

Charging satisfaction among current EV drivers is reported based on where drivers usually charge their vehicle:[1,2]

- **Home dedicated charging:** "inside in my private garage", "outside on my private driveway", or "in my assigned parking stall in my building's parking lot, carport, or parkade."
- **Home shared charging**: "in a parking stall equipped with an outlet or EV charging station for shared use in my building's parking lot, carport, or parkade."
- **Community charging**: "at a public EV charging location on a street near my home", "at a public EV charging location in the community (e.g., grocery store, community centre, car dealership, parkade, etc.)", or "at my workplace."

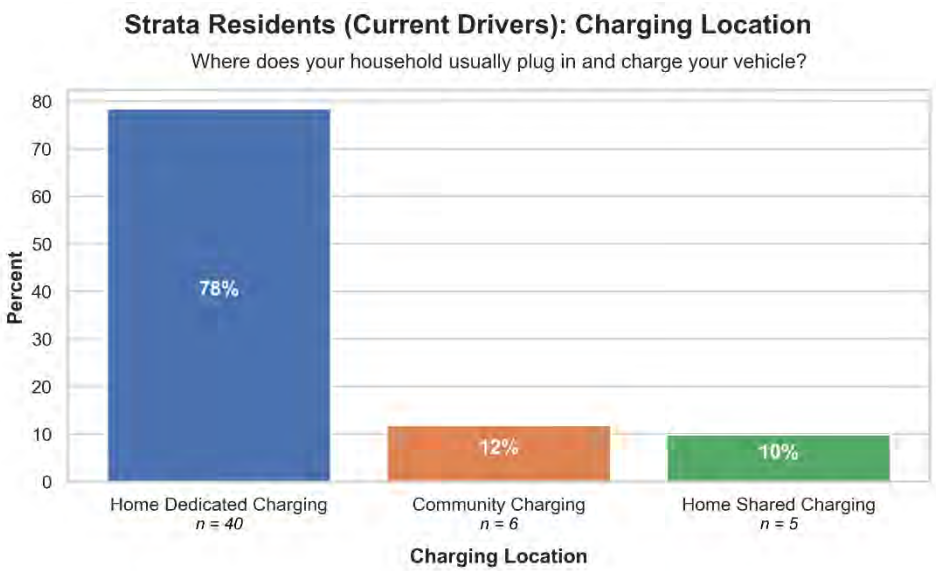
Results

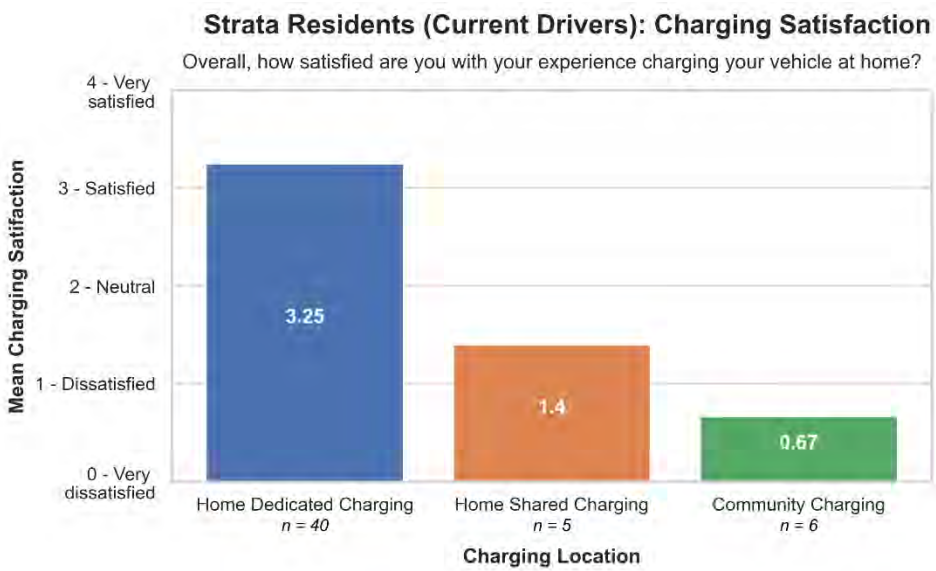
Results are reported for current EV drivers in strata MURBs/SFD & multiplex combined:

- Current EV drivers who have access to home dedicated charging represent the majority of respondents (78%), followed by those who are unable to charge at home and rely exclusively on community charging (12%). One-in-ten (10%) drivers have access to home shared charging only.
- Drivers with access to home dedicated charging reported being most satisfied with their home charging experience with a mean score of 3.3.
- In contrast, drivers with access to home shared charging or who exclusively rely on community charging are dissatisfied with their home charging experience (or lack thereof), with a lower mean score of 1.4 and 0.7 respectively.

[1] Question: "Where does your household usually plug in and charge your vehicle? Select all that apply."

[2] If a respondent charged in their assigned parking stall and at a public EV charging location, they were classified as having access to "home dedicated charging." If they charged in a shared parking stall and at their workplace, they were classified as having access to "home shared charging." If they exclusively charged at a public location, they were classified as having access to "community charging" only.


Strata Residents (Current Drivers): Charging Location
Where does your household usually plug in and charge your vehicle?
Percent
80
70
60
50
40
30
20
10
0
78%
12%
10%
Home Dedicated Charging
n = 40
Community Charging
n = 6
Home Shared Charging
n = 5
Charging Location


Strata Residents (Current Drivers): Charging Satisfaction
Overall, how satisfied are you with your experience charging your vehicle at home?
Mean Charging Satifaction
4 - Very satisfied
3 - Satisfied
2 - Neutral
1 - Dissatisfied
0 - Very dissatisfied
3.25
1.4
0.67
Home Dedicated Charging
n = 40
Home Shared Charging
n = 5
Community Charging
n = 6
Charging Location

Resident Charging Infrastructure

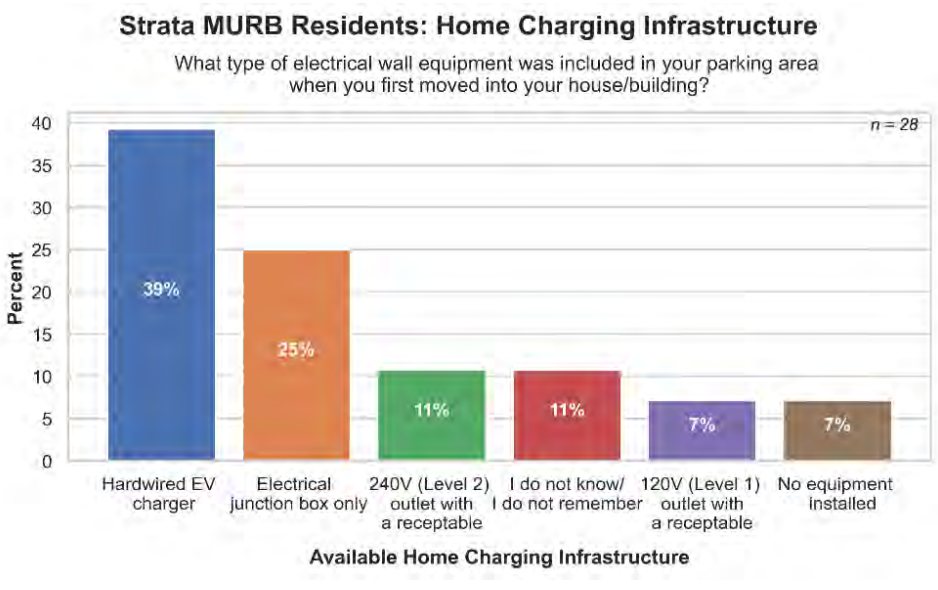
Charging Outlet Type

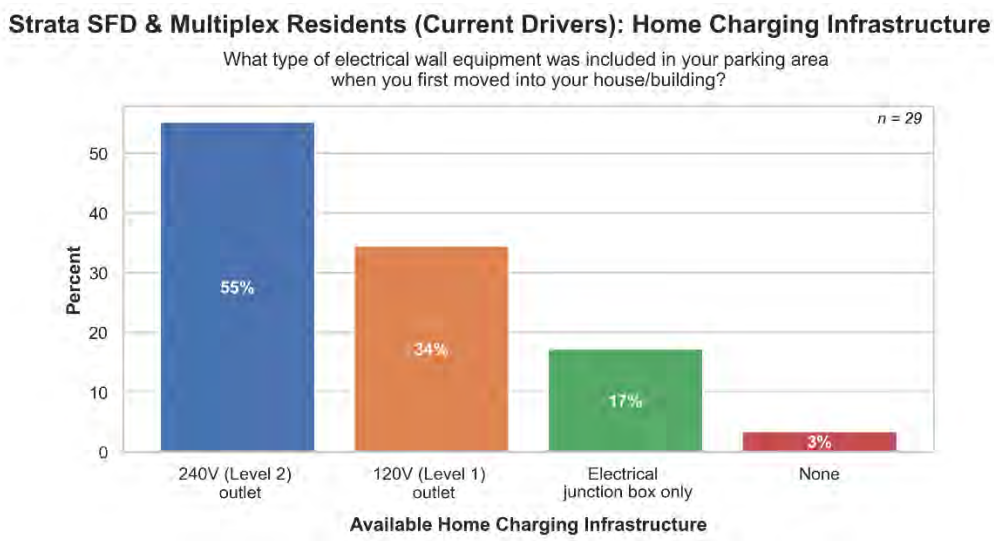
What type of electrical wall equipment was included in your parking area when you first moved into your house/building? Select all that apply.

Results

Results are reported for current/prospective EV drivers combined, by strata MURBs and strata SFD & multiplex:

- Among strata MURB residents, a hardwired EV charger (39%) was the top commonly reported equipment pre-installed when residents first moved into their EV-Ready home, followed by an electrical junction box (25%) and a Level 2 receptacle (11%).
- Among strata SFD & multiplex residents, a Level 2 receptacle (55%) was the top commonly reported equipment pre-installed when residents first moved in.
- This means the majority of residents reported overall high EV-ready compliance in their buildings, ranging from EV-ready compliant outlets (e.g., electrical junction box or Level 2 receptacle) to full EV charger installations. However, there are a notable number of residents that had non-compliant outlets, either consisting of a Level 1 receptacle only or no energized outlet altogether





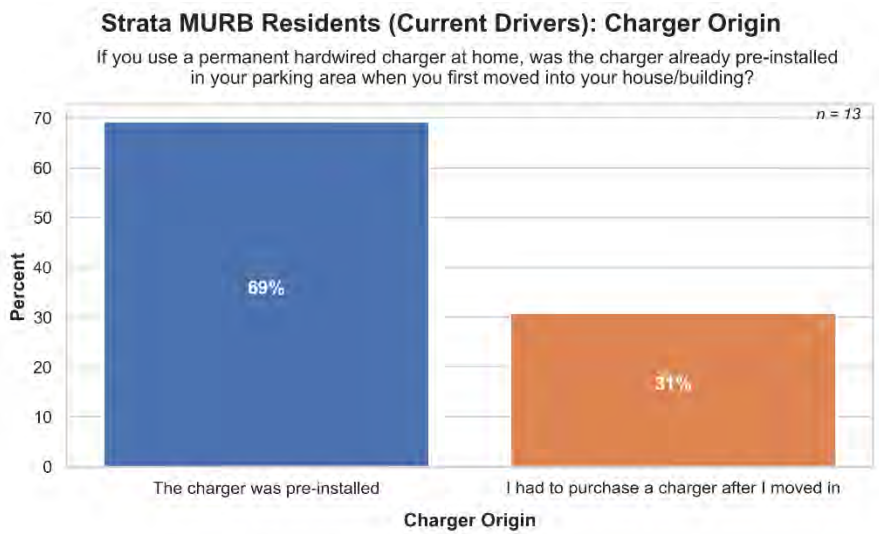
Charger Equipment Origin

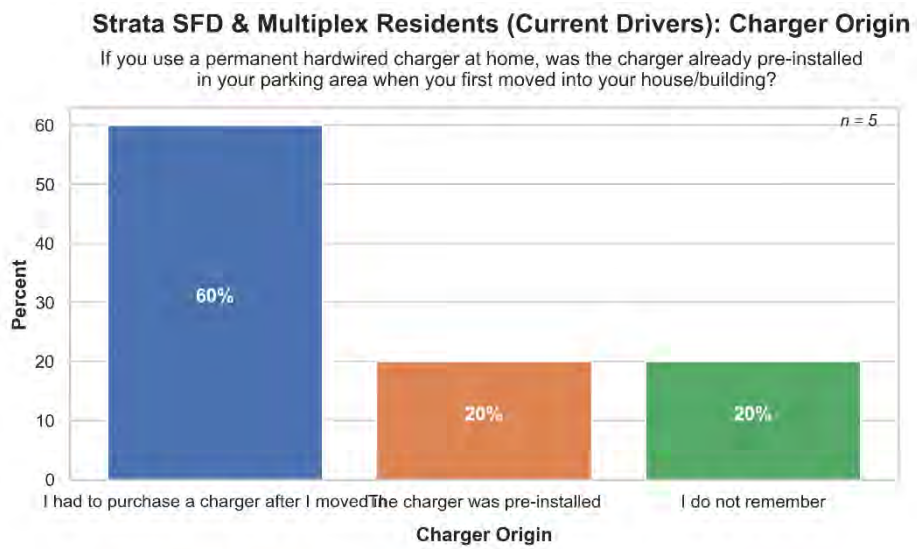
If you use a permanent hardwired charger at home, was the charger already pre-installed in your parking area when you first moved into your house/building?

Results

Results are reported for current EV drivers, by strata MURBs and strata SFD & multiplex:

- Among current EV drivers, two-thirds (69%) of strata MURB residents and two-in-ten (20%) of strata SFD & MP residents had their permanent hardwired charger pre-installed when they first moved into their EV-ready home.[3]





[3] There is the potential that respondents may have included situations where the homeowner purchased and installed the charger in advance prior to moving in.

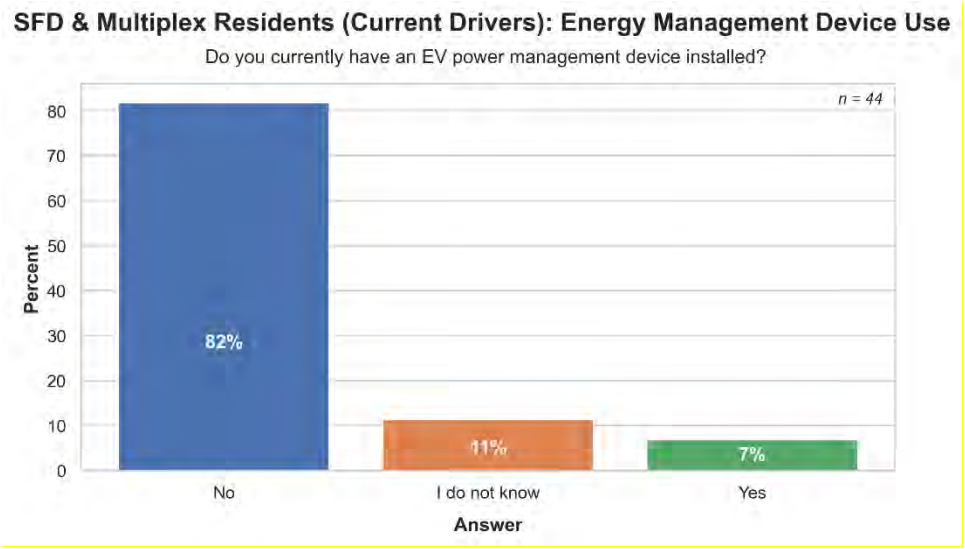
Power Management Devices

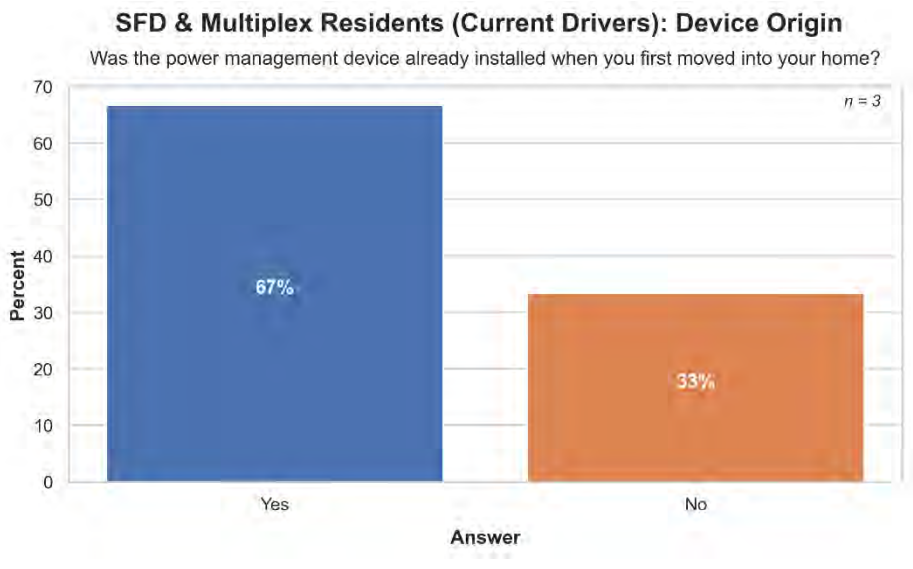
Do you currently have an EV power management device installed? *Electric vehicle power management devices control the electrical load from an electric vehicle (EV) charger to prevent overloads on your home's electrical panel. They are also known as energy management systems, energy or smart dividers, energy managers, smart splitters, smart switches, or load managers.* **Was the power management device already installed when you first moved into your home?**

Results

Results are reported for current EV drivers in strata/non-strata SFD & multiplex combined:

- Three-quarters (76%) of current EV drivers reported not having an EV power management device installed in their EV-ready home.
- Among the handful of drivers that have a power management device installed, two out of three drivers reported it was pre-installed. For the single resident who purchased their device after moving into their home, they used blog articles to inform their purchase decision and purchased the device from an online retailer.





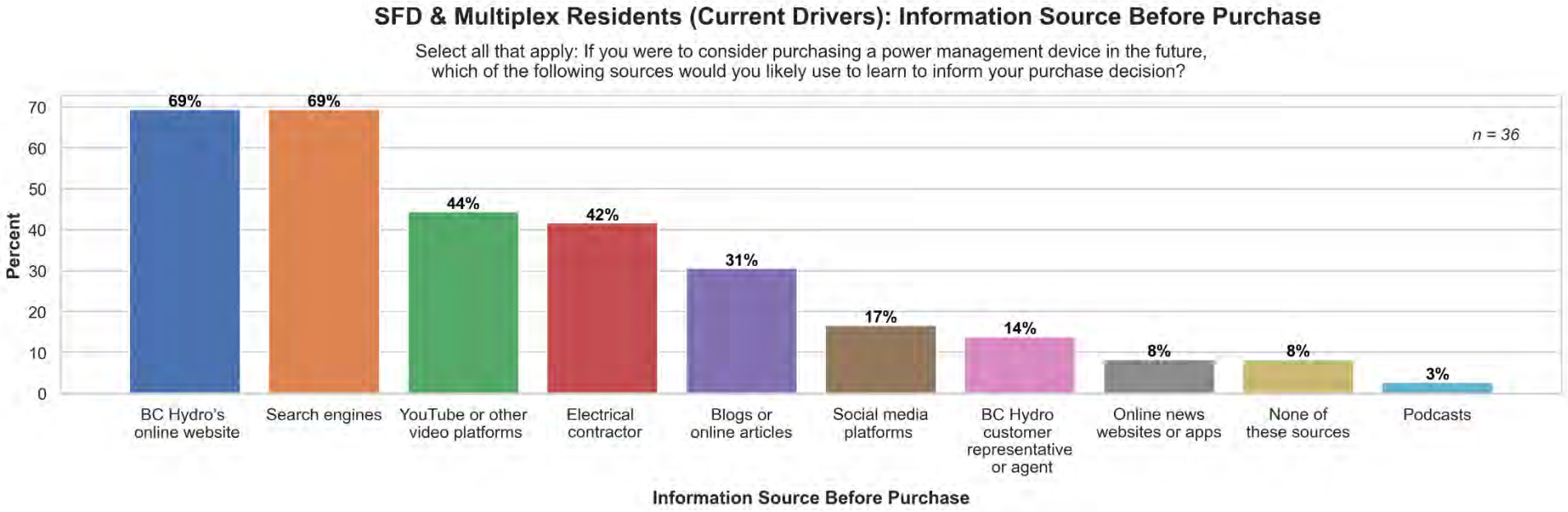
Power Management Device Information Sources

If you were to consider purchasing a power management device in the future, which of the following sources would you likely use to learn to inform your purchase decision? Select all that apply.

Results

Results are reported for current EV drivers in strata/non-strata SFD & multiplex combined:

- Search engines and BC Hydro's online website are the two most popular sources of information that current EV drivers reported they would use to inform a purchase decision on EV power management devices at 69%, followed by YouTube (or other video platforms) and electrical contractor at 44% and 42% respectively.



Resident Charging Management

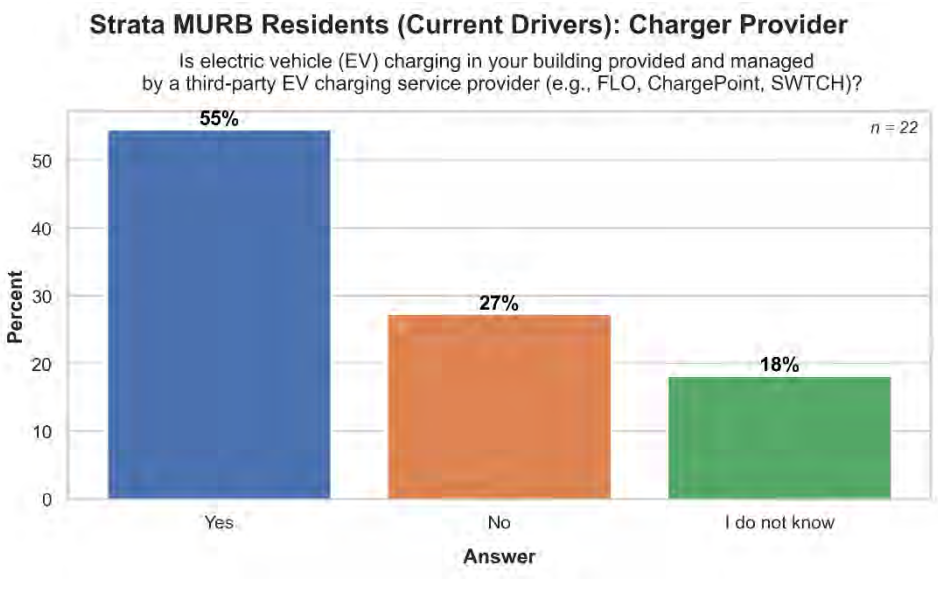
Charging Service Provider

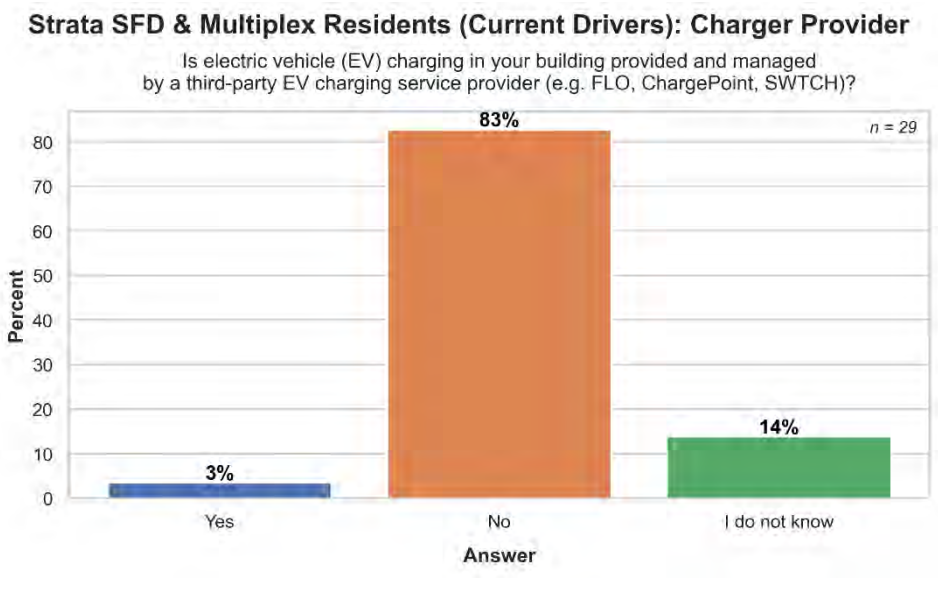
Is electric vehicle (EV) charging in your building provided and managed by a third-party EV charging service provider (e.g., FLO, ChargePoint, SWTCH)?

Results

Results are reported for current EV drivers, by strata MURBs and strata SFD & multiplex:

- Among current EV drivers, half (55%) of strata MURB residents reported having an EV charging service provider managing their building and only 3% of respondents for strata SFD & multiplex.





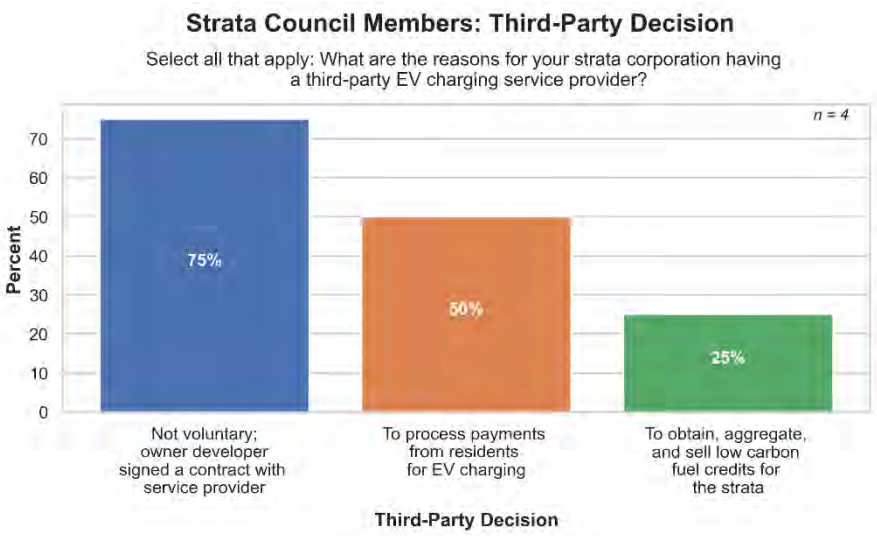
Charging Service Provider Reason

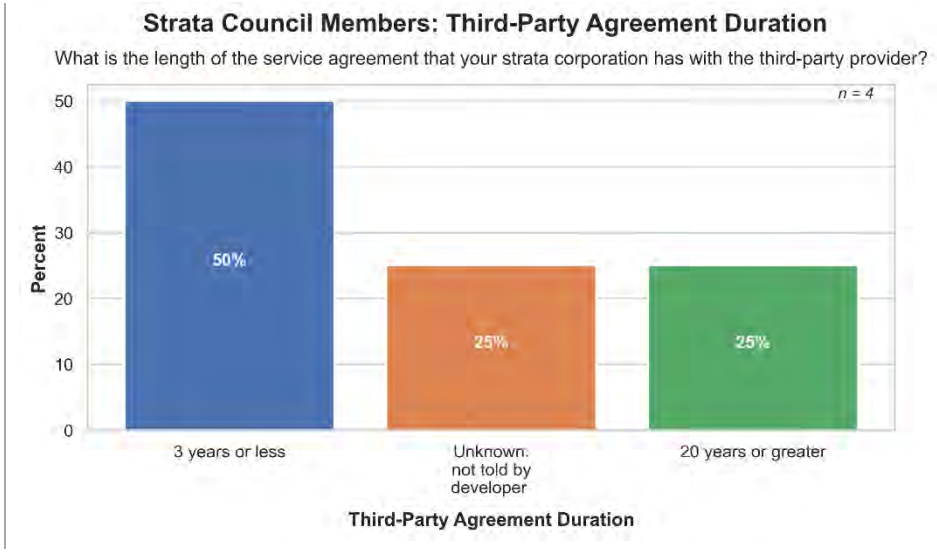
What are the reasons for your strata corporation having a third-party EV charging service provider? Select all that apply. **What is the length of the service agreement that your strata corporation has with the third-party provider?**

Results

Results are reported for strata council members in strata MURBs:

- The majority of strata council members living in strata MURBs report have a contract with an EV charging service provider as a result of the owner/developer signing a contract with the provider prior to strata formation.
- Among the handful of strata council members in a strata corporation that have an EV charging service provider, three out of four reported it was not voluntary as the owner/developer signed a contract prior to strata formation. The single strata council member in a building where it was not voluntary reported it was to process payments for EV charging.





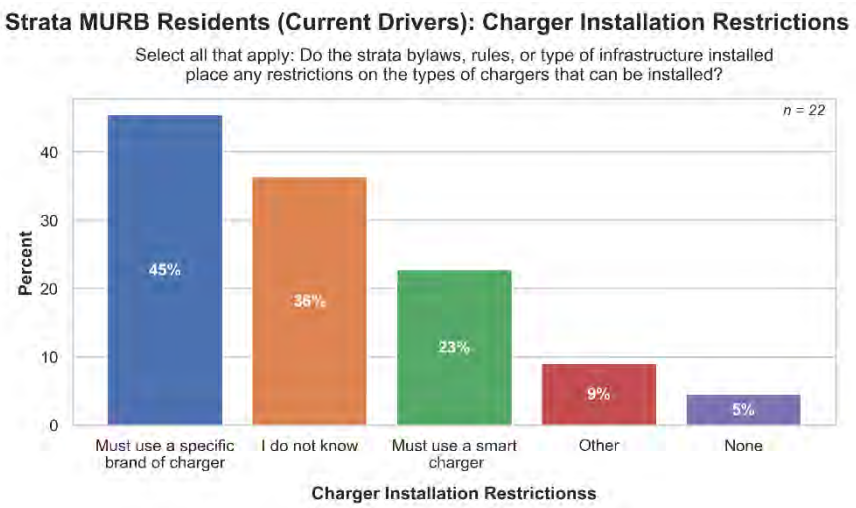
Charger Installation Type Restrictions

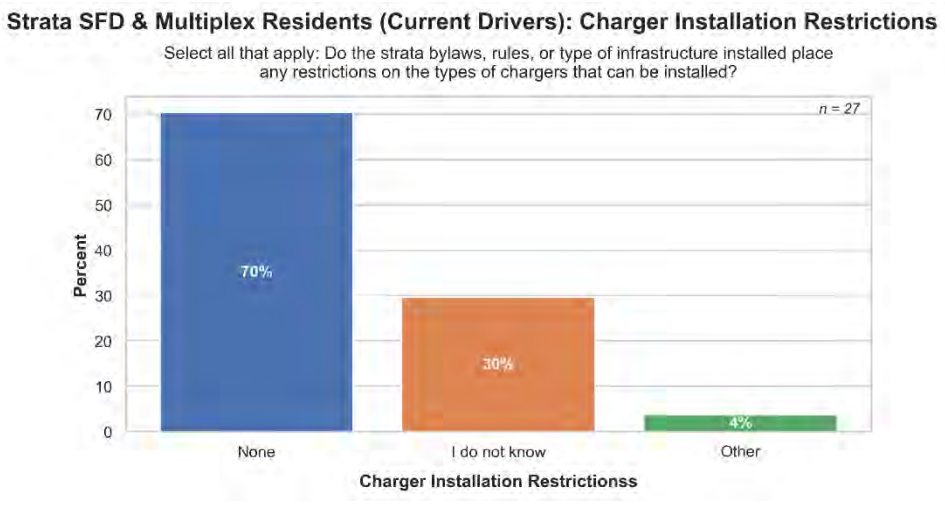
Do the strata bylaws, rules, or type of infrastructure installed place any restrictions on the types of chargers that can be installed? Select all that apply.

Results

Results are reported for current EV drivers, by strata MURBs and strata SFD & multiplex:

- Among current EV drivers, strata MURB residents report the use of a specific brand of charger (45%) and use of a smart charger (23%) as the top two restrictions required by their strata corporation. In contrast, strata SFD & multiplex residents do not generally have bylaws or rules restricting the types of chargers that drivers can use.





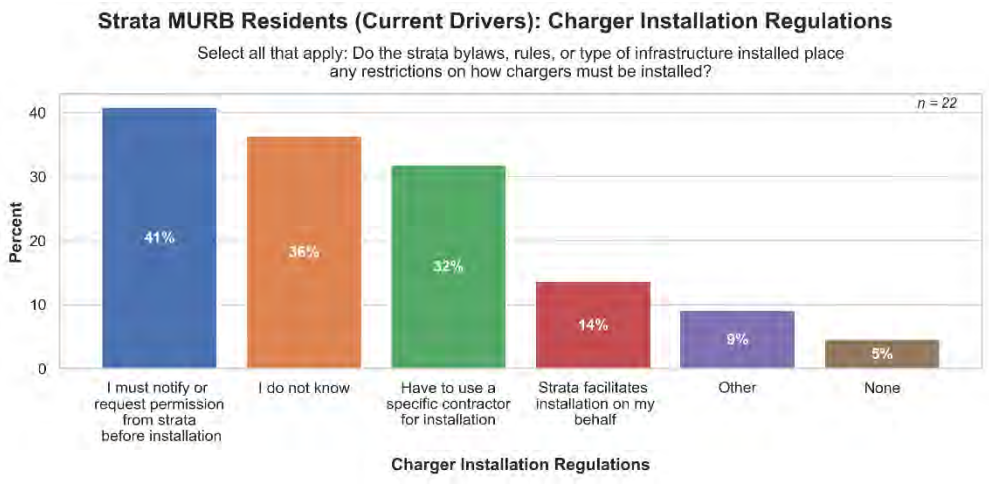
Charger Installation Restrictions

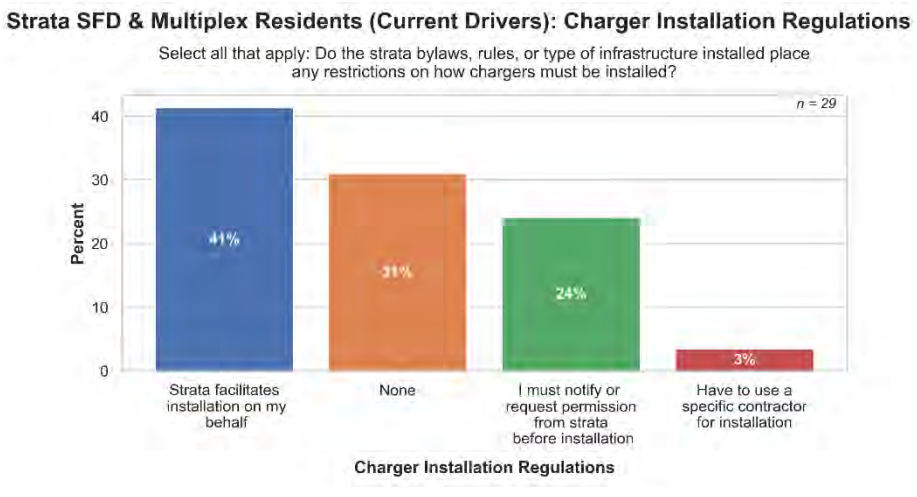
Do the strata bylaws, rules, or type of infrastructure installed place any restrictions on how chargers must be installed? Select all that apply.

Results

Results are reported for current EV drivers, by strata MURBs and strata SFD & multiplex:

- Among current EV drivers, four-in-ten (41%) strata MURB residents must notify or request permission from the strata before installation, followed by a third (32%) needing to use a specific electrical contractor for the installation of an EV charger.
- In contrast, four-in-ten (41%) strata SFD & multiplex have no regulations on EV charging installations. Among those that do, a quarter (24%) of residents must notify or request permission from the strata before installation.





Resident Charging Behaviour: Strata MURBs

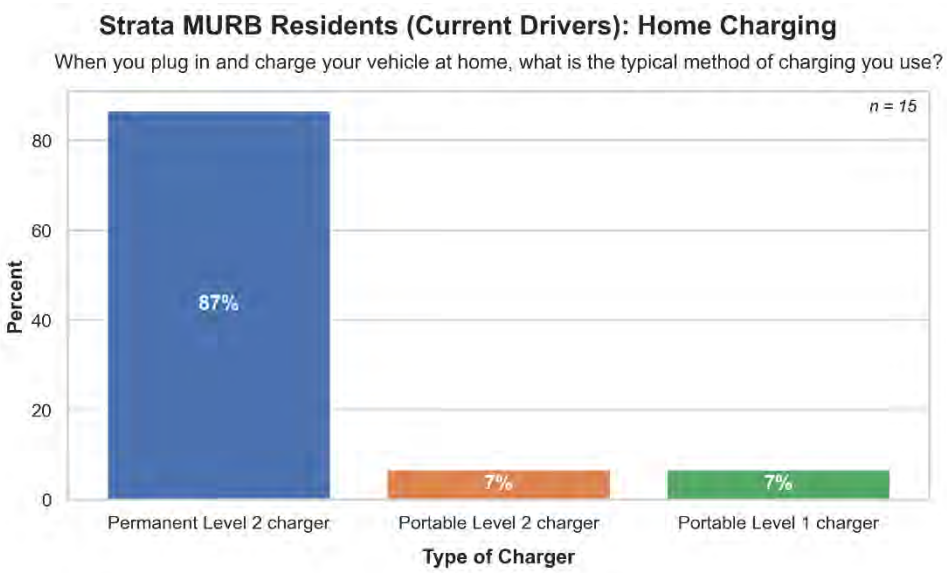
Charging Method

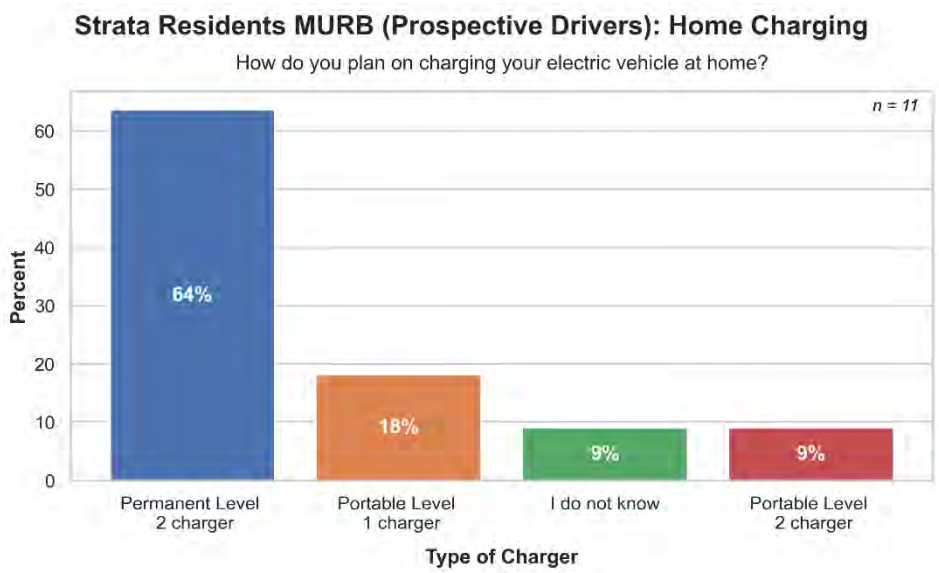
Current EV Driver: **When you plug in and charge your vehicle at home, what is the typical method of charging you use?**
Prospective EV Driver: **How do you plan on charging your electric vehicle at home?**

Results

Results are reported by current EV drivers and prospective EV drivers in strata MURBs:

- Among current EV drivers, permanent hardwired EV chargers are the predominant form of charging (87%). Among prospective EV drivers, the majority of respondents anticipate using a permanent hardwired EV charger (64%).
- For both current and prospective EV drivers, a small number use or anticipate using a portable plug-in Level 1 charger at 7% and 18% respectively. This behaviour may be attributed to situations where the driver only has access to a Level 1 receptacle in their non-compliant EV-Ready parking stall, or they are unable to install a Level 2 EV charger.





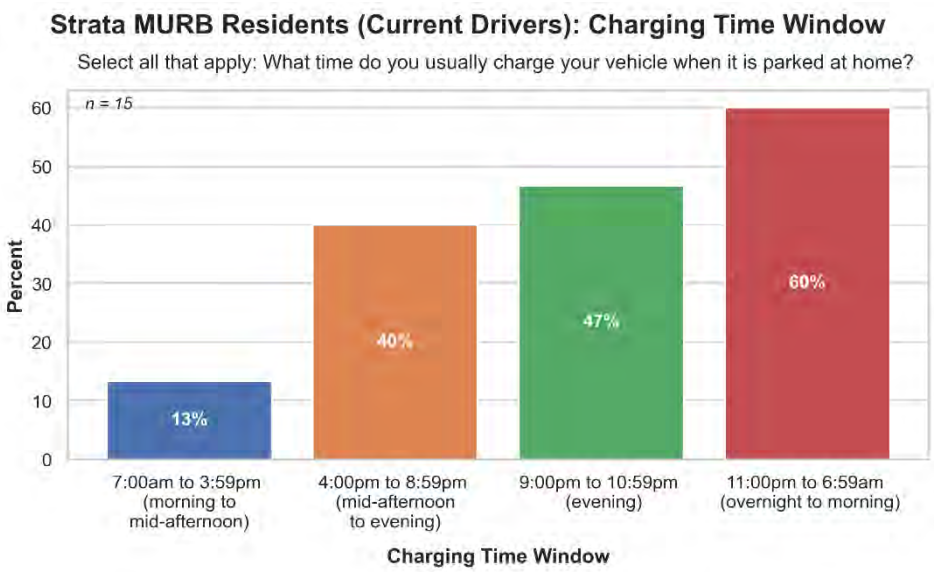
Charging Time Window and Scheduling

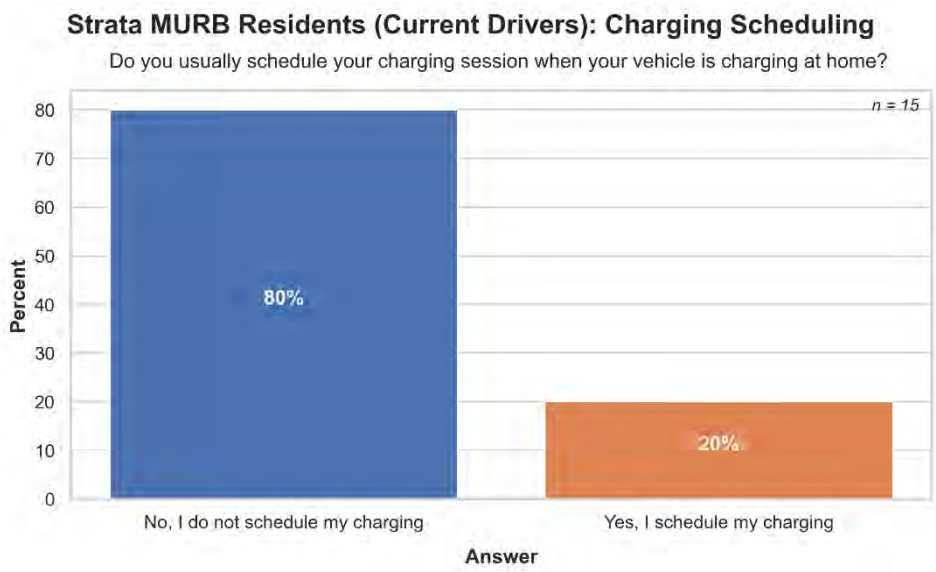
What time do you usually charge your vehicle when it is parked at home? Select all that apply. **Do you usually schedule your charging session when your vehicle is charging at home? *Scheduling in this context means you pre-program your vehicle to draw energy from your charger and actively charge only during a defined scheduled time of the day.***

Results

Results are reported for current EV drivers in strata MURBs:

- Six-in-ten (60%) current EV drivers regularly charge their vehicle overnight from 11:00 pm to 6:59 am. Almost half (47%) of the drivers begin their charge in the evening (9:00 to 10:59 pm) and four-in-ten drivers begin their charge in the mid-afternoon to evening (4:00 to 8:59 pm).
- More than three-quarters (80%) of current EV drivers do not schedule their charging sessions.
- For background, time-of-day pricing is an optional for all of BC Hydro's residential customers except for account types that cover common areas of MURBs or customers who don't have a connected smart meter that communicates remotely with BC Hydro.





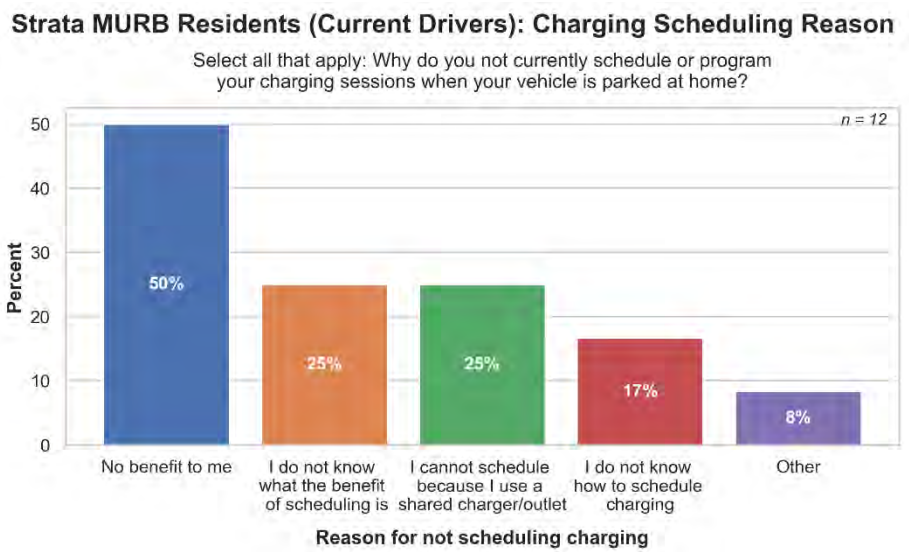
Charging Scheduling Reason and Method

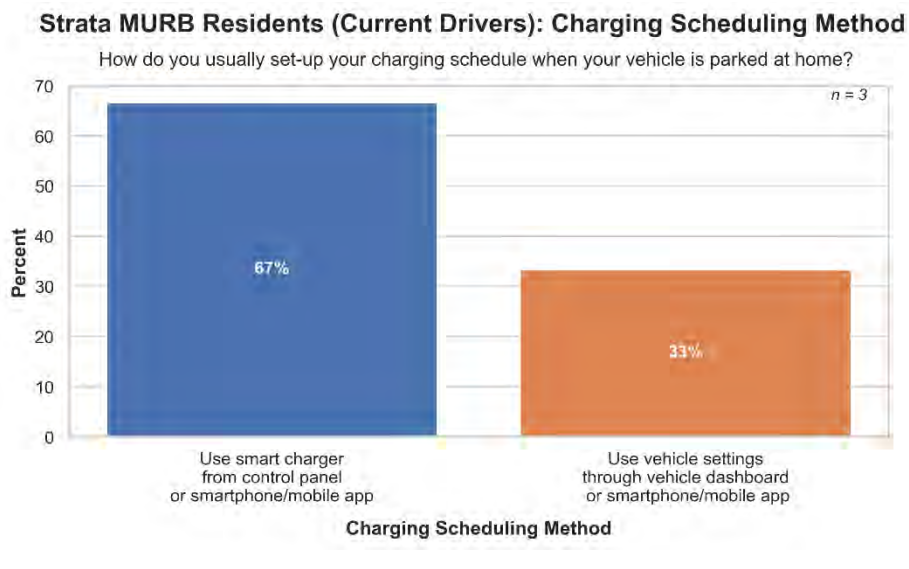
Why do you not currently schedule or program your charging sessions when your vehicle is parked at home? Select all that apply. **How do you usually set-up your charging schedule when your vehicle is parked at home? Select all that apply.**

Results

Results are reported for current EV drivers in strata MURBs:

- Three-quarters (75%) of current EV drivers do not schedule their charging session as they reported no benefit or do not know the benefit. Almost two-in-ten (17%) reported not knowing how to schedule their charging session.
- Among drivers that do schedule their charging, the majority (67%) typically schedule using their smart charger.





Resident Charging Behaviour: Strata & Non-Strata SFD & Multiplex

Charging Time Window and Scheduling

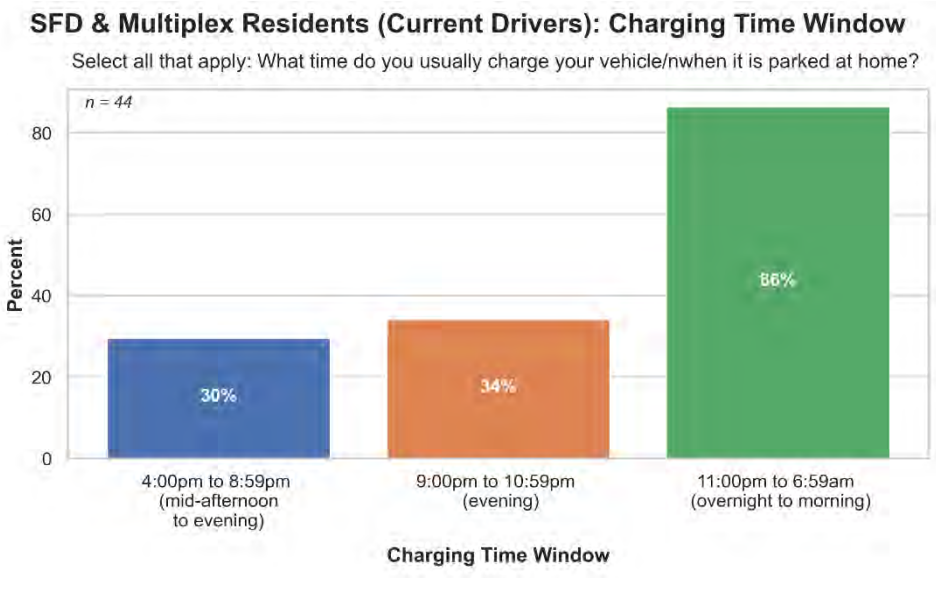
What time do you usually charge your vehicle when it is parked at home? Select all that apply.

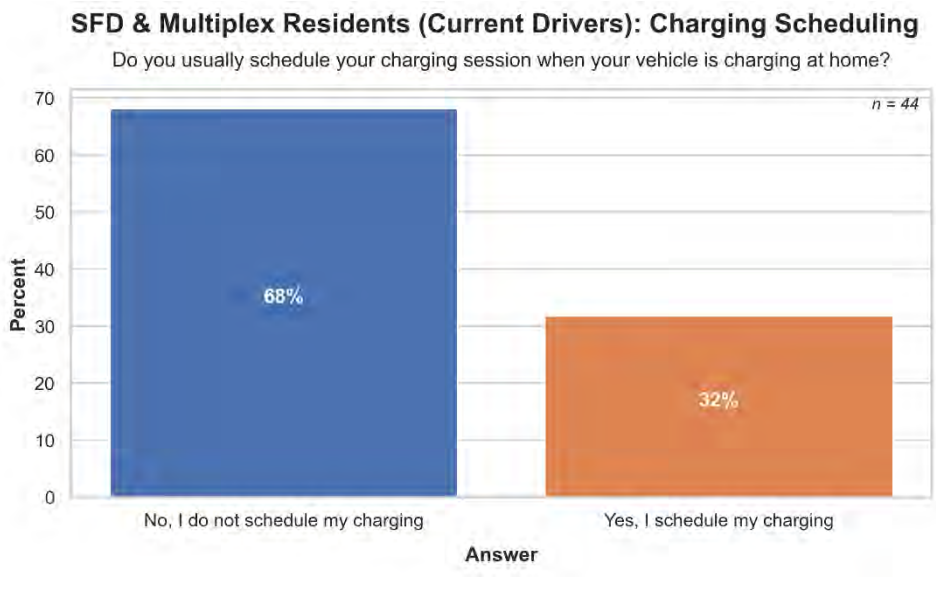
Do you usually schedule your charging session when your vehicle is charging at home? *Scheduling in this context means you pre-program your vehicle to draw energy from your charger and actively charge only during a defined scheduled time of the day.*

Results

Results are reported for current EV drivers in strata/non-strata SFD & multiplex combined:

- More than three-quarters (86%) of current EV drivers charge their vehicle overnight from 11:00 pm to 6:59 am. More than a third (34%) of drivers begin their charge in the evening (9:00 to 10:59 pm) and three-in-ten drivers begin their charge in the mid-afternoon to evening (4:00 to 8:59 pm).
- Over two-thirds (68%) of current EV drivers do not schedule their charging sessions.





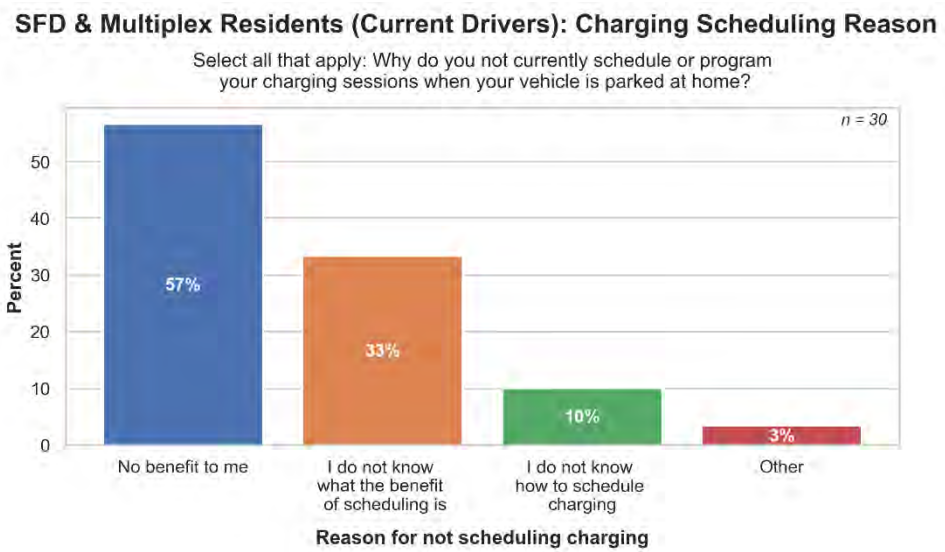
Charging Scheduling Reason and Method

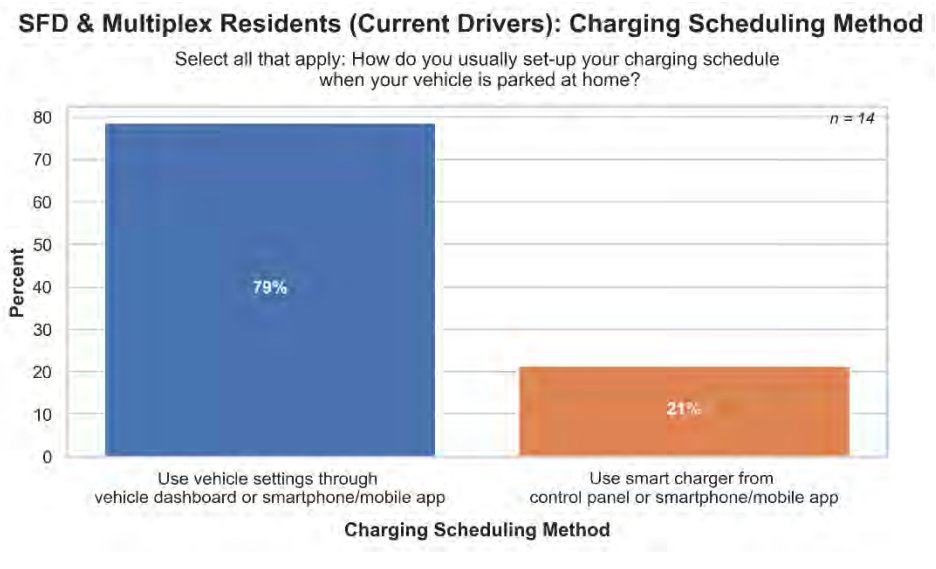
Why do you not currently schedule or program your charging sessions when your vehicle is parked at home? Select all that apply. **How do you usually set-up your charging schedule when your vehicle is parked at home? Select all that apply.**

Results

Results are reported for current EV drivers in strata/non-strata SFD & multiplex combined:

- Over on-half (57%) of current EV drivers do not schedule their charging session as they reported no benefit and one-third (33%) of drivers do not know the benefit. One-in-ten (10%) reported not knowing how to schedule their charging session.
- Among drivers that do schedule their charging, the majority (79%) typically schedule using their vehicle settings.





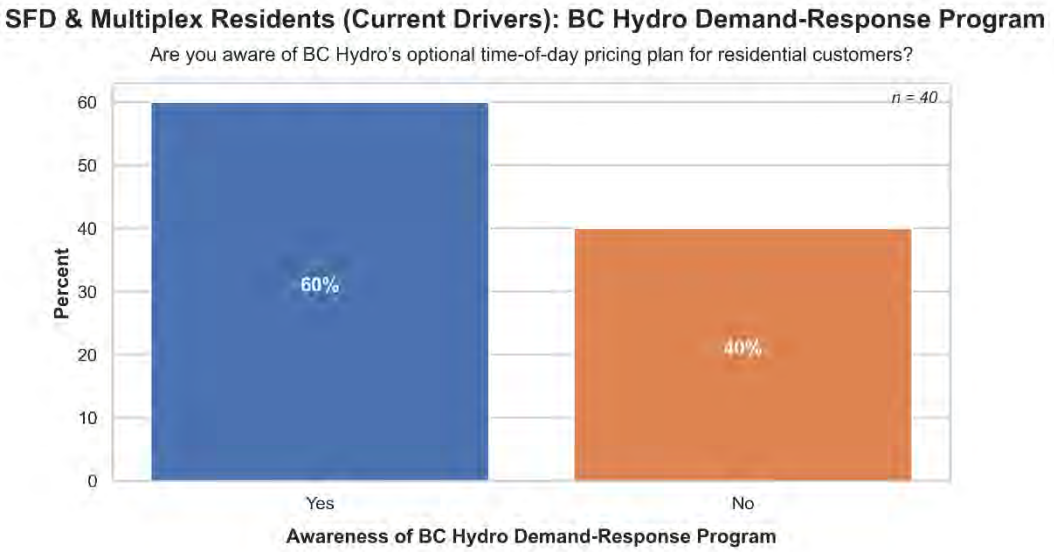
BC Hydro Time-of-Day Program

Are you aware of BC Hydro's optional time-of-day pricing plan for residential customers? *On this plan, electricity is more expensive from 4 to 9 pm and cheaper overnight from 11pm to 7 am.*

Results

Results are reported for current EV drivers in strata/non-strata SFD & multiplex combined:

- Six-in-ten (60%) current EV drivers are aware of BC Hydro's optional demand-response program.
- Two-thirds (66%, or 29 out of 44 current EV drivers in SFD & multiplex) have charging time-of-day patterns that would be compatible with a demand-response program.



BC Hydro Peak Saver Program

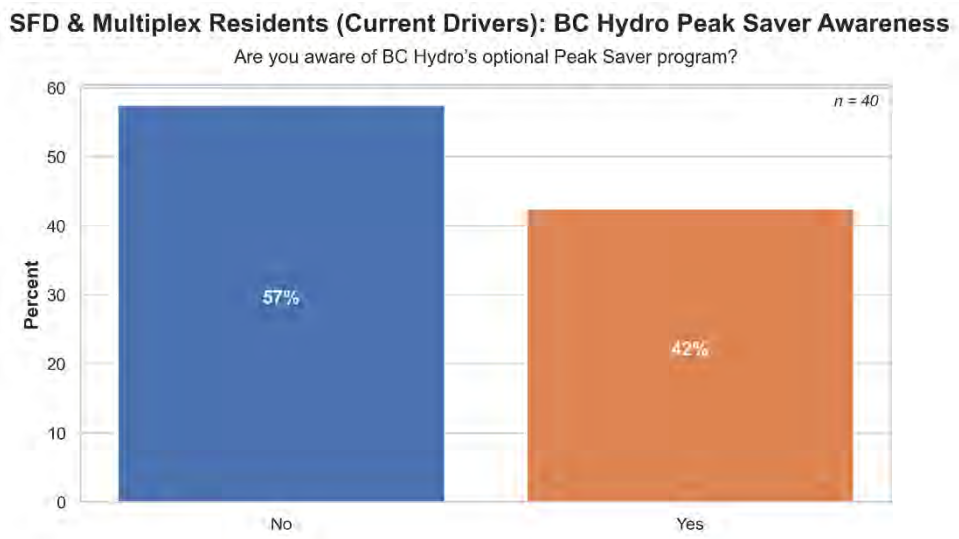
Are you aware of BC Hydro's optional Peak Saver program? *In this program, you receive a financial reward every winter and summer season if your eligible electric vehicle charger is enrolled for BC Hydro to remotely delay charging during peak events—times of high electricity demand.*

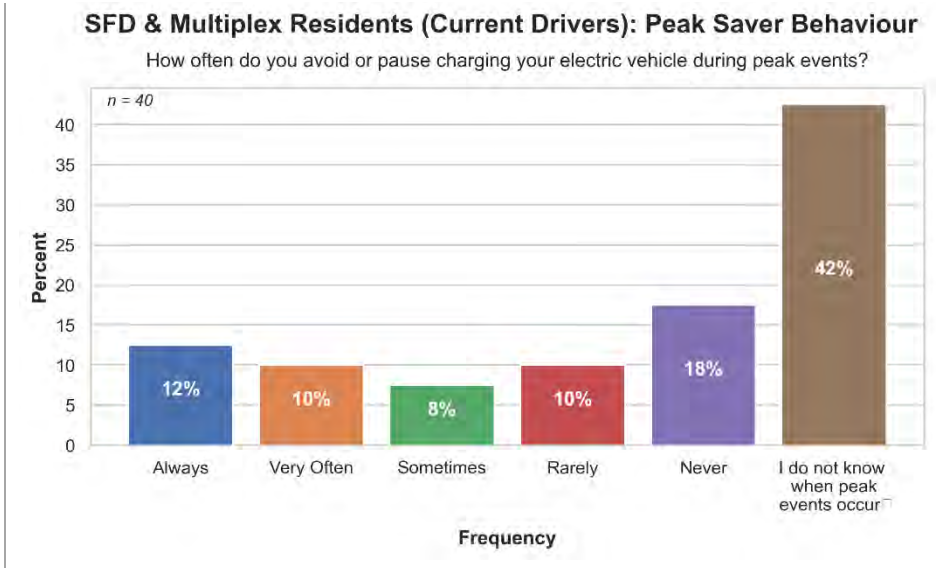
How often do you avoid or pause charging your electric vehicle during peak events? *Peak events are short periods where electricity use across the grid is expected to be highest, typically during very cold or hot weather. There is no set schedule and there can be up to 20 events each winter or summer, depending on changing conditions on the BC Hydro grid.*

Results

Results are reported for current EV drivers in strata/non-strata SFD & multiplex combined:

- Over half (57%) of current EV drivers are aware of BC Hydro's optional program peak saver program.
- Almost three-quarters (70%) of current EV drivers rarely, never, or do not know when peak events occur. For clarity, this includes all drivers regardless of whether they were aware or not of the peak saver program.





EV-Ready Challenges: Infrastructure

For **residents**, one-third of both current EV drivers (35%) and prospective EV drivers (33%) reported no previous, current, or anticipated challenges related to installing and using EV charging in their building. For the remaining two-thirds (65%) of current drivers, the need to hire an electrical contractor to install a charger was cited as the top reason impacting their experience. For prospective EV drivers, the high cost of purchasing an EV charger was cited as the top reason impacting their experience.

For **strata council members**, the top challenge reported by almost half (46%) of respondents was non-compliant EV-Ready parking stalls, where electrical outlets or electrical junction boxes suitable for EV charging were missing.

For **electrical engineers** and **electrical contractors**, the top challenge reported was the electrical demand generated by EV charging as a result of EV-Ready requirements was considered to be too high from their perspective.[4] This resulted in general electrical infrastructure upgrades or local distribution upgrades (64% and 45% of engineers respectively) and oversized local distribution (55% of contractors).

- For engineers, unclear or inaccessible EV-Ready requirements was cited as the second most important barrier for over half of respondents (55%), followed by inadequate energy management systems available in the market (45%).
- For contractors, the lack of physical space to accommodate either energy management system-related equipment (41%) or general EV-Ready hardware (32%) and insufficient details on engineering drawings (36%) were cited as the other top three challenges.

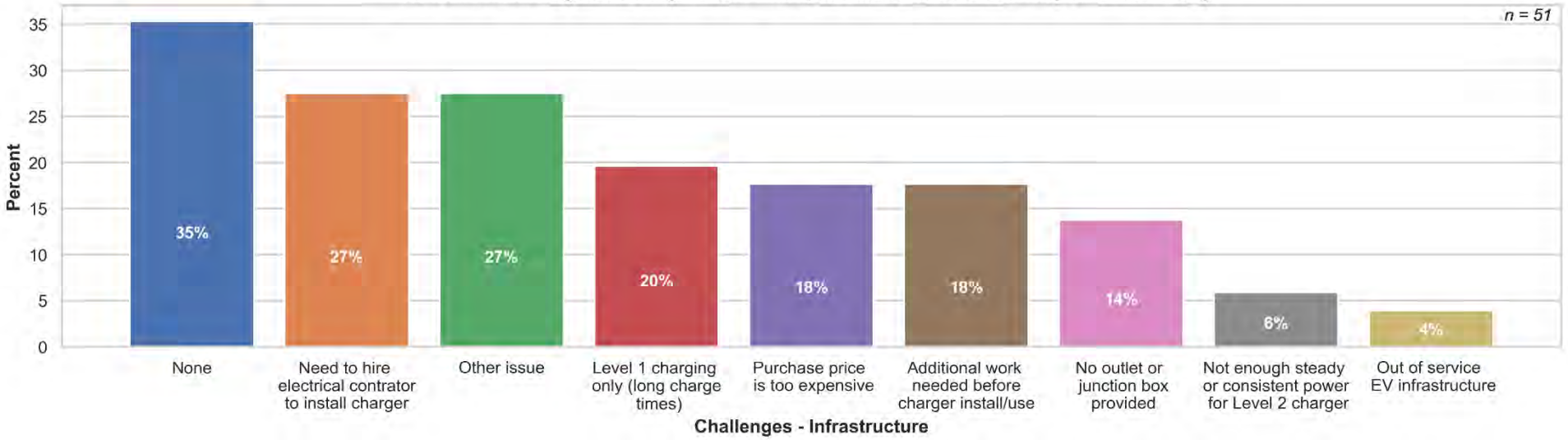
For **municipal building inspectors** (only responsible for inspecting Part 3 single-family and multiplex homes), the majority reported no issues. 33% of inspectors (2 respondents) indicated challenges related to the electrical demand generated by EV charging as a result of EV-Ready requirements, similar to engineers and contractors.

For **municipal plan checkers**, the top challenge reported by almost half (46%) of respondents was missing or incomplete documentation on drawings submitted as part of a development application. A third (31%) also indicated reviewing non-compliant designs where inadequate charging power was provided as per the EV-Ready standard. Similar to engineers, contractors, and building inspectors, challenges related to the electrical demand generated by EV charging as a result of EV-Ready requirements were cited regarding local distribution upgrades (46%) and utility upgrades (38%).

[4] A response option of "None" was unavailable for the engineer and contractor survey.

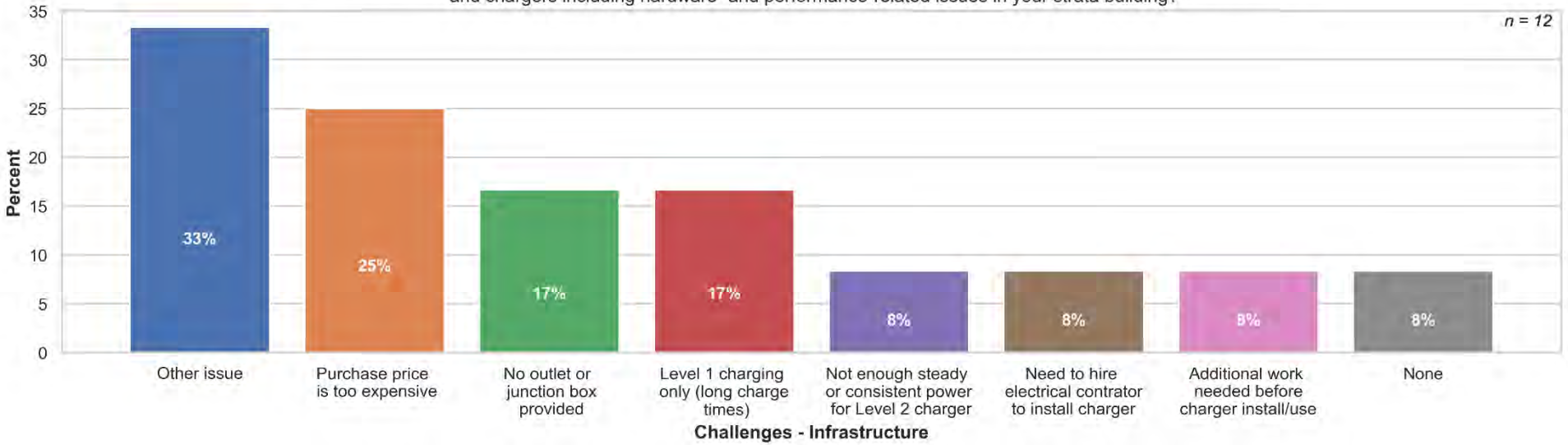
Strata MURB, SFD & Multiplex Residents (Current Drivers): Challenges - Infrastructure

Select all that apply: What issues do you experience or have experienced in the past as it relates to installing and using EV outlets and chargers including hardware- and performance-related issues in your strata building?



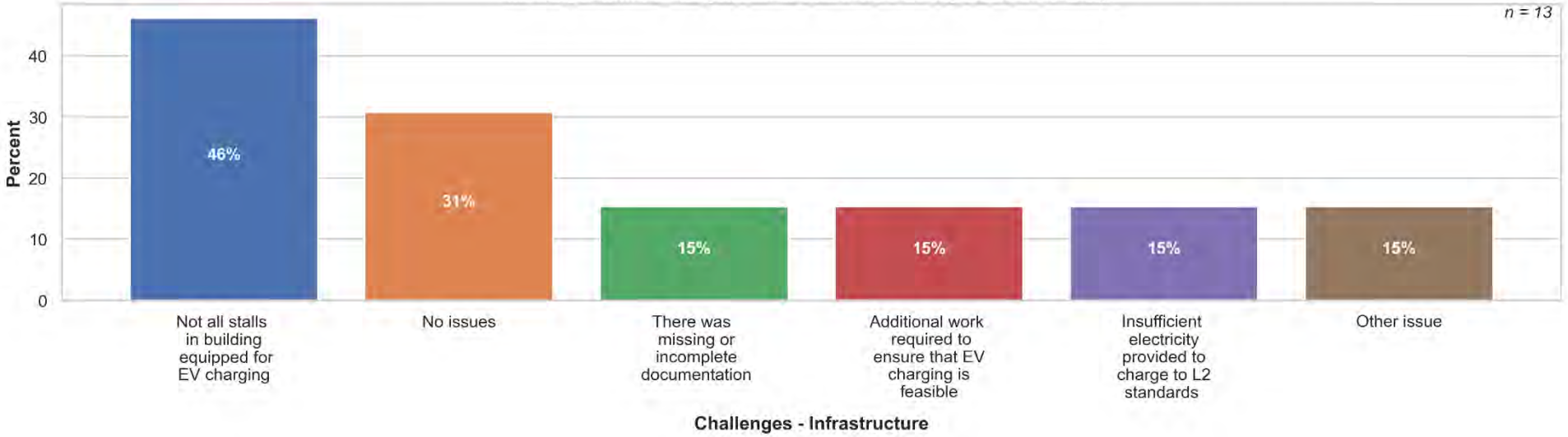
Strata MURB Residents (Prospective Drivers): Challenges - Infrastructure

Select all that apply: What issues do you currently or anticipate experiencing as it relates to installing and using EV outlets and chargers including hardware- and performance-related issues in your strata building?



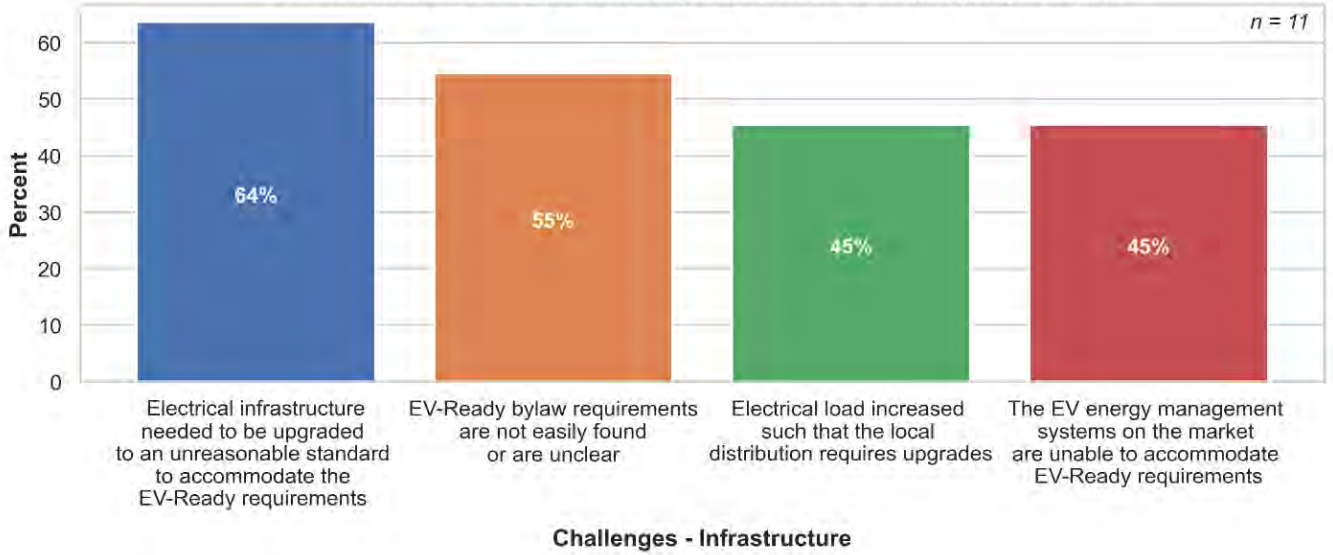
Strata Council Members: Challenges - Infrastructure

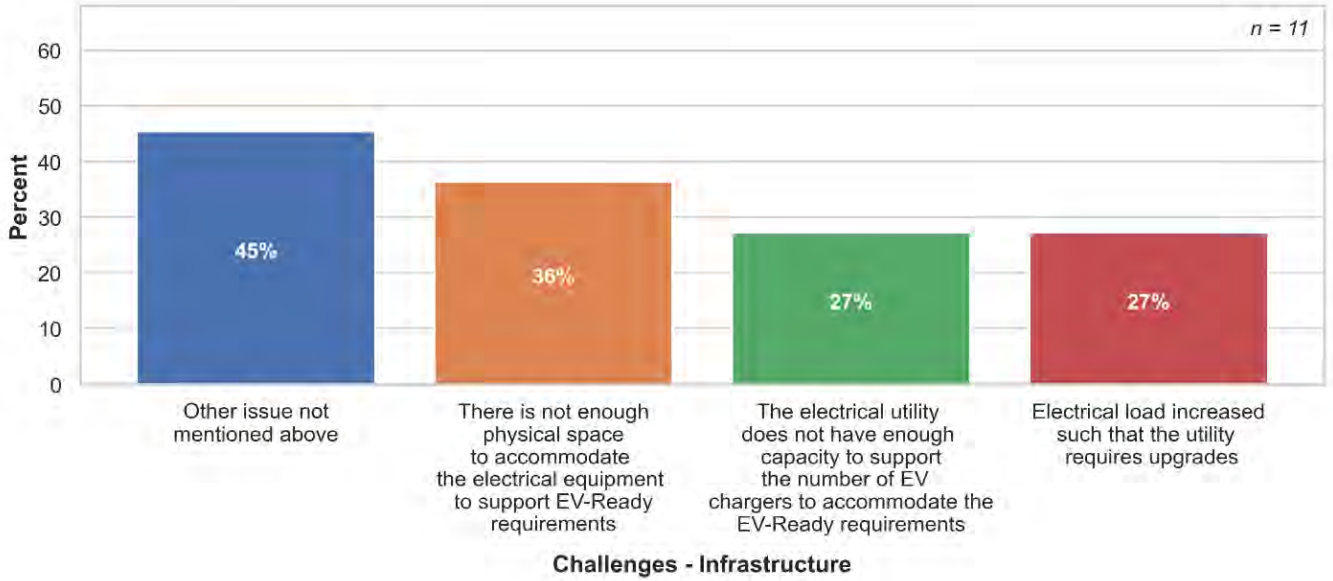
Select all that apply: What issues do you experience or have experienced in the past as it relates to installing and using EV outlets and chargers including hardware- and performance-related issues in your strata building?



Electrical Engineers: Challenges - Infrastructure

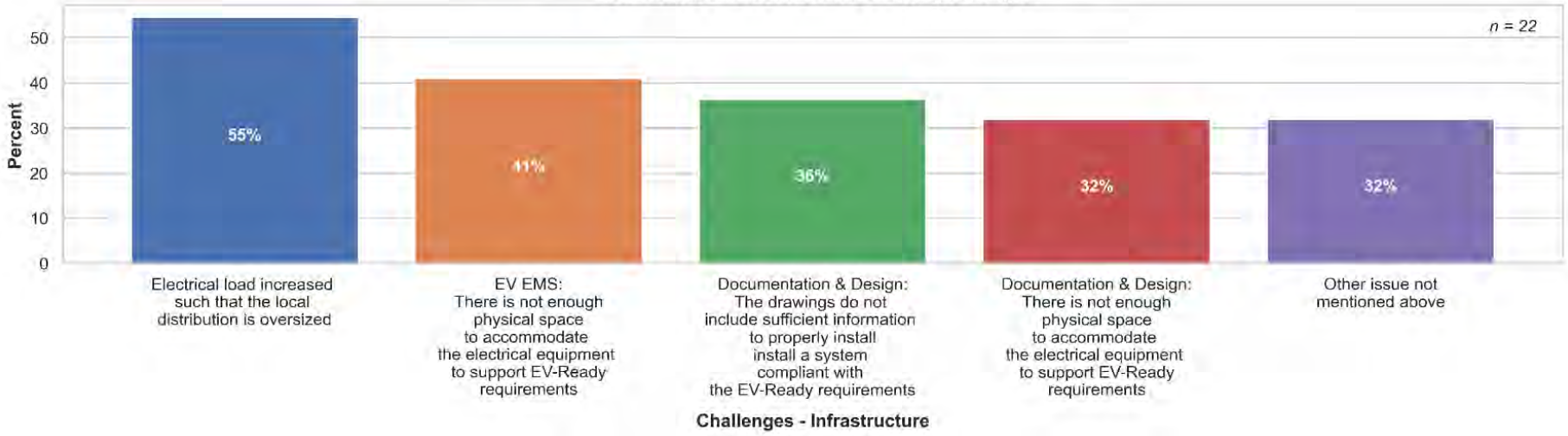
Select all that apply: What are typical issues that you see when designing the installation of EV charging chargers and hardware in buildings that are subject to residential EV-Ready requirements?

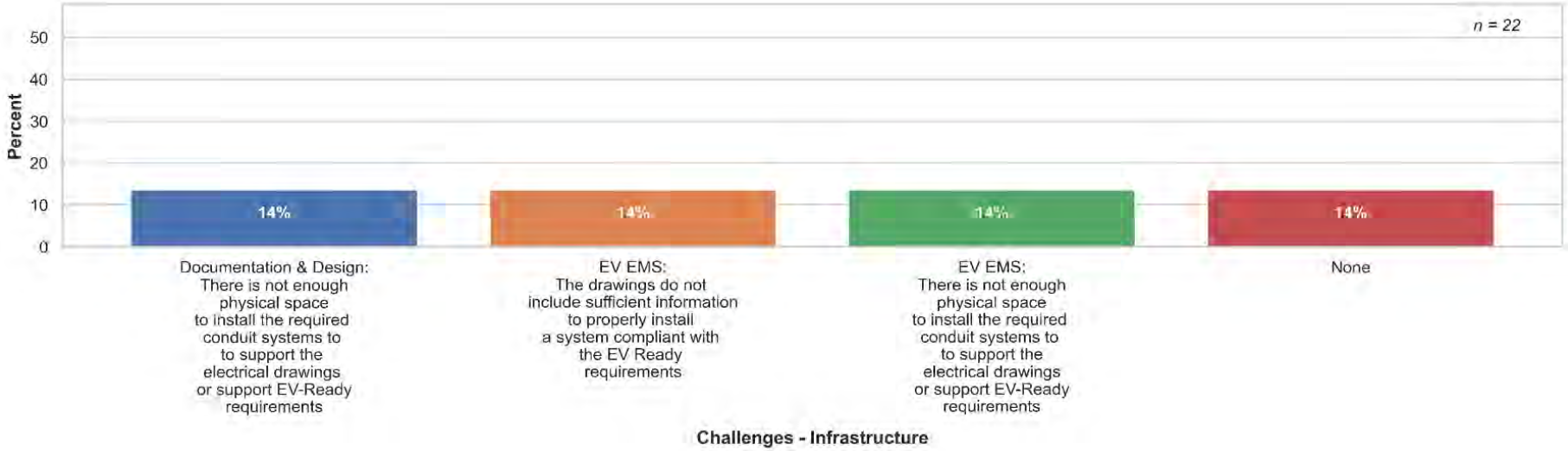




Electrical Contractors: Challenges - Infrastructure

Select all that apply: What are typical issues that you see when installing EV chargers and hardware in new residential EV-Ready buildings?



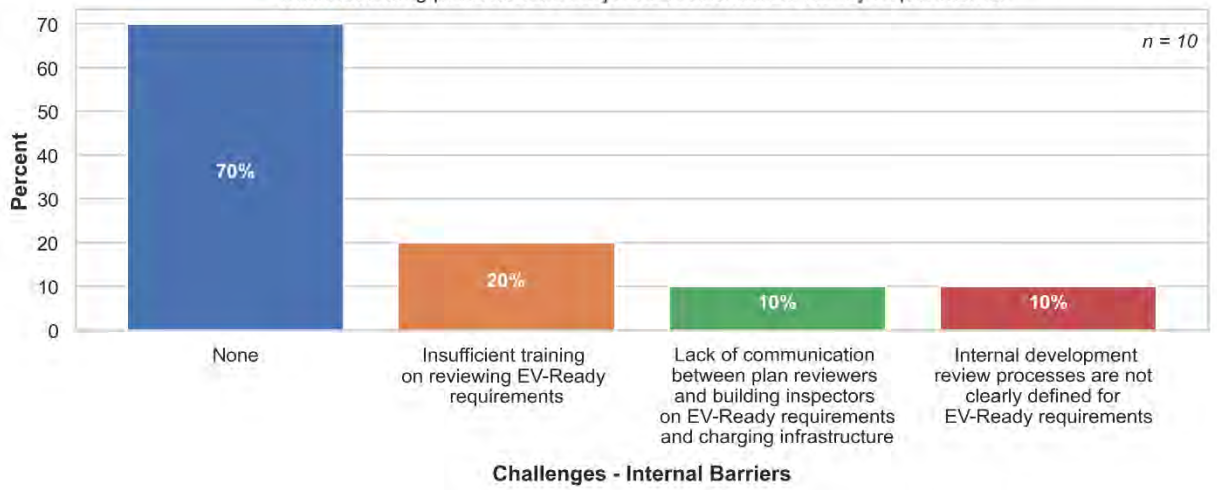


Municipal Plan Checkers: Challenges - Infrastructure

Select all that apply: What are typical issues that you see when reviewing plans that are subject to residential EV-Ready requirements?

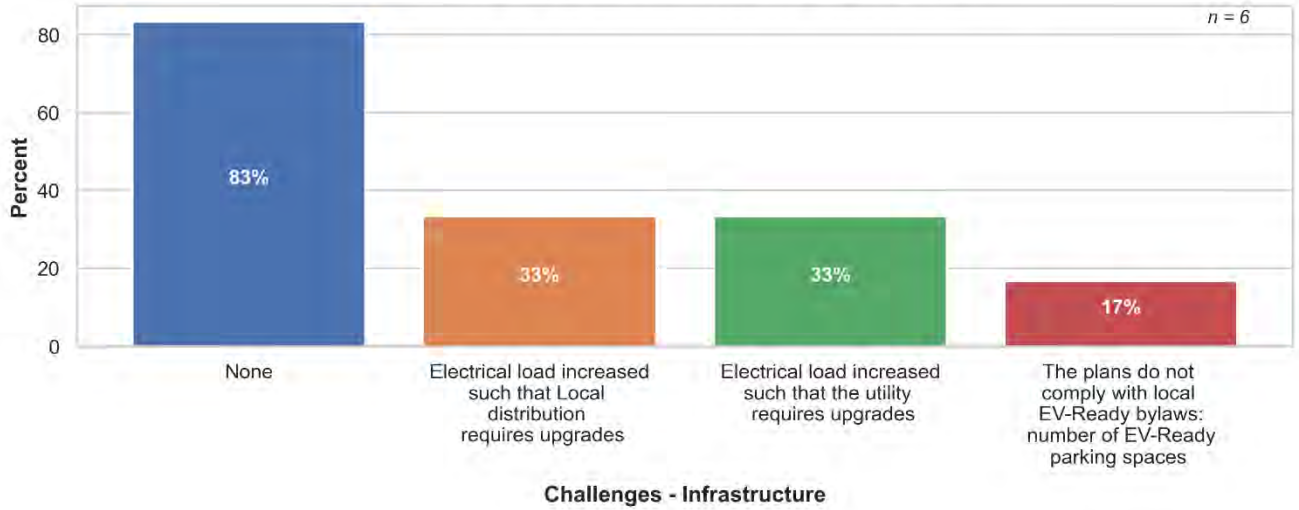
Municipal Plan Checkers: Challenges - Internal Barriers

Select all that apply: What are typical issues that you experience or have experienced in the past as it relates to internal barriers (e.g., development review processes, possessing the adequate knowledge and skills) when reviewing plans that are subject to residential EV-Ready requirements?



Municipal Building Inspectors: Challenges - Infrastructure

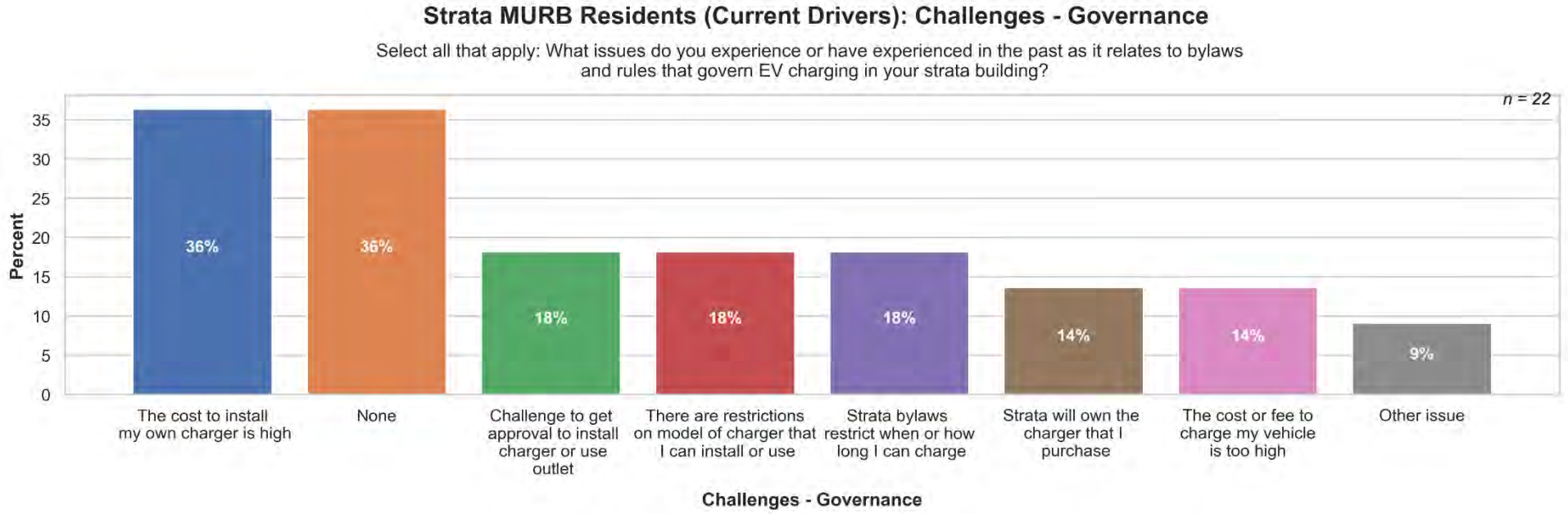
Select all that apply: What are typical issues that you see when inspecting buildings that are subject to residential EV-Ready requirements?



EV-Ready Challenges: Governance and Management

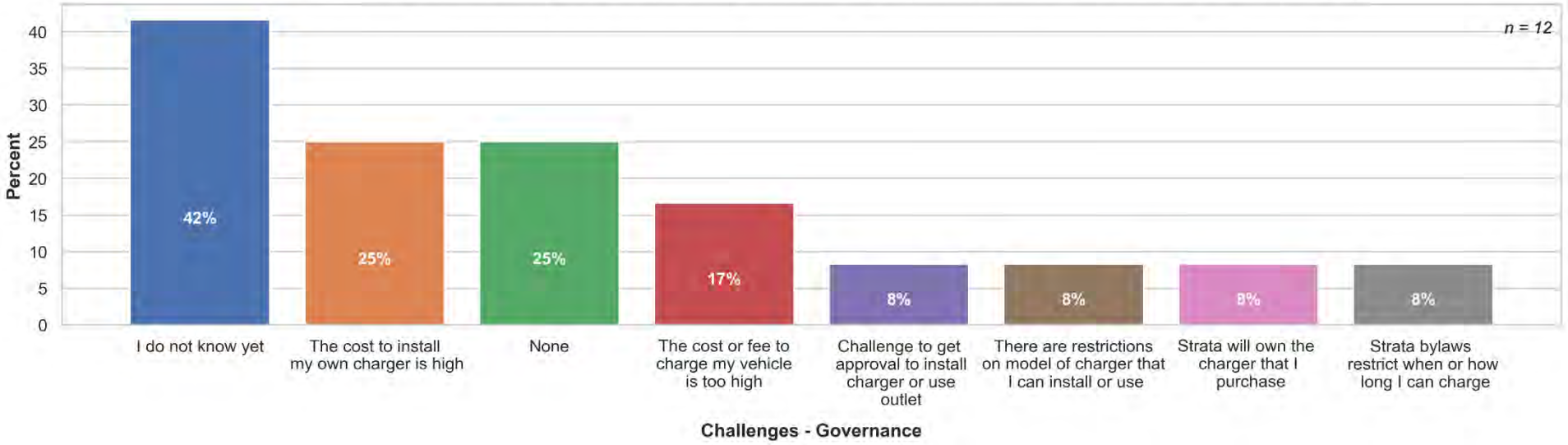
For **residents**, a third of current EV drivers (36%) reported no previous or current challenges related to bylaws and rules that govern EV charging in their building. For both current and prospective EV drivers, the high cost for installing a charger was cited as the top reason impacting their experience (36% and 25% respectively). Receiving approval from the strata corporation to install chargers was the second top challenge for current EV drivers (18%) and the third top challenge for prospective drivers (8%).

For **strata council members**, the top challenge reported by half (50%) of the six respondents was high fees charged by the EV charging service provider and proprietary EV charging infrastructure, limiting the ability for the strata corporation to select an alternative service provider. The other top challenge was the strata council having a lack of information and/or being unaware of how to manage EV charging in their building (33%).



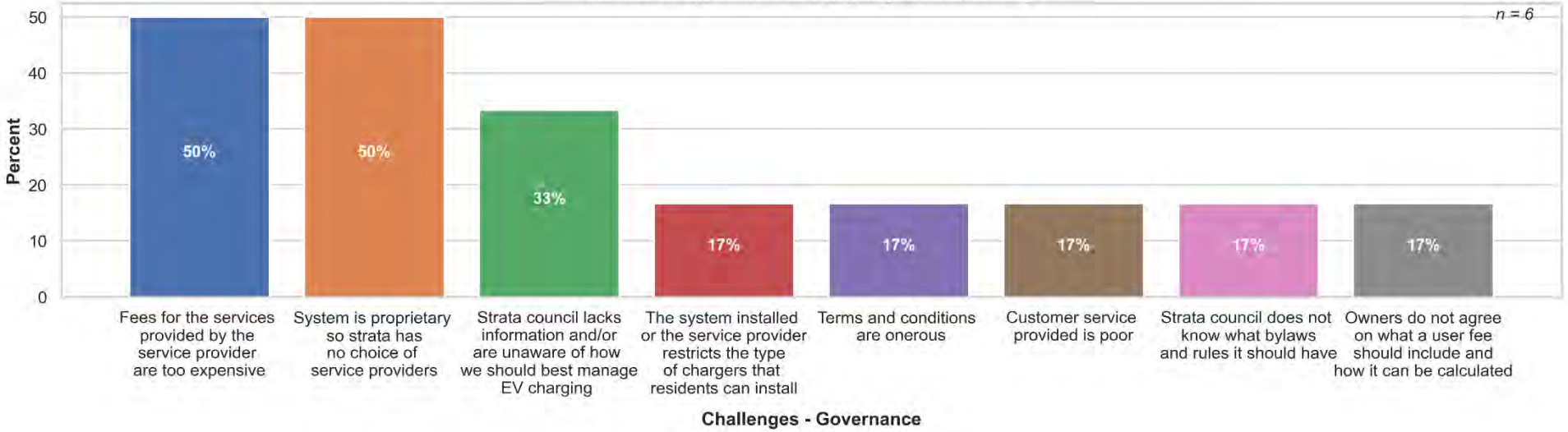
Strata MURB Residents (Prospective Drivers): Challenges - Governance

Select all that apply: What issues do you currently or anticipate experiencing as it relates to bylaws /n and rules that govern EV charging?



Strata Council Members: Challenges - Governance

Select all that apply: What issues do you experience or have experienced in the past as it relates to bylaws and rules that govern EV charging in your strata building?

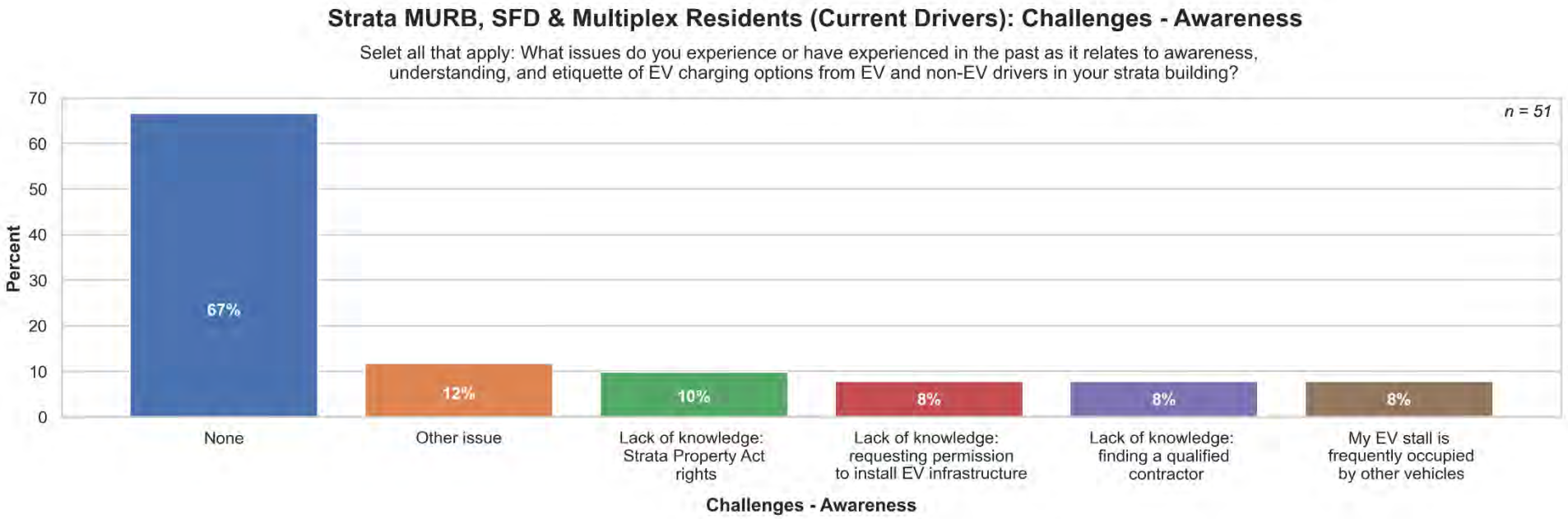


EV-Ready Challenges: Knowledge and Communication

For **residents**, two-thirds of current EV drivers (67%) and four-in-ten prospective EV drivers (42%) reported no previous, current, or anticipated challenges related to awareness and understanding of EV charging in their building. For prospective drivers, the top two challenges were lack of awareness on whether they can install or use a charger (17%) and not knowing whether if they need to or how to request permission or what rights they have to EV charging in their strata building (17%).

For **strata council members**, three-quarters (73%) of members indicated no challenges related to awareness and understanding. Where there were challenges, these were attributed to residents not requesting permission to use an outlet or install an EV charger (27%) and residents not understanding their rights and responsibilities related to EV charging (27%).

For **electrical engineers**, contacting and communicating with authorities having jurisdiction was the top challenge (64%). This was a similar challenge faced by **electrical contractors** (39%), but the top challenge was contacting and communicating with the EV charging service provider (43%).

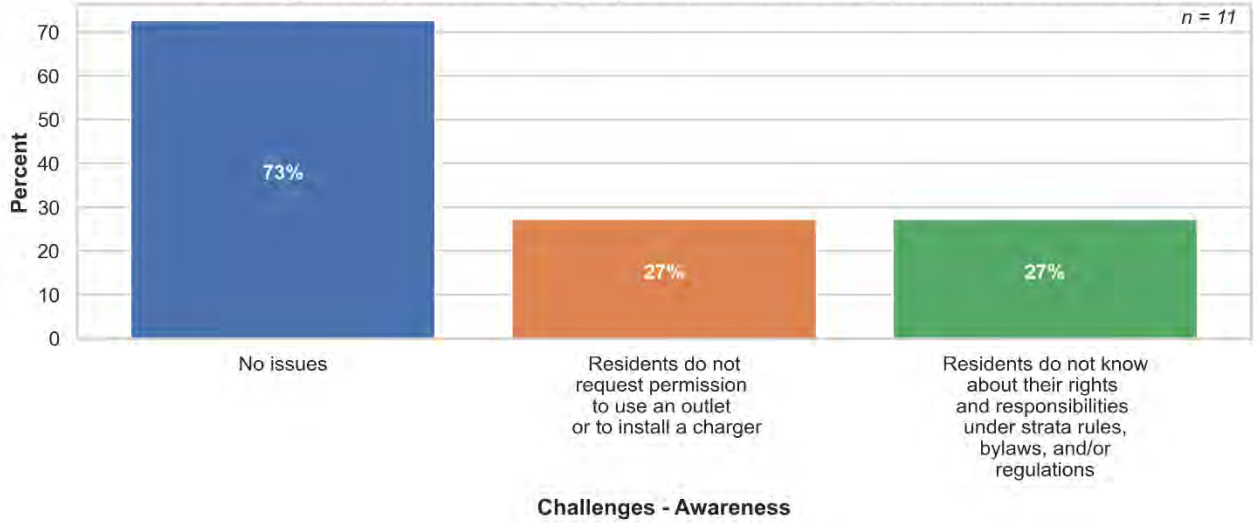


Strata Residents MURB (Prospective Drivers): Challenges - Awareness

Select all that apply: What issues do you currently or anticipate experiencing as it relates to awareness, understanding, and etiquette of EV charging options from EV and non-EV drivers in your strata building?

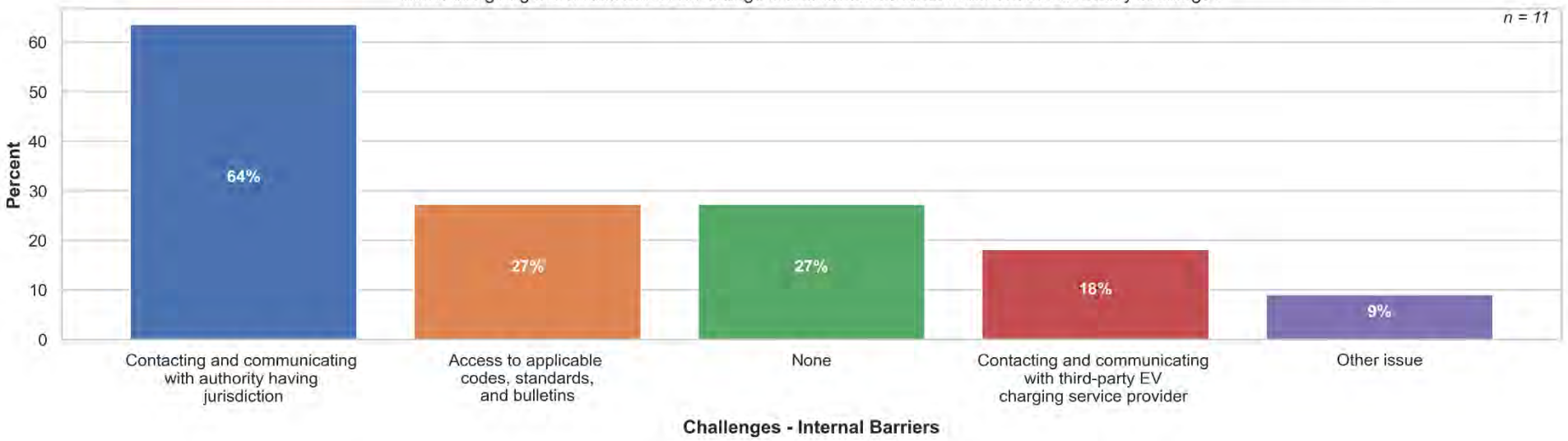
Strata Council Members: Challenges - Awareness

Select all that apply: What issues do you experience or have experienced in the past as it relates to awareness, understanding, and etiquette of EV charging options from EV and non-EV drivers in your strata building?



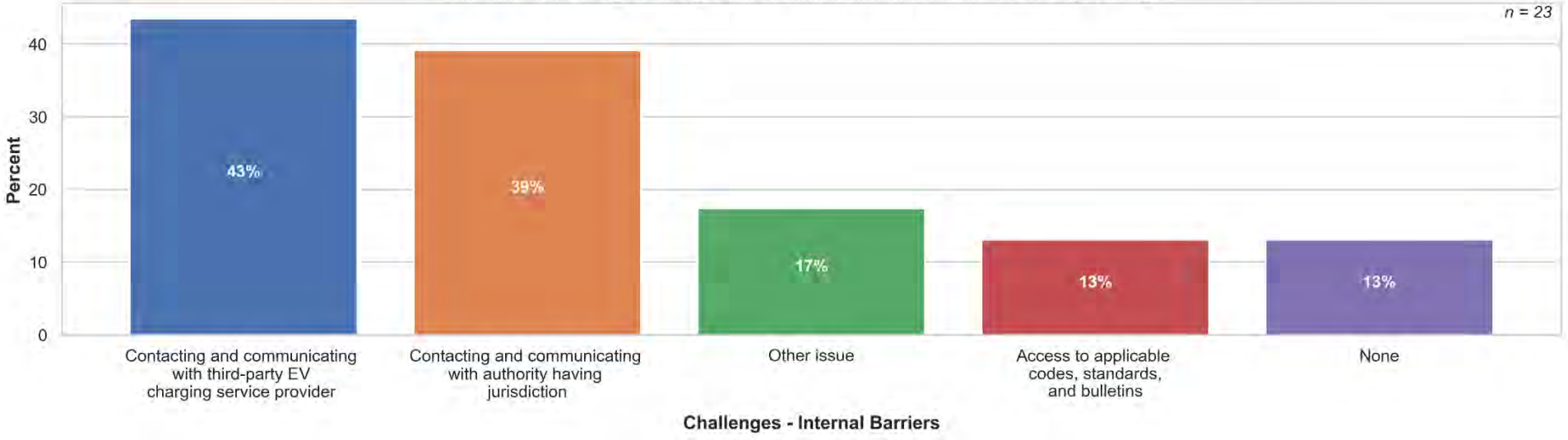
Electrical Engineers: Challenges - Internal Barriers

Select all that apply: What are typical issues that you experience or have experienced in the past as it relates to information & communication when designing the installation of EV chargers and hardware in new residential EV-Ready buildings?



Electrical Contractors: Challenges - Internal Barriers

Select all that apply: What are typical issues that you experience or have experienced in the past as it relates to information & communication when when installing EV chargers and hardware in new residential EV-Ready buildings?



APPENDIX G: REPRESENTATIVE QUOTES

Finding #2: Buildings that are not 100% EV-ready (i.e., where some residents do not have an EV-ready parking stall) create barriers for residents who are not assigned an EV-ready parking stall and who wish to charge their EV at home

Stakeholder	Quote
Electrical Contractor	"Some bylaws only require 'EV prepared' and not 'EV Ready' so no wiring in pipework or the communication system for proper load management isn't planned out correctly. If it isn't installed 100% to be EV Ready then the building/strata has a very difficult time moving forward. Stratas at this stage don't have contingency funds, etc."
	"Most projects are coming through as 4:1 load sharing. Base building design must have communication locations set out for an EV-EMS to work properly. Method of load sharing wiring installation practices is cumbersome. We have a good solution but getting the word out is challenging. It would be great for engineers to have an installation spec."
	"Often the designer or engineer does not include or emphasize the need for a dedicated EV network throughout the parkade in multi unit buildings. There needs to be [ethernet cable] hard wiring to each stall or [wireless access points] throughout the entire area, something I have noticed is missing in almost every single EV-ready new build we have worked on."
	"It should be determined that for it to be EV Ready, the conductors are already at the junction box in the stall. Not in a box elsewhere or not even wired for to begin with. We've come across some situations where the raceway infrastructure is there, but no conductors from the electrical panel. For homeowners, the price to install the EV charger needs to be fair and the same cost for all. Not one requiring more labour and materials than the other. Strata's can be brutal to deal with if everything is not fair, regardless of rebates and savings."
Electrical Engineer	"The way engineers design a system can be different. Someone may get a dedicated circuit while another stall is constantly sharing with other users, which is driven by developer decisions and direction. This is not described or mandated anywhere, so developers will do the easiest or cheapest way."

	"Often jurisdictions have EV requirements that may not take into the account the nuance of a project. It is often difficult to track down the necessary contacts to seek approval / variance / clarification."

Finding #3: EV charging infrastructure may not be constructed to a compliant standard for some EV-ready buildings due to: (a) gaps and oversights during the development process

MURBs and SFD & Multiplex

Stakeholder	Quote
Electrical Contractor	"Some EV-ready installations are completed and some are not; we can't spend all day to determine if wiring is done correctly. The division of scope makes it difficult. If a contractor didn't know what they are doing and install just one charger, and the next person goes gets a different contractor and installs a different charger, those chargers can't load share on a branch circuit. Engineers should include provide guidance or install EVEMS in advance so chargers can be brand agnostic."
	"As a contractor, I do not know if everything is set up. For example, wiring to all locations, WiFi or cellular, load management, etc. And sometimes it is set up incorrectly, for example with 50A receptacles on 40A breakers set up for 4:1 load sharing, which breaks code rules and requires us to educate the clients further on why we need to remove or alter parts of their new building."
	"I think we need more standardization on new builds. For example, the EV circuit should be ready for a charger installation every time. Often times we find no breaker, no wiring, no splices, or other pieces of the circuit missing and it adds unnecessary costs to end consumers."
Electrical Engineer	"There is often a disconnect between the initial building designs provided by developers and the current EV-ready requirements. Developers frequently lack the technical expertise needed to align their designs with evolving EV charging standards. As a result, compliance issues are often only identified late in the project—sometimes not until just before occupancy—leading to costly delays last-minute modifications to meet the necessary requirements and disagreements on the definition of EV Ready with the Strata."

Municipal Plan Reviewer	"The electrical contractor installing the electrical system is often blind to the requirements imposed on the architect or builder and will simply install in accordance with min provincial code requirements. Anything prescribed by zoning, policy, bulletins, can easily be overlooked by the electrical contractor who is not privy to the same information as the builder."
	"There are some barriers at the national level from a lack of design standards. The current process involves reviewing projects on a case-by-case basis, and standardized designs would reduce the time required to review permits/engineering drawings. For example, the Canadian electrical code standards do not include standards for EV management systems.
Municipal Building Inspector	"Permitting requirements are important—building and electrical permit. Electrical contractor will never think about the building permit. There are many parameters for MURBs that affect EV charging. Does it impact fire separation? Is it impacting path of egress? Does it affect fire response? These are things not considered by electrical contractors installing these systems. Fire departments pick up on this when they do fire prevention inspection, "we didn't see this EV charger in the path of egress."

SFD & Multiplex Only

Stakeholder	**Quote**
Resident	"The electrical service at my new duplex was at capacity from day 1 in 2021 with basically zero spare capacity on my panel. Electricians (I've tried engaging with 3) have not wanted to do the (permitted) work to install capacity for a charger. … Electricians have told me it is very difficult/painful process to get permits from [local government] for this type of work (installing capacity for L2 charger on residential panel near capacity)."
	"Duplex need capacity for charging or standard EVEMS's. Capacity/load planning for a duplex with 3rd suite sharing a single 200A service needs to be better thought through for persistent EV charging loads. How does my 1 of 3 units sharing 200A budget for overall load when needing to add a 40-50A L2?"

Electrical Contractor	"Townhouses are very challenging because people want load management device as suite-panel service, but when you factor in all the units into main load calculation for the service, it might be OK for the first few units but eventually, its becoming a problem."
Municipal Building Inspector	"We are electrifying everything in new construction and consumer demand wants hot tubs, jacuzzi, 2 or 3 outlets for EV charging, 2 washing machines. Along with basement and secondary suites, there is a lot of duplicate loads and electrical heating (e.g., heat pump). When we are getting rid of gas, 200 amp, 320 amp, or even 400 amp [are triggered], which represents onerous electrical code requirements that developers are avoiding. More infill properties that go beyond 200 amp is starting to tip the scale of a transformer in a neighbourhood, which means BC Hydro is having to redesign their neighbourhood distribution. That is resulting a lot of anxiety among development community because we are building more homes than BC Hydro can change distribution, meaning people can't move into their homes."
Building Official Representative	"Not seeing as many lower amperage service installs (100 amp) in new builds. [Instead], seeing 200 amp, 320 amp sometimes 400 amps. Often times with the services the client want, you can't make it work if you have under 100 or 125 amp service. EV chargers are driving trend for increased service, [but] electrification [more] generally is driving the change, such as electric boilers/heat pumps, some people have saunas, etc."
	"People who install [energy management systems] usually are starting with a 200 amp system, and then install the [EMS] because they want more and more amenities. The electrician is pulling hair and have to redesign to keep everything going. Decision is made between homeowner and electrician sometime during the project. The ~3% of single-family homes upgrading to power management system are doing so due to a cost decision to prevent upgrading service beyond 200 amp—usually a typical 2,000 to 3,000s sq. ft., 2-level building with 3 to 4 bedrooms and a garage."
Strata Association Representative	Unfortunately, [townhouse owners] often think they can just plug the [power management] device into an outlet and that's it. They don't realize that under the electrical code they have to hire a licenced electrician to assess the situation and make sure it's a safe and viable solution. … Suppliers or just people who like to make YouTube videos say you can save a lot of money and do it yourself by just plugging in a

	splitter. They don't tell people to hire a professional. … The strata council would have no idea the townhouse owner is using a splitter.”

Finding #3: EV charging infrastructure may not be constructed to a compliant standard for some EV-ready buildings due to: (b) lack of coordination or unclear division of responsibilities between Authorities Having Jurisdiction

Stakeholder	Quote
Municipal Plan Reviewer	“We are not qualified to know or understand if the electrical system installed meets the expectations of the EV Charging System. We can only assess if an outlet exists. Cannot assess if it is a dedicated circuit or not”
	“We mark how many EV ready location are required by the city but are not involved in whether or not the electrical needs to be upgraded to the site or not.”
	“We look to ensure the rough wiring is installed but in general are unaware of what the builder had to go through to have them installed for the final inspection.”
Building Official Representative	“Technical Safety BC just looks to see if the construction is safe, not if it meets bylaws.”
Strata Association Representative	“For townhouses that have a panel, no one is checking the electrical safety of these panels when they are installed.”

Reason #4: Tenants living in strata housing lack the decision-making power to install EV chargers in EV-ready residential buildings

Stakeholder	Quote
Resident	"As a tenant, I can't make the decision to have a contractor install EV charging infrastructure to my stall, and it also wouldn't make sense to bear the cost if I only have the charger for the length of my rental."
	"Moving from my current parking location (owned by landlord) to one capable of accepting a LVL 2 charger requires a property sale/transfer estimated to be $5,000."
	"My parking stall doesn't even have a junction box, so they would need to pull cables to install charger. I tried to reach out to strata to see what it would be to install and they want me talk to the landlord. Landlord would not talk to me as the tenant, so I got stonewalled."

Reason #5: EV charging hardware incompatibility prevents or makes it cost prohibitive for residents to install EV chargers of a different brand

Stakeholder	Quote
Resident	"The strata council is refusing to let owners install private chargers and I don't know who I can turn to."
Electrical Engineer	"The industry needs to catch up as there is a lack of available hardware that is brand agnostic. Government regulation can push the industry in a certain way."
Electrical Contractor	"Property managers and strata lot owners do not understand what EV Ready means. Most think that any charger can be installed, and do not realize a [energy] management system needs to be put in place that all owners conform to."

Finding #6: Hiring an EV charging service provider prior to the creation of the strata corporation can result in challenges for strata councils and residents, locking them into restrictive contracts, fees, and hardware limitations

Stakeholder	Quote
Resident	"[The developer] contracted with a company that said they were experienced, but [we're] having continual issues with software going down. Had an issue with 2/3 of the building not being able to charge. [We] don't have control over the contract because not enough people have purchased units."
	"I purchased a hybrid car knowing that the building would be EV ready. Unable to charge because don't have charger in stall as I didn't purchase from the developer 2 years ago [when I moved in]. Whenever you want to make changes to the common area, [we] need to get council approval. They said that anyone can install charger but have to use the same charger at the strata and have to use the same electrician to install, but the electrician is not answering the phone."
	"The property and electrical company were not helpful in getting me set up to charge my vehicle. No one seemed to respond to my request for info and setting up account etc. took them over a week to respond and I had to go looking for other ways to charge my car [until] they sorted out the confusion."
Strata Council Member	"Original developer signed the contract with our provider before move-in, and the strata corporation has to live with it. The developer does not inform the strata corporation what its rights and responsibilities are in respect to the contract."
	"Right now, there is a middle-man that takes a cut and makes the process more complicated than it needs to be."
Electrical Contractor	"[Service provider] is hard to reach and pricey."
	"The time difference between technical teams of the service provider on the East Coast can be an issue for commissioning chargers. In other words, if we install a charger at 2 pm here, it will not be able to be commissioned until the following business day. Incurring additional travel costs and time."
	"There is a lack of understanding of the agreement with EV service providers. Developers partner with providers to get rid of a lot of

Strata Association Representative	complexity with installing and managing EV infrastructure, but they enter into an exclusive contract for 15-25 years. Information about how developers create bylaws regarding EV infrastructure installation and use, how they chose the service provider, rules about costs for equipment and charging, and how the system is administered is sometimes not (well) communicated to the strata."
	"Stratas are locked into 5, 10, 25 year service agreements with a tight fee. Strata corporations do not have a breakeven on these—it is a service charge above and beyond the electrical charging [and] they are difficult to maneuver out of. The number of service users are so low going into it, and the service model is based off of 30% or more usage, so the strata corporation subsidizes in the beginning."
	"If the service provider ceases to operate or reorganize, do these service agreements have a dissolutions, do the organization owns the [equipment]? The exclusivity is a big issue, as the cost is much more than what they can recoup."
	"[Stratas corporations] are inheriting an expensive system [and] have pulled out systems because the charging company's product cost is too high with the processing fees and contracts. Where is the consumer protection for this? Owners have no say in this."

Finding #7: Residents and strata councils may lack knowledge about EV charger installation and operation, and may not receive critical documentation on EV charging infrastructure upon handover from the developer

Stakeholder	Quote
Resident	"Main thing is that stratas are causing all the problems."
	"Uncertainties from strata of who will be paying for the EV charging. Strata told me it's common property so everybody would be paying for the EV charger but I hired an electrician who stated only we will be paying for it."
	"I know that on the [service provider] dashboard, there's an option to charge based on energy consumption instead of per time, but at least in our case, the building manager doesn't want to make any changes to the setting and council refuses to make any policy about it."
	"Price quoted from [service provider for an installation] was $15k—double what was expecting to pay. I don't have the extra money [as I'm] still paying for the car. Thankful that I bought a hybrid and not fully electric because otherwise would be hooped."
	"I had to pay for installation, and then pay a monthly fee for the system, and then pay per hour. I can understand paying for 2 of these, but not all 3."
	"I pay for charging my vehicle but the strata is gouging me for $13.00 per month for absolutely nothing. I paid for the unit, paid for installation, pay for the use of electricity and they want $14 on top of that even if I don't use the charger."
Electrical Contractor	"There is no turnover information when new EV Ready buildings are handed over to the strata, and strata managers do not understand them."
	"Property managers and strata lot owners do not understand what EV Ready means. Most think that any charger can be installed, and do not realize a [energy] management system needs to be put in place that all owners conform to."
	"Residents, realtors, property management companies need to understand that if an EVEMS has not been installed in the base build, there is an upfront cost to installing one. Otherwise, all chargers must

	be the same model so they can communicate on their own for load sharing purposes (almost always wired as 4:1 load share)."
Electrical Engineer	"Residents are given wrong information."
Strata Association Representative	"If the developer creates a [strata] bylaw, it is filed and transfers over to new owners. But if [the developer] are making rules that are not filed, this is where the loss of information happens. The strata council is not handed over all the details about EV charging on day one. You have a brand new council without bylaws and rules yet, and the developer does not create rules for EV charging as they want the owners to develop them. But it takes time, so owners are frustrated when its not already in place."
	"Development promotes that they will be EV-ready, so there is an expectation that people can walk in and plug their cars in, and in reality, it could mean many different things."
	"Municipalities all have varying bylaws and definitions of EV-ready, but they all use the same terminology. Developers use this in marketing language, and ultimately the consumer confused with these different terms. When people buy, they expect to either plug in or immediately be able to add their station, which may not be the case."