ELECTRIC MOBILITY CANADA
ACCELERATING ELECTRIC TRANSPORTATION

MOBILITÉ ÉLECTRIQUE CANADA
ACCÉLÉRER L'ÉLECTRIFICATION DES TRANSPORTS

Making Parking "EV Ready": Requirements for New Construction & Incentives for Existing Buildings

An Electric Mobility Canada Position Paper

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1 Overview

Electric vehicle (EV) adoption is growing rapidly across Canada and around the world. In June 2021, the Federal government committed that it would require 100% of car and passenger truck sales be zero-emission by 2035.[1] A February 2021 survey by KPMG finds that 68% of households that plan to buy a new vehicle in the next five years are likely to purchase an EV.[2]

However, access to convenient, cost-effective EV charging is critical to enable drivers to adopt EVs. The most convenient and low cost place to charge an EV is at home, where households' vehicles park every night; about 75% of all EV charging in Canada currently occurs at home.[3] Likewise, many drivers use workplace and/or public "on the go" EV charging.

However, getting access to EV charging is not always easy, especially in multifamily buildings. Nearly 30% of Canadians live in apartments or condos. A lack of EV charging access in these buildings especially creates a major barrier to EV uptake.

To support access to EV charging, it is critical that new and existing parking in residential buildings, workplaces, and fleet facilities be made "EV Ready".

"EV Ready" parking features an adjacent electrical outlet (e.g., a junction box or a receptacle), at which an EV charger can be installed in the future.

Accordingly, Electric Mobility Canada calls on the Federal, Provincial and local governments, utilities, and other stakeholders to:

1. Require 100% EV Ready residential parking, and 20-40% EV Ready non-residential parking, in new developments. Local and Provincial governments have a golden opportunity to adopt EV Ready requirements for new construction. Likewise, the Federal Government can adopt EV Ready requirements into the model National Energy Code for Buildings and the National Building Code.

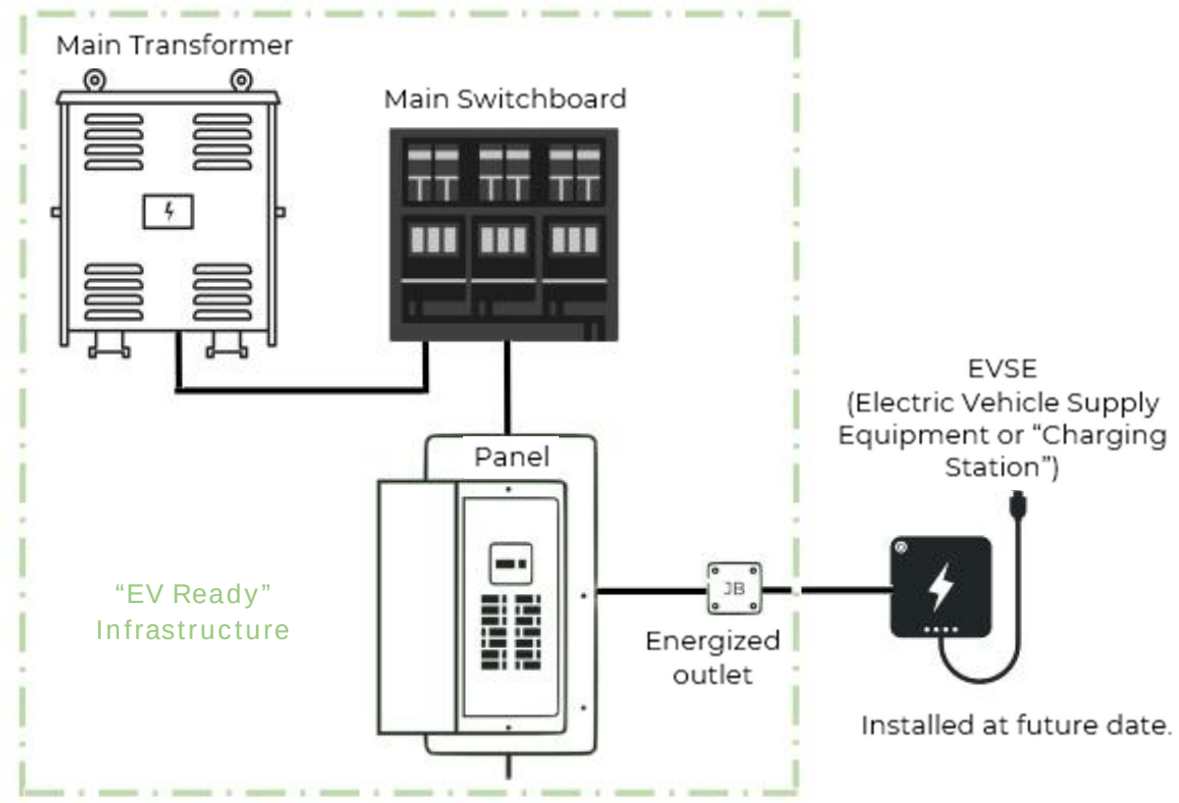
2. Make at least one million parking spaces in existing multifamily buildings EV Ready in the next 5 years through best practice incentive programs. We recommend the Federal Government fund an EV Ready Incentive Program, providing $1-billion over five years to make at least one-million parking spaces in multifamily buildings EV Ready. Likewise, utilities, Provincial, and local governments all can support comprehensive EV Ready upgrades to existing multifamily buildings, workplaces and fleet facilities.

[1] Government of Canada. June 29, 2021. "Building a green economy: Government of Canada to require 100% of car and passenger truck sales be zero-emission by 2035 in Canada". https://bit.ly/3tFOVtC
[2] KPMG. February 25, 2021. "Electric Vehicles to make up majority of new car purchases". https://bit.ly/3rtKcse
[3] Fleetcarma. *Charge the North: Summary Report*. https://www.fleetcarma.com/charge-the-north-summary/

2 What is EV Ready Parking?

"EV Ready" parking is a parking space that features an adjacent electrical outlet capable of providing at least "Level 2" EV charging (as defined by the SAE standard J1772 – i.e., 208V/240V, <80A). EV Ready parking makes it much easier and lower cost to install an EV charging station in the future, compared to retrofitting all the requisite electrical infrastructure at the time that a Level 2 EV charger is installed. Figure 1 shows the equipment required to make a parking space EV Ready.

Figure 1: EV Ready Parking. Source: AES Engineering.



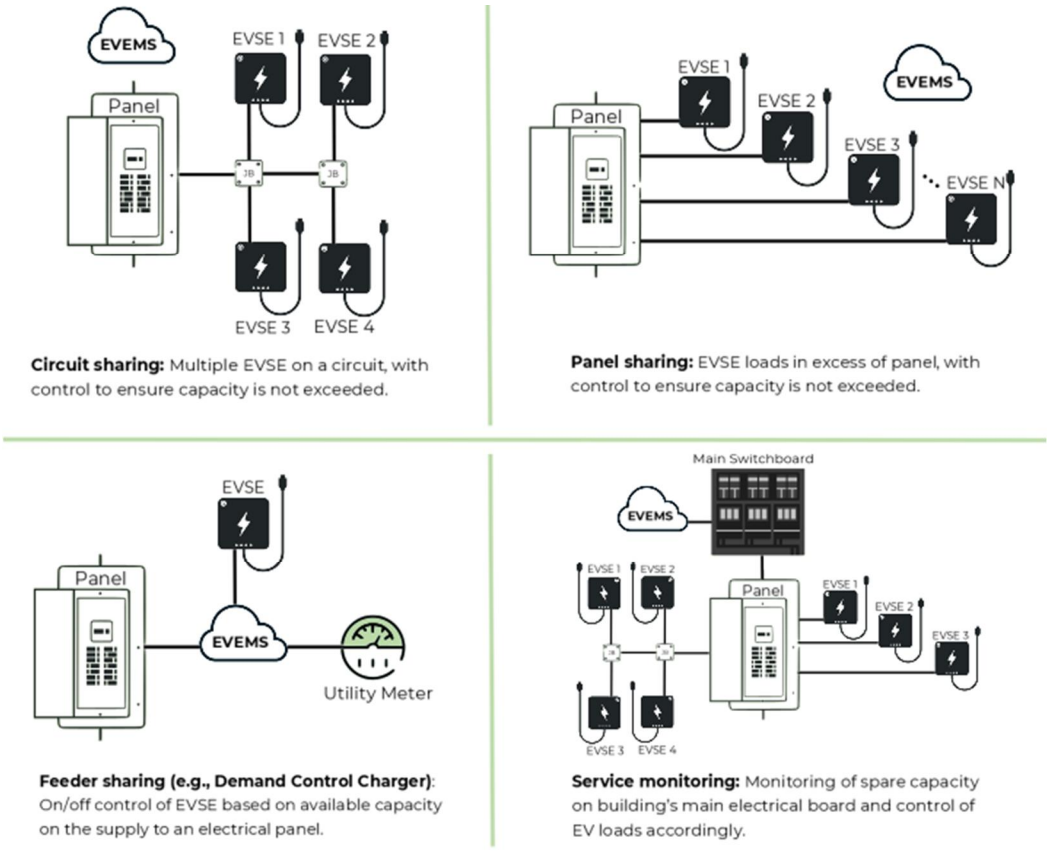
2.1 About EV Energy Management Systems (EVEMS)

EV energy management systems (EVEMSs) are technologies that allow multiple EVs to charge on the same electrical circuit. EVEMSs make it possible to provide large amounts of parking (e.g., 100% of parking in an apartment building) with EV charging. By controlling the rate and timing of charging, EVEMSs charge multiple vehicles while reducing the required circuit capacity. Most networked chargers are compatible with EVEMSs.

While the speed of charging slows when multiple EVs are charging simultaneously on a shared circuit, using reasonable amounts of load sharing using EVEMS is perfectly appropriate in situations where vehicles are parked for longer periods of time (e.g., overnight in residential parking, or the course of a day at a workplace).

When implementing an EVEMS, or otherwise installing charging equipment that is capable of load sharing, design and owners should ensure that they design the load sharing system to provide for the energy needs of all drivers being served in a typical period (e.g overnight). In making such considerations, it is important to consider cold weather efficiency and charging needs for long trips.

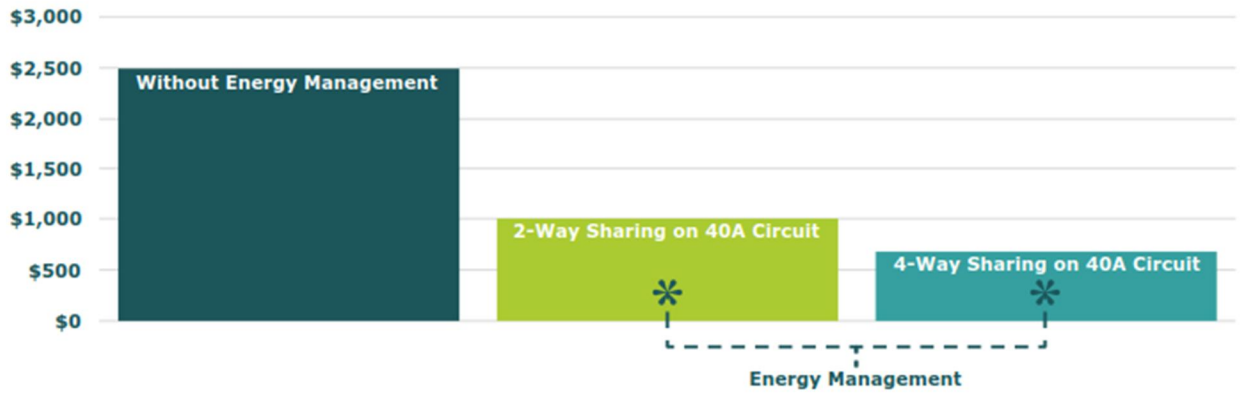
Figure 2: Some different electrical configurations enabled by EVEMS. Source: AES Engineering.



2.2 Costs of 100% EV Ready Parking can be Low When Designing for Use of EVEMS

Designing for use of EVEMS can significantly reduce the cost of implementing "EV Ready" parking, by reducing the size of the electrical system that must be installed. Figure 3 demonstrates the incremental costs to make an example 6-storey apartment building 100% EV Ready, when designing a building without use of EVEMS, versus using EVEMS to enable 2-share and 4-share configurations on 40A branch circuits.

Figure 3: Cost per parking space to make all parking EV Ready in a new 6 storey multifamily building in Kelowna, BC. Source AES Engineering. 2019.



Numerous EV Ready costing studies have been undertaken for local governments, utilities and building owners across the country. These studies have found that all residential parking can be made EV Ready in new multifamily buildings for costs of approximately $500 to $1500 per parking space[4] – this is a fraction of the total cost to construct new parking, which typically exceeds $50,000 per parking space in major Canadian cities (the total cost of structural parking includes the cost of structural concrete and rebar; electrical and mechanical systems; the opportunity cost of space; etc.).

It is much lower cost to make new buildings EV Ready, compared to existing buildings; however, it is possible to implement 100% EV Ready retrofits to residential buildings at acceptable costs, as will be explored below.

[4] See, e.g., AES Engineering. 2021. *Electric Vehicle Charging Infrastructure Costing Study*. Prepared for the Clean Air Partnership. https://bit.ly/33OqxuM & AES Engineering. 2017. *Electric Vehicle Charging Infrastructure in New Multifamily Developments: Requirement Options and Costing Analysis*. Prepared for City of Richmond. https://bit.ly/3FKV0r5

3 EV Ready New Construction Requirements

3.1 Canadian Jurisdictions are Leading in EV Ready Requirements Adoption

As of the time of this writing, multiple Canadian local governments and Provinces have established requirements that residential parking, and a proportion of non-residential parking, in new construction to be EV Ready. Likewise, many other jurisdictions are considering requirements with similar levels of ambition. The table below summarizes requirements known to the author as of December 2021.

JURISDICTION	RESIDENTIAL	COMMERCIAL
City of Toronto, ON	100% EV Ready	25% EV Ready
Province of Quebec	100% EV Ready (single family)	
Ville de Laval, QC	50% EV Ready	
City of Vancouver, BC	100% EV Ready	45% EV Ready
City of North Van, BC	100% EV Ready	45% EV Ready
City of Port Moody, BC	100% EV Ready	20% EV Ready
City of Surrey, BC	100% EV Ready	20% EV Ready
District of North Van, BC	100% EV Ready	20% EV Ready
District of Saanich, BC	100% EV Ready	Varies, ~5% EV Ready
City of Victoria, BC	100% EV Ready	5% EV Ready
Town of View Royal, BC	100% EV Ready	~5% EV Ready
City of Richmond, BC	100% EV Ready	
City of Burnaby, BC	100% EV Ready	
City of New West, BC	100% EV Ready	
District of Squamish, BC	100% EV Ready	
City of Coquitlam, BC	1 EV Ready / dwelling	
District of West Van., BC	100% EV Ready	
Township of Langley, BC	1 EV Ready / dwelling	
City of Nelson, BC	1 EV Ready / dwelling	10% EV Ready

The 100% EV Ready requirements for residential parking adopted by many of the local governments noted above represent an international best practice, and the recommended approach for other jurisdictions to replicate.

3.2 Recommended EV Ready Requirements for New Developments

An “EV Ready” parking space should be defined as: “A parking space that features an adjacent energized electrical outlet [i.e., a junction box or a receptacle] capable of providing Level 2 charging.”

It is recommended that jurisdictions require:

- 100% EV Ready residential parking – All (100%) residential parking in new developments be “EV Ready”.
- Significant proportions of EV Ready non-residential parking – Jurisdictions should consider establishing requirements according to whether parking is intended for “workplace charging”, “opportunity charging” or fleets:
    - Workplace charging - Approximately 20-40% of parking intended for employee parking is recommended to be EV Ready. Like residential uses, workplace charging requirements should allow for significant amounts of load sharing using EVEMS, reflecting that relatively slow rates of EV charging are appropriate for the typically long dwell times of the workplace parking spaces.
    - Opportunity charging (i.e., “on the go” charging; “convenience charging”) - Approximately 5-20% of parking intended for non-residential visitors (e.g., retail customers, etc.) is recommended to be EV Ready for “Opportunity Charging”. This Opportunity Charging should provide a relatively fast rate of Level 2 charging (e.g., minimum 6.6kW), given that the vehicles spend relatively shorter periods of time in such parking
    - Fleet charging - Parking intended for fleet vehicles is generally recommended to be 100% EV Ready.

3.3 How Cities, Provinces and the Federal Government Can Support EV Ready New Construction

Cities, provinces and the federal government all have a role to play in requiring new construction to be EV Ready. The table below outlines key roles for these different levels of government. It also notes more detailed guidance documents that can support policy adoption.

Jurisdiction	*Action*	*Resources*
Local Governments	Adopt local EV Ready requirements for new construction. Local governments have enacted these requirements in: • Parking design requirements (e.g., in Parking Bylaws or Zoning Bylaws). • Policies applied to new construction. • Building requirements.	AES Engineering. 2021. *"EV Ready" Requirements for New Buildings: A Best Practice Guide for BC Local Governments*[5] - This Guide provides model bylaw language for EV Ready new construction requirements and associated technical bulletins.
Provincial Governments	• Explicitly enable local governments to adopt EV Ready requirements if not enabled by default, and/or • Adopt EV Ready requirements in Province-wide regulations and policies (e.g., such as building codes or land use planning rules).	McEwen Climate and Energy; AES Engineering & Integral Group. 2019. *EV Ready Requirements Framework.* Prepared for Natural Resources Canada[6] - This report includes draft language for inclusion in model national codes, and may be customized for Provincial codes.

Federal Government	• Provide financial support for cities and Provinces to enact requirements.
	• Adopt requirements into model Codes:
	  • Model National Building Code (Part 9 buildings)
	  • Model National Energy Code for Buildings (Part 3 buildings)	

[5] AES Engineering. "EV Ready" Requirements for New Buildings: A Best Practice Guide for BC Local Governments 2021. https://docs.communityenergy.ca/wp-content/uploads/EV-Ready-Requirements-for-New-Buildings-Final.pdf

[6] AES Engineering & Integral Group. "EV Readiness" Requirements Framework. 2019. https://cleanairpartnership.org/cac/wp-content/uploads/2019/10/NRCan-EV-Readiness-Requirements-Framework-Final-Report-4-11-2019-McEwen-Climate-and-Energy.pdf

4 EV Ready Existing Buildings

4.1 How to Implement EV Charging Infrastructure in Existing Buildings

Broadly, there are two ways that existing buildings can implement EV charging infrastructure:

1. Comprehensive EV Ready retrofits – A building undertakes an electrical renovation to make a significant proportion of parking "EV Ready" (e.g., A multifamily condominium might make all parking EV Ready, to accommodate all drivers adopting an EV in the coming decades. A workplace might implement a 10% EV Ready retrofit to accommodate parking for the foreseeable future). As drivers adopt EVs, EVSE are installed at their assigned parking space. Comprehensive EV Ready retrofits can be particularly valuable for multifamily condominiums, rental housing and workplaces.

2. Incremental additions of EV chargers – Under this model, a building implements a few chargers at a time. Often, EVSE are located in common parking areas (e.g., visitor parking) and are shared by multiple residents or building occupants. Over time, as more EVs are adopted, new electrical renovations are undertaken to implement more charging.

The table below compares these two options for multifamily buildings.

To date, most incentive programs that support EV charging infrastructure in existing multifamily buildings, workplaces, or fleet parking (e.g., NRCan's ZEVIP) support the incremental addition of a few EV chargers. However, it is important that programs evolve to also offer multifamily buildings, workplaces and fleets the option to implement Comprehensive EV Ready Retrofits (e.g., 100% EV Ready residential buildings). In many circumstances, these Comprehensive EV Ready Retrofits will provide the greatest value over the lifetime of the building. Moreover, Comprehensive EV Ready Retrofits will most cost-effectively enable wide-spread EV adoption, optimizing use of public and/or utility rate-payer funds.

	1. Comprehensive EV Ready Retrofits	2. Incremental additions of EV chargers
Process	One large electrical renovation	Series of incremental electrical renovations over time.
Cost	• Lower life-cycle cost. • Larger one-time upfront cost.	• Higher life-cycle cost. • Series of smaller projects.
Location of charging stations	In drivers' assigned parking space.	Often, initially in commonly accessible parking (e.g., visitor parking). Sometimes in assigned parking.
Process for drivers to install chargers	Simple process to install chargers (after initial comprehensive electrical renovation).	Process to implement new chargers is frequently lengthy, and usually complicated.
Convenience	Highly convenient for drivers. Parking & EV charging in regular assigned parking spot.	Depends on location of chargers. If located in common parking (e.g., visitor parking), can be less convenient.
Futureproofing	Typically, can ensure that all drivers get adequate charging infrastructure. Avoids stranded assets.	Initial installations may not be designed for later expansion; some potential for stranded assets. Potential to exhaust limited electrical capacity if design for EVEMS not considered.
Example Incentive Programs	• CleanBC EV Ready Rebate Program[7]	• NRCan Zero Emission Vehicle Infrastructure Program (ZEVIP) for multifamily buildings[8] • Transition énérgetique Quebec rebates[9] • CleanBC EV Charger Rebate Program[7]

[7] BCHydro. EV charging rebates for apartment and condo buildings. https://electricvehicles.bchydro.com/incentives/charger-rebates/apartment

[8] Government of Canada. Zero Emission Vehicle Infrastructure Program. https://www.nrcan.gc.ca/energy-efficiency/transportation-alternative-fuels/zero-emission-vehicle-infrastructure-program/21876

[9] Government of Quebec. Multi-unit building charging station rebate. https://vehiculeselectriques.gouv.qc.ca/english/rabais/multilogement/programme-remboursement-borne-recharge-multilogement.asp

4.2 Case Study – BC EV Ready Rebate Program

The CleanBC EV Ready Rebate program[10] is a model example of a comprehensive EV Ready Retrofit incentive program. The EV Ready Rebate program supports multifamily buildings to implement 100% EV Ready retrofits. The program was launched in January 2021.

To participate in the program, buildings must first commission an EV Ready Plan from an engineer or electrical contractor. The EV Ready Plan outlines a strategy that provides a minimum of one EV Ready parking space per residential unit. The EV Ready Plan must include an assessment of how much electrical capacity is available for the building to implement EV charging; determination of the minimum charging performance requirements (e.g. how much load sharing with EVEMS is viable) for the building; and conceptual designs and cost-estimates to make all parking spaces EV Ready. The program provides up to $3000 per EV Ready Plan (up to 75% of the cost of the Plan).

Once a multifamily condominium or rental building owner has received the EV Ready Plan and its cost estimate, they decide whether or not to proceed with the project (e.g. during an Annual or Special General meeting, in the case of a condominium). The CleanBC EV Ready Rebate program provides a $600 per EV Ready parking space, up to $80,000 per building (50% of total costs), for buildings that implement at least 1 EV Ready parking space per residence.

Since the program's initiation less than a year prior to this writing, more than 200 multifamily buildings have undertaken EV Ready Plans. At the time of this writing, dozens are proceeding with implementing 100% EV Ready retrofits, and many more buildings have scheduled a decision on their EV Ready upgrade plans at an condominium Annual General Meeting or Special General Meeting.

Many EV charging industry participants recognize the CleanBC EV Ready Rebate Program as a best practice, and note that the program cost-effectively enables wide-spread adoption of EVs and the most convenient charging services for the building. Requests have been made to the Province to extend the EV Ready rebates to workplaces and fleet parking facilities.

[10] BCHydro. EV charging rebates for apartment and condo buildings. https://electricvehicles.bchydro.com/incentives/charger-rebates/apartment

4.3 Case Study – A Multifamily Building that has Implemented an EV Ready Retrofit

A multifamily condominium in the District of West Vancouver, BC, recently implemented a 100% EV Ready retrofit. The building includes 46 underground parking spaces. The building undertook an EV Ready Feasibility Assessment (i.e., an "EV Ready Plan"). The Feasibility Assessment found that all parking spaces could be made EV Ready, and identified a range of different electrical configurations and their estimated costs.

At a Special General Meeting, the condominium decided to implement 100% EV Ready parking, using EVEMS to share power between 4 parking spaces per 40A circuit. The cost for EV Ready materials and labor, including communications systems, (excluding EVSE) was $57,200, or about $1250 per parking space. Residents opted to install EVSE at 25% of the parking spaces at the time of retrofit; the other residents will install EVSE as they adopt EVs.

Figure 4: EV Ready Infrastructure in a multifamily building parking garage. Source: AES Engineering.

4.4 Recommendations for EV Ready Programs

Electric Mobility Canada calls on the Federal Government to allocate $1-billion to make at least 1 million multifamily buildings EV Ready in the next 5 years.

Likewise, Electric Mobility Canada advocates for utilities, Provinces and local governments to implement strong EV Ready programs.

EMC endorses the following principles for program design:

- Provide program options that enable comprehensive EV Ready retrofits – Programs should support 100% EV Ready retrofits to existing multifamily condominiums. Likewise, they should support existing multifamily rental and non-residential buildings to implement EV Ready parking to some of their parking (e.g. 10-100% of parking spaces). Programs should not specify specific charging equipment, load management equipment or explicit standards (protocols, geometries). Governments should leave these aspects of design to the market. Programs should also be flexible to new load sharing technologies as they become available on the market only after being fully certified by the proper certification authority.

- Meaningful incentives – Incentive programs should initially fund at least 50% to 75% of the cost to make parking in existing multifamily buildings EV Ready. Providing substantial levels of funding will help encourage condominiums and other buildings to forgo incremental installation of a few EV chargers overtime, which can result in greater life-cycle expenses and barriers to EV adoption. EV Ready incentive values can be scaled down as local adoption increases, and 100% EV Ready upgrades are normalized.

- Explore financing opportunities – Program administrators, the Canada Infrastructure Bank, and other stakeholders should explore financing opportunities that can reduce the one-time expense of EV Ready parking. This may be particularly valuable for the condominium sector.

- Support both the residential and non-residential sectors – EV Ready residential parking is the greatest priority to enable EV adoption. However, EV

Ready workplace parking and fleet parking is likewise important to maximize EV adoption in the next decade and beyond.

- Impartial, expert guidance – Multifamily condominiums in particular often face challenges to understand their options. Programs should provide impartial, expert guidance to building owners.