WHITE PAPER: EV Charger Retrofit Options for Condominiums

Premise: ZEVIP cost sharing programs for L2 EV Chargers could better match the needs of condominium projects

A. Personal EVs on the road will grow from 1% today to ≈43% in 2035, and to 100% in 2045[i]. Condominium residents will need EV Chargers at a rate matching this growth over 25+ years
B. Infrastructure for Chargers is best planned and installed at one time, not over decades
C. EV Chargers are best installed as needed to prevent obsolescence and to avoid upfront costs

However, ZEVIP cost sharing programs do not match these needs for condominiums:

A. ZEVIP Programs are designed for a ten year, not a 25-year, term
B. ZEVIP programs do not support infrastructure without chargers
C. ZEVIP programs require charger installation up front, not over 25 years

A specific ZEVIP program supporting existing condominium infrastructure, often labelled an EV ready installation, would benefit ZEVIP, condominium residents, and condominium management.

The following paragraphs expand on this premise.

Introduction

The challenges of complete facility installation of EV chargers and charging infrastructure in existing multiunit buildings is a frequent topic of discussion. Most of these concerns revolve around either facility electricity capacity, or the installation cost and timing of EV charger hardware. Electrical capacity, has been addressed for most situations while charger infrastructure is more of a challenge.

Condominium Electrical Capacity

The concerns of inadequate electrical capacity in a condominium can almost always be addressed by intelligent load management systems that are available today. The average EV driver will use about 10 kWh of electricity to drive the national average of 55 km per day, or 18,000 km per year. Advanced networked EV Chargers systems can take advantage of long vehicle dwell times and can dynamically manage charging speeds to stay within electrical constraints while ensuring vehicles are charged by the morning.[1] These systems have demonstrated that almost every multi-unit building in Canada could comfortably support near-term EV charging needs without additional power supply from local utilities.

Condominium EV Charging Infrastructure Installation

A second difficulty that has been more challenging in existing condominiums is finding a path to efficient and affordable installation of electrical infrastructure and EV chargers. The Canadian ZEV Mandate will require that sales of EVs will reach 100% in 2035. At that time, about 43% of the vehicles on the road are predicted to be EVs as referenced in the endnote. It will be another 10 years before most of Canada's fleet of personal vehicles on the road will be electric. Endnote 1 shows the percentage of EVs on the road each year, based on ZEV Mandate requirements.

[1] https://swtchenergy.com/swtch-energy-unveils-swtch-control-to-solve-ev-charging-capacity-challenges-at-aging-multi-tenant-buildings/

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So, what does that mean for condominium installations of EV chargers? To keep the numbers simple, consider a 100-unit condominium. One EV charger would be required each three months on average to match Canadian EV adoption rates. Often, parking spaces cannot be swapped or reassigned to simplify charger installation by grouping parking spots. This situation is typical in larger multi-unit buildings. Moving parking assignments, if possible, is in any case a source of tension and discourages condominium associations from voting to take that path. This leaves EV charger installations scattered randomly over the parking areas and with installations spread over 25 years.

There are three available options for a full installation of chargers in the 100-unit condominium.

1. Install Infrastructure and Chargers as Required by tenants:

When a tenant decides to acquire an EV, the electrician is summoned and installs a dedicated electrical panel and conduit for the first charger. Condominium management will pay for the infrastructure while the tenant may pay for the charger. Another tenant on the other side of the parking garage could be the second tenant to need an EV charger three months later. The electrician will repeat this process, adding a new circuit to the panel or a new panel as needed. All 100 chargers will be installed over 25 years, by 2048. The result is a nightmare of suboptimal panels and conduit. This also comes at a high cost because of the piecemeal nature of the installations. Chargers are purchased as needed, so there is not an issue of large upfront charger costs or of unused obsolete installed chargers. The frequent and random need for individual EV charger installations with short lead times of a few months is not compatible with ZEVIP cost sharing programs.

2. Install All Infrastructure and EV Chargers Now

The infrastructure design is optimized, and installation costs are minimized by installing all infrastructure and chargers up front. This installation is suitable for ZEVIP cost sharing, but there is a flaw. Chargers will be installed now that will not be used for two decades or more. They will be obsolete and probably useless before they are needed. By the end of a ten-year ZEVIP program, many of the chargers will never have been used, negatively impacting the value of 10-year charger data collection. Additionally, the premature installation of chargers misses the opportunity to keep pace with evolving vehicle and charging technology, most significantly vehicle to building or bi-directional charging which we expect to become more prevalent over the next 10 years and to open additional opportunities for energy management at the building and utility level. Thus, a complete upfront installation is not an optimal solution for ZEVIP or for the condominium owner or for condominium management.

3. Install Infrastructure now, then EV Chargers as Required

This option is more practical than options 1. or 2. Installed infrastructure can be optimized. EV chargers are purchased by individual tenants when needed, as occurs in private homes, and are attached to the charger network. ZEVIP cost sharing does not support this option because chargers are not part of the installation. Without cost sharing, the high initial infrastructure installation price is a deterrent to action by condominium management or associations. Condominiums typically cannot proceed with capital expenditures without 80% of owners in agreement.

In British Columbia, BC Hydro provides a rebate of 50% up to $600 per connector for EV charger infrastructure without requiring chargers to be connected. This ‘EV ready’ program for existing

condominiums puts them on an equal footing with the EV Ready requirements for new condominiums that has been legislated in many jurisdictions.
Https://electricvehicles.bchydro.com/incentives/charger-rebates/apartment

Proposal

ZEVIP could offer a cost sharing option for condominium infrastructure-only retrofit installations, similar to the BC program linked above. To provide the charger usage data that informs the ZEVIP program, the requirement for the condominium owner would be to report usage annually until e.g., 95% of chargers have been installed and are in use. This would be a flexible end date, accommodating actual EV adoption.

Benefits

Such a program has benefits for condominium residents, management, and ZEVIP:

1. An up-front installation of infrastructure will permit condominium residents acquiring EVs to have immediate access to an EV charger. This is of course a benefit to the condominium resident. It also provides data that ZEVIP does not have with current condominium programs. Over 25 years, the real demand, usage data, and adoption rates of EVs will be recorded without the distortions caused by delays in access to charging, high costs of charging infrastructure for users, conflicts with condominium management, and more.
2. For this program stream, ZEVIP funds will not pay for EV chargers, as individual chargers will be purchased by the residents (or by the condominium management if they choose to do so). By implementing an 'infrastructure only' program option, NRCan will play a crucial enablement role in a cost-efficient way by not paying for unused chargers and spreading the funding over more current and future EV owners.
3. Charger technical requirements will change as vehicle to grid and vehicle to building charging (V2X)[2] is offered in future years. Other innovations may significantly impact the nature of EV Charging over the next two decades. By funding only infrastructure, and by requiring long term reporting on charging use, ZEVIP would have more program certainty and more data on the evolving EV charger environment.
4. As ZEVIP programs end at some future time, long term reporting requirements can remain in place for awarded projects that will maintain data on the usage of chargers up to the complete adoption of EVs on Canadian roads.

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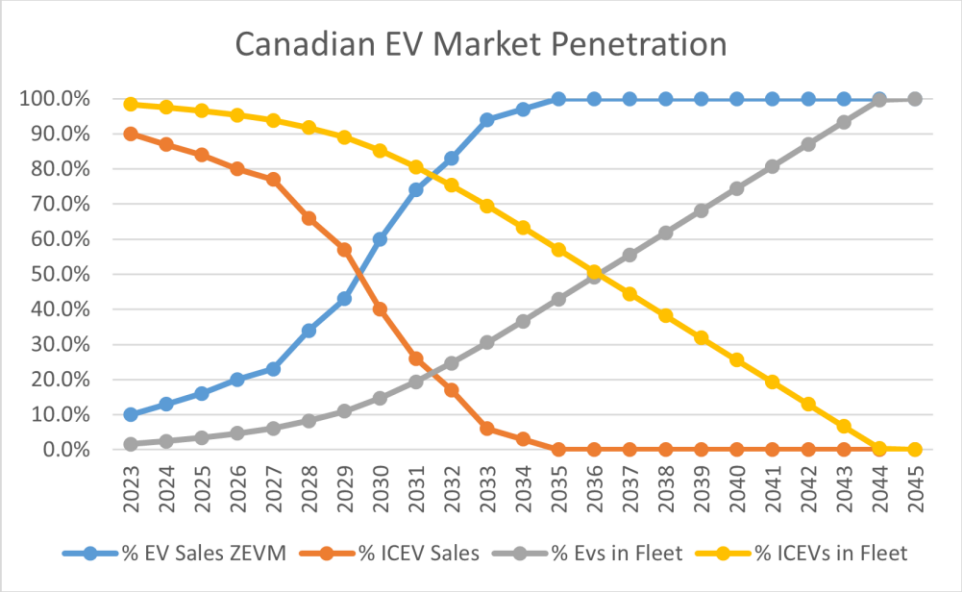
[2] V2X = Vehicle to Everything (Vehicle to Grid, Vehicle to Building, etc.) For more details, see Link 1 and Link2

ENDNOTE

[i] The ZEV Mandate specifies the minimum percentage of EV sales in Canada for each year from 2026 to 2035. **Assumptions**: each EV will replace an ICEV on the road; existing sales of 10% EVs at the end of 2022 will ramp up smoothly to the 20% mandated in 2026; and the total number of vehicles on the road will not change. The Canadian, and therefore the condo's, percentage of EVs is calculated and shown in the graph and table below.



Year	2023	2024	2025	2026	2027	2028	2029	2030
% EV Sales/ ZEVM Sales	10.0%	13.0%	16.0%	20.0%	23.0%	34.0%	43.0%	60.0%
% ICEV Sales	90.0%	87.0%	84.0%	80.0%	77.0%	66.0%	57.0%	40.0%
% EVs in Fleet	1.6%	2.4%	3.4%	4.7%	6.1%	8.3%	11.0%	14.7%
% ICEVs in Fleet	98.4%	97.6%	96.6%	95.3%	93.9%	91.7%	89.0%	85.3%

Year	2031	2032	2033	2034	2035	2036	2037	2038
% EV Sales/ ZEVM	74.0%	83.0%	94.0%	97.0%	100.0%	100.0%	100.0%	100.0%
% ICEV Sales	26.0%	17.0%	6.0%	3.0%	0.0%	0.0%	0.0%	0.0%
% EVs in Fleet	19.4%	24.6%	30.5%	36.7%	43.0%	49.3%	55.5%	61.8%
% ICEVs in Fleet	80.6%	75.4%	69.5%	63.3%	57.0%	50.8%	44.5%	38.2%

Year	2039	2040	2041	2042	2043	2044	2045
% EV Sales/ ZEVM Sales	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
% ICEV Sales	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% EVs in Fleet	68.1%	74.4%	80.7%	87.0%	93.3%	99.6%	100.0%
% ICEVs in Fleet	31.9%	25.6%	19.3%	13.0%	6.7%	0.4%	0.0%

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