

A woman with blonde hair, wearing a light-colored trench coat and blue jeans, is standing in a parking garage. She is holding a black charging cable and plugging it into the front of a white electric car. The car's headlights are on, and the background shows other cars and the structure of the parking garage. The text is overlaid on the image.

EV Ready Retrofits for Condominium Strata Buildings

Preparing Your Building for Widespread Future EV Charging



About this Presentation

- This presentation supports BC residential strata corporations (condominium-style), rental building owners, and property managers, in considering and implementing retrofits to future-proof their properties for growing EV adoption.
- This presentation was commissioned by the District of Saanich, with funding from BC Hydro, and prepared by AES Engineering Ltd.
- Any organization is welcome to use these presentation materials.

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A Note about Stratas

- Strata corporations are governed by law under [the Strata Property Act](#).
- Under the act, specific procedures are required, including but not limited to:
 - A $\frac{3}{4}$ vote of owners for change of use or funding at a general meeting; and
 - The passing of a bylaw to implement user fees for operating costs such as energy or network fees.
- Some examples within this presentation may not apply to all stratas.

Contact [Vancouver Island Strata Owners Association \(VISOA\)](#) or the [Condominium Home Owners Association of BC \(CHOA\)](#) for support and resources in implementing EV infrastructure under the Strata Property Act.

Outline

1. Background

- Why plan for widespread adoption of electric vehicles (EVs) & EV charging?
- Where do we charge? - The importance of at home charging

2. About EV charging & EV Energy Management Systems

3. Two models for implementing EV charging infrastructure

- Comprehensive EV Ready retrofits
- Incremental additions of EV charging
- Incentives

4. Planning a comprehensive EV Ready retrofit

- Process
- Resources to help residential strata corporations and rental building owners
- Considering other fuel-switching electrification upgrades when planning EV Ready retrofits



1. Background

Benefits of EVs

- **Lower Fuel Costs** – Charging an EV in BC is equivalent to about \$0.20/L gasoline.¹
- **Lower Maintenance Costs** – Consumer Reports finds EVs have half the maintenance costs.²
- **GHG emissions reductions** – ~85-90% lower life cycle emissions (including manufacturing), when charging on BC's relatively low GHG grid.³
- **Zero tailpipe emissions** – Improved air quality.
- **Quiet & excellent performance.**



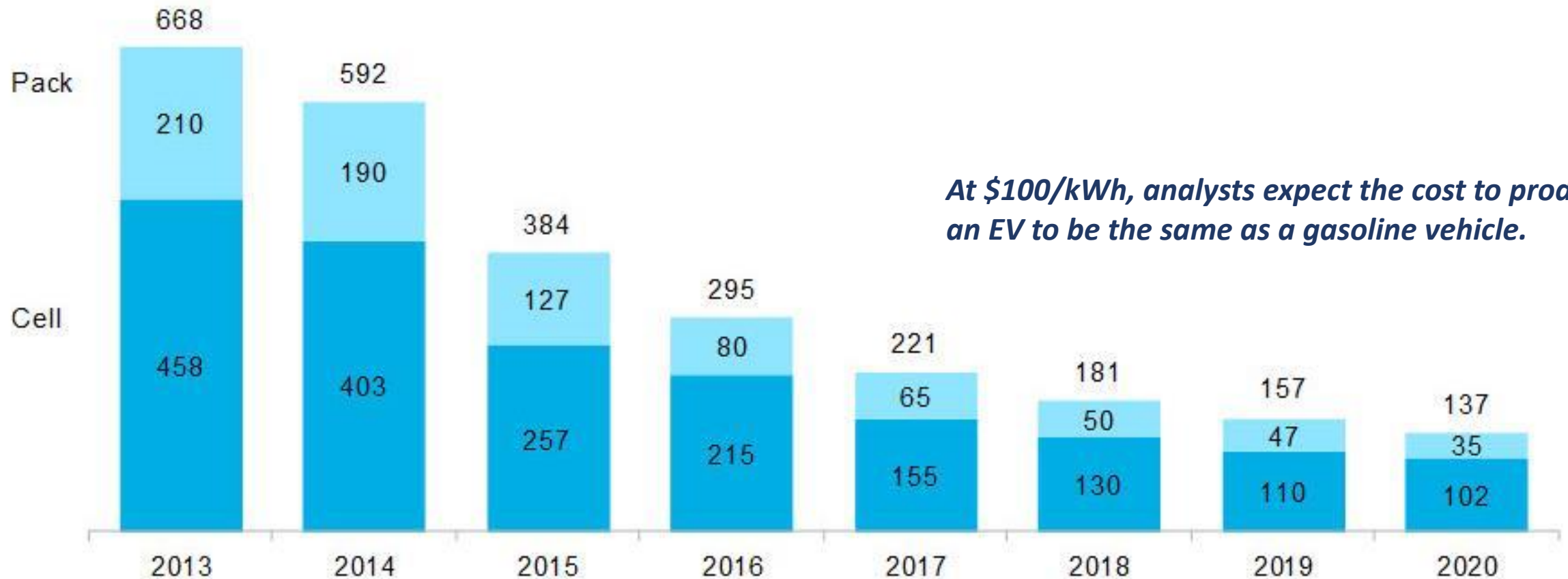
1. AES Engineering calculations.

2. [advocacy.consumerreports.org/press_release/electric-vehicle-owners-spending-half-as-much-on-maintenance-compared-to-gas-powered-vehicle-owners-finds-new-cr-analysis/](https://www.consumerreports.org/press_release/electric-vehicle-owners-spending-half-as-much-on-maintenance-compared-to-gas-powered-vehicle-owners-finds-new-cr-analysis/)

3. [carboncounter.com/](https://www.carboncounter.com/)

The cost of batteries for EVs is declining

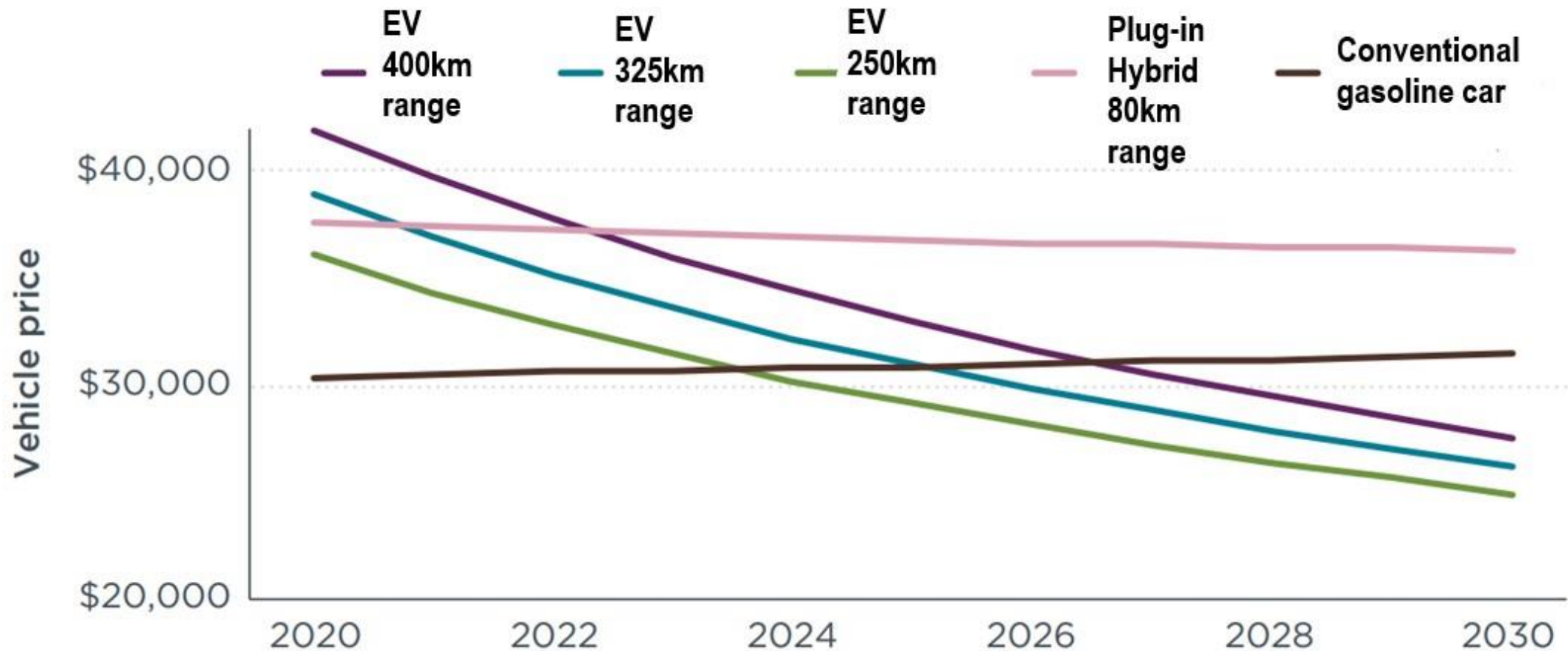
real 2020 \$/kWh



At \$100/kWh, analysts expect the cost to produce an EV to be the same as a gasoline vehicle.

Source: BloombergNEF

As battery prices decline, EVs are projected to achieve “price parity” with conventional vehicles in the mid-2020s (without incentives)



Source: International Council on Clean Transportation (ICCT). April 2019. *Update on electric vehicle costs in the United States through 2030*. ICCT is a respected independent NGO in this sector. Multiple other analysts project similar trends, including Bloomberg New Energy Finance, BNP Paribas, DNV GL, Rocky Mountain Institute, and others.

Province of BC has adopted a Zero Emissions Vehicle Regulation –
recently made it more ambitious.

2035

By ~~2040~~ every new car sold in BC
will be a zero-emission vehicle

& 90% Zero-Emissions new vehicles by 2030!





In June 2021, the Federal Government announced that it would require 100% of car and passenger truck sales to be zero-emissions by 2035

Source: <https://www.canada.ca/en/transport-canada/news/2021/06/building-a-green-economy-government-of-canada-to-require-100-of-car-and-passenger-truck-sales-be-zero-emission-by-2035-in-canada.html>

The Importance of Home Charging

- Home charging is the most common, cost-effective & convenient form of charging
 - 72% of EV charging in Canada occurs at home (FleetCarma. 2019. “Charge the North”)
- Multifamily building residents increasingly demand access to “at home” charging
- As of January 2021, 16 BC local governments (together representing most new development in BC) require that 100% of residential parking in new buildings be “EV Ready”



Charging Pyramid




Source: US Department of Energy.



2. About EV Charging & EV Energy Management Systems

Types of EV Supply Equipment (EVSE)

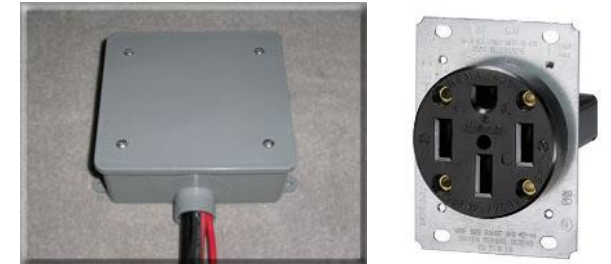
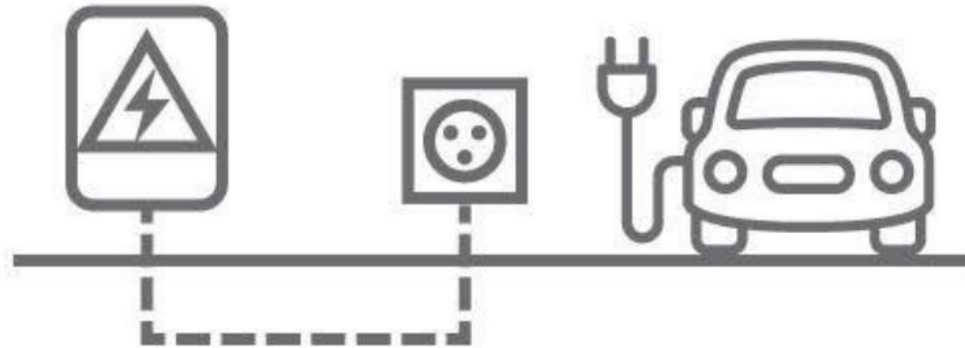
i.e. “chargers” or “charging stations”

Type	Example	Voltage Output	Current Output	Power Output	Speed of Charge	Application
AC Level 1		120V	12A – 16A	1.4kW – 1.9kW	Slow (~3-9km of range per hour)	Some home & workplace
AC Level 2		208V – 240V	≤80A	≤19.2kW	Medium (~10-100 km of range per hour)	Preferred for home & workplace; public
DC Fast Charging		50V – 100V	≤400A	≤400kW	Fast (~150-2000+ km of range per hour)	Public fast charge

What is “EV Ready” Parking?

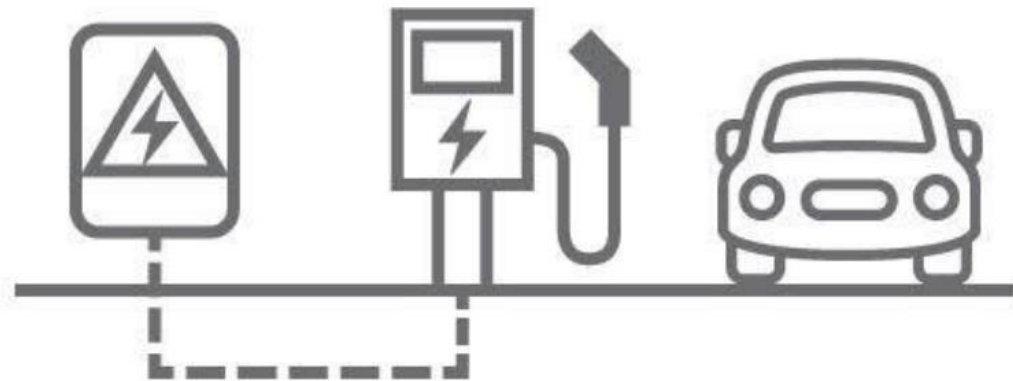
EV Ready

- Wired electrical outlet adjacent to parking space.
- EV Supply Equipment (EVSE) installed in future.

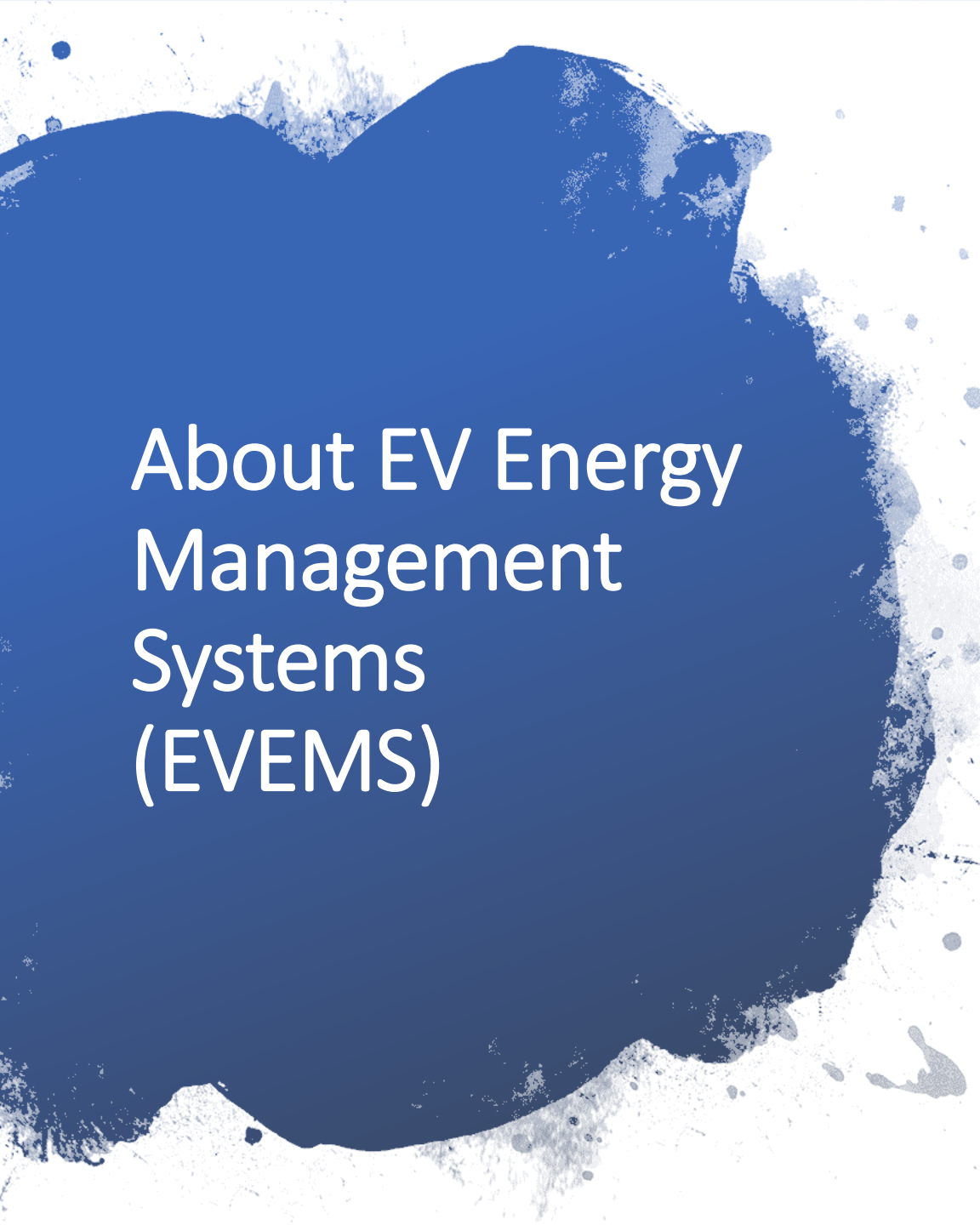


Junction box or receptacle

EVSE Installed



EVSE

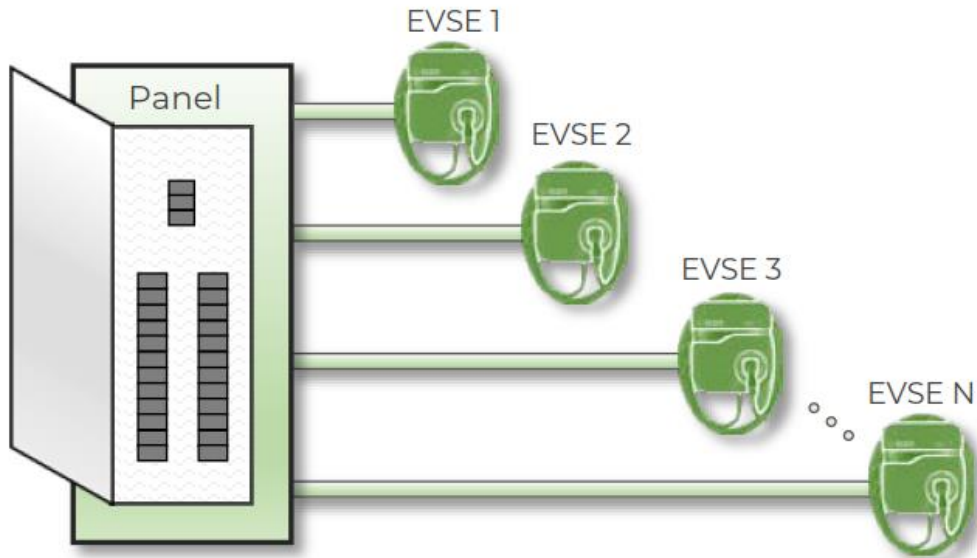


About EV Energy Management Systems (EVEMS)

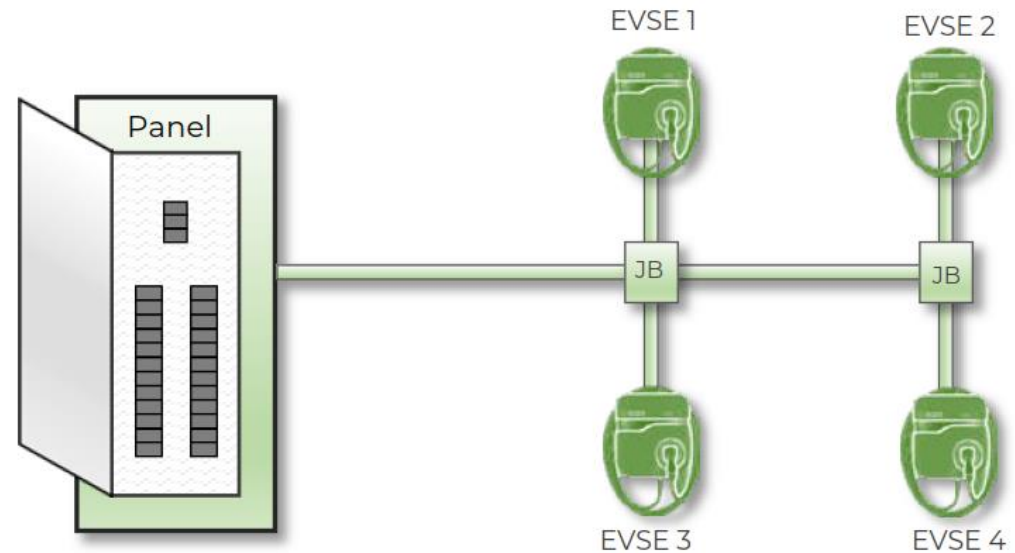
- EVEMS monitor and control EV loads.
- Advantages include:
 - **Reduces electrical capacity & costs** necessary to provide EV charging.
 - **Allows greater amount of EV charging** within finite electrical capacity of existing buildings.
 - **Manages EV loads to maximize value** – e.g. avoid demand charges; time charging to best align with utility “EV rates”; etc.
- EVEMS are important to enabling high levels of EV charging in multifamily buildings.

About EV Energy Management Systems

“Dumb” charging on dedicated circuits vs. “smart” EVEMS



- EVSE must be on dedicated branch circuits
- Charging stations loads are not managed
- Higher electrical capacity & higher cost for multiple EVSE



- EVSE can share a circuit
- Charging stations loads are managed so they do not exceed the capacity of the circuit
- Less capacity & lower cost for multiple EVSE

Reduced cost through use of EVEMS - Example

- The table below illustrates recent cost estimates for a 100% EV Ready retrofit to a multifamily building in Vancouver with 153 parking spaces.
- Costing is from late 2020.
- Different electrical configuration options represent different designs for load sharing.

Configuration Option	Total Project Cost (Paid by strata; one time retrofit)	Cost per Stall*	EVSE Cost (Paid by drivers when they adopt EV; one time cost)	Energy Cost ** (Monthly; paid by drivers)	Network Cost *** (Monthly; paid by drivers)
Dedicate 40A Circuit ("dumb charger")	\$643,000	\$4,200	~\$500 - \$1,500	~\$71/month	\$0 (if not networked) ~\$15-\$25/month if networked
4-way sharing per 40A circuit (EVEMS)	\$144,000	\$940	~\$1,000 - \$3,000	~\$36/month	~\$15-25/month

* Cost per parking stall is total project cost divided by number of stalls. Differences to due to rounding.

** Different energy costs are due to increased utility demand charges for peak consumption. Driving distances same in all scenarios.

*** EVEMS systems frequently require drivers to pay monthly network fees. Dedicated circuits may require network fees for utility billing, etc.

Reduced cost through use of EVEMS - Example

- There can be ways to reduce costs even further, through aggressive use of load sharing.
- The 7-share of 40A and 12-share on 60A are uncommon, and do not provide much power per vehicle
 - Many EV charging service providers and buildings are not comfortable with such high levels of sharing
 - However, modeling and some early pilots suggest such high levels of sharing can be viable in urban areas where households drive relatively short distances on average.

Configuration Option	Total Project Cost (Paid by strata; one time retrofit)	Cost per Stall**	EVSE Cost (Paid by drivers when they adopt EV; one time cost)	Energy Cost *** (Monthly; paid by drivers)	Network Cost **** (Monthly; paid by drivers)
Dedicate 40A Circuit ("dumb charger")	\$643,000	\$4,200	~\$500 - \$1,500	~\$71/month	\$0 (if not networked) ~\$15-\$25/month if networked
4-way sharing per 40A circuit (EVEMS)	\$144,000	\$940	~\$1000 - \$3,000	~\$36/month	~\$15-25/month
7-way sharing per 40A circuit (EVEMS)	\$101,000	\$662	~\$1000 - \$3,000	\$30/month	~\$15-25/month
12-way sharing per 60A circuit (EVEMS)	\$96,000	\$628	~\$1000 - \$3,000	\$30/month	~\$15-25/month



3. Retrofitting EV charging into multifamily buildings

Two models for implementing EV charging

Multifamily buildings implement EV charging in one of two ways...

1. Comprehensive EV Ready retrofits

- **Often 100% of parking spaces are made EV Ready**
 - Alternately, 1 parking space per residence made EV Ready, or some other value
- **One-time comprehensive project**
- **Most convenient for drivers**
 - EV charging at regular assigned parking space
 - Easy process to install EVSE as drivers adopt EVs
- **Greater upfront one-time cost**
- **Lowest life-cycle costs**
 - Allows for design for EVEMS & load sharing
 - Avoids potential for stranded assets
 - Costs average ~\$1000 per EV Ready parking space (significant variation between buildings; drivers later purchase EVSE as they adopt EVs)
 - Can minimize energy costs

2. Incremental additions of EV Charging

- **EVSE implemented in one to a few parking spaces**
 - Charging often for shared use in a common property stall
- **Typically, incremental additions of EVSE over time**
- **May be less convenient for drivers**
 - Sharing EVSE can be inconvenient (e.g. moving vehicle at night; scheduling charging; finding EVSE occupied; etc.)
 - Installing additional EVSE & electrical infrastructure can be time intensive; delayed access to charging
- **Less first cost**
- **Higher life-cycle cost**
 - Cannot maximize potential of EVEMS
 - Potential for stranded assets
 - Costs average ~\$7000 per EVSE (significant variation between buildings)
 - Will not minimize energy costs

CleanBC EV charging rebates for apartment & condo buildings

Comprehensive EV Ready retrofits

EV Ready Rebates

- Supports buildings to implement EV Ready upgrades (minimum 1 EV Ready space per residential unit; can make all parking EV Ready)
- Up to \$3,000 for EV Ready plan
- Up to \$80,000 for EV Ready infrastructure
- Up to \$14,000 for chargers

NEW Saanich Top-Up to Clean BC Rebates:

- \$1,000 for EV Ready plan
- \$100/stall for EV Ready infrastructure

Incremental additions of EV Charging

Standalone EV Charger Rebate

- Up to \$2000 per charging station, to maximum of \$14,000 per MURB complex
- Stations must be networked for at least 2 years



Rebates are subject to change. Check official websites confirm program details:

<https://goelectricbc.gov.bc.ca/>

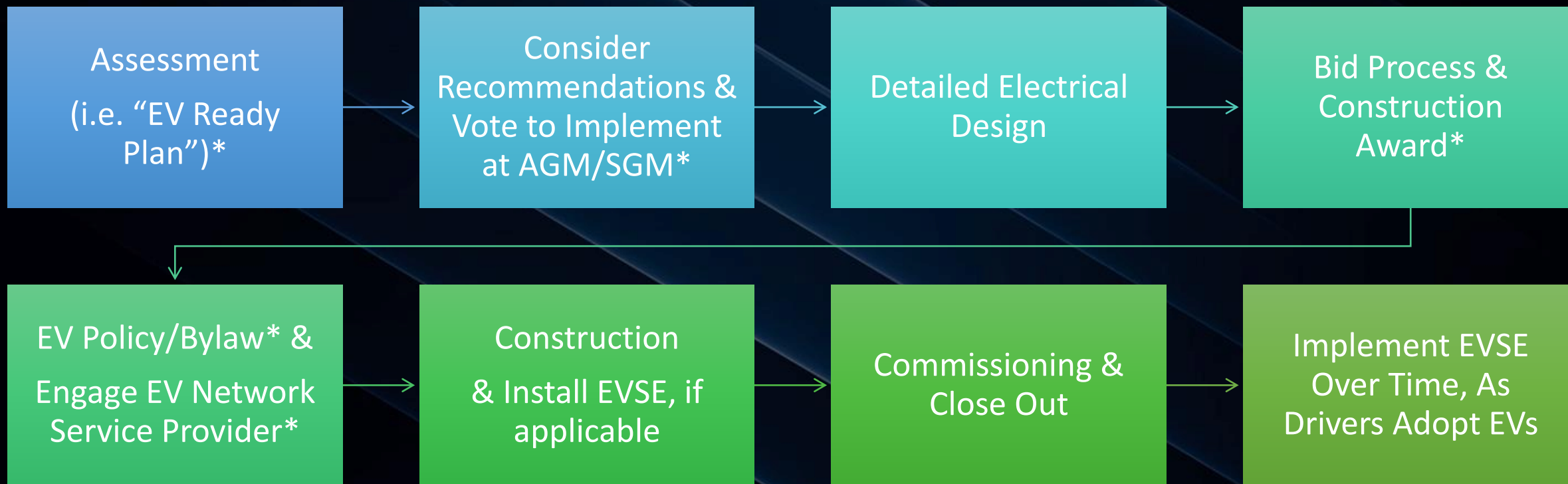
<https://electricvehicles.bchydro.com/incentives/charger-rebates/apartment>



4. Planning a Comprehensive EV Ready Retrofit



Planning & Implementing EV Ready Retrofits



*Strata owners required to approve funding, pass bylaws or resolutions, and award contracts at various steps. Contact VISOA and/or CHOA for guidance.



Resources to assist condominium strata buildings plan & implement EV Ready Retrofits

- Review CleanBC Go Electric EV Ready Rebate Program:
 - <https://goelectricbc.gov.bc.ca/>
 - <https://electricvehicles.bchydro.com/incentives/charger-rebates/apartment>
- Access Support from Plug In BC EV Advisor for eligible building types:
 - <https://pluginbc.ca/ev-advisor-service/>
- Find guidance and resources for making decisions under the Strata Property Act:
 - <https://www.visoa.bc.ca/>
 - <https://choa.bc.ca/contact-us/>
- More about taking climate action and driving an EV in Saanich:
 - www.Saanich.ca/EV



EV Ready Plan Key Considerations

- The [Program allows](#) an electrical engineer or a licensed electrical contractor to complete an EV Ready Plan. It is encouraged that electrical contractors be certified under the [EV Infrastructure Training Program](#).
- Consider getting quotes from ~2-3 firms.
- Select consultants on the basis of experience, qualifications & price.
- The EV Ready Rebate program offers a rebate of 75%, up to \$3k PLUS \$1,000 top-up from District of Saanich. Costs for EV Ready Plans generally range from \$2.5k - \$7k+.
- Legal fees to change strata rules/bylaws may be included in the rebate program. Retain a strata lawyer early on and request a quote so you can include it the budget when you apply for BC Hydro's preapproval.

Consider other ways to make your building climate friendly

What are fuel-switching electrification upgrades?

- Switching from fossil fuel equipment (e.g. gas, fuel oil, etc.) to efficient electrical systems, e.g. heat pumps.
- System upgrades may include:
 - Hot water heater.
 - Common area make-up air.
 - Space heating.
 - Cooking.
 - Fireplaces.
- Reduce GHGs
- Can improve indoor air quality; provide cooling

Incentives

- CleanBC Better Buildings Program - <https://betterbuildingsbc.ca/>
- Significant incentives for various fuel-switching electrification upgrades

Why plan fuel switching & EV Ready upgrades at the same time?

- Optimize electrical renovations
- Potential for comprehensive project financing
- In the future, buildings may be required to implement fuel-switching to reduce GHGs

Multifamily buildings may consider a feasibility study of fuel-switching electrification opportunities to complement the EV Ready Plan.

- Will involve further costs, but can increase value



100% EV Ready Multifamily Condo Retrofit - Case Study

About the building

- Greater Vancouver area
- 23 residential units
- 46 parking spaces (2 per residence; residential spaces located adjacent to one another)

Project team

- **Electrical Engineer** – AES Engineering
- **Electrical Contractor** – Power Pros
- **EV Network Service Provider** – ChargePoint

Approach

- Conducted EV Ready Plan to assess options
- Opted to implement 100% EV Ready project at SGM
- 4 parking spaces (2 housing units) share 40A circuits, with 2 EV Ready spaces installed
- \$1390 per parking space (before incentives) for EV Ready detailed design & install
- 10 households installed EVSE; 13 waiting until they purchase an EV



A woman with blonde hair, wearing a light-colored trench coat, is standing in a parking garage. She is holding a black charging cable and is in the process of plugging it into the front of a silver electric car. The background shows other cars parked in the garage, and the lighting is somewhat dim, typical of an indoor parking structure. The overall mood is calm and focused.

Thanks!

Questions?