INTEGRATING ELECTRIC VEHICLE CHARGERS IN BUILDINGS

Electric vehicles (EVs) currently represent 10 percent of new vehicle registrations in Canada, a pivotal shift in the adoption of sustainable transportation. According to Canada's Energy Future 2023 report, which outlines scenarios for achieving net-zero greenhouse gas (GHG) emissions by 2050, the number of zero-emission vehicles (ZEVs) on the road is projected to reach 50 percent by 2035, 60 percent by 2040 and 90 percent by 2050.[1]

As EV demand accelerates, it's essential for building owners to understand:

1. **EV charging infrastructure and implementation.**
2. **Advancements in load management technology.**
3. **Available funding opportunities.**

[1] Government of Canada: cer-rec.gc.ca/en/data-analysis/energy-markets/market-snapshots/2024/market-snapshot-zero-emission-vehicles-now-account-for-over-10-percent-of-all-new-vehicles-in-canada.html

CHARGING LEVEL

A charger is a device that tells the vehicle how much electrical current it can draw.

There are three levels of chargers. For commercial buildings, the decision will be between a Level 2 and Level 3 charger, as a Level 1 charger will not be a robust enough solution.

EV charger options[2]

OPTIONS	LEVEL 1	LEVEL 2	LEVEL 3 (FAST CHARGER)
INPUT	120 V	208/240 V	480 V
OUTLET TYPE	Standard electrical outlet (e.g., a phone charger)	Special electrical outlet (e.g., a stove or dryer plug)	DC outlet (not found in homes)
TIME TO CHARGE	8 to 50+ hours	4 to 10 hours	25 to 30 minutes
RANGE (PER HOUR OF CHARGING)	3 km to 8 km	16 km to 50 km	Up to maximum driving range of vehicle
TYPICAL USES	Home charging and back-up situations	Home charging, charging at businesses and public spaces	Charging at dedicated stations, public spaces, and highway corridors
ELECTRICITY TYPE	AC electrical current	AC electrical current	DC outlets

[2] Natural Resources Canada: natural-resources.canada.ca/energy-efficiency/transportation-alternative-fuels/electric-vehicle-charging/25049

CHARGING TIME

CHARGERS	BENEFITS	EXAMPLES
LEVEL 2 CHARGERS	When car is not in use for a longer period—slower charging	Condo, office building
LEVEL 3 CHARGERS	Fast charge (20 to 60 mins)	Gas station, shopping mall

In public or private spaces, fee-based charging may include options such as time-based fees, flat fees, electricity usage fees (kilowatt-hours) or a combination of the above. Some fee-based charging systems may include penalty rates that encourages vehicle owners to unplug once their EV has reach 80% battery charge.

EASE OF IMPLEMENTATION

Level 2 chargers are simple devices that can be installed by any licensed electrician, although it's recommended to hire one with EV charger experience. You can find an electrician near you through the Electrical Safety Authority's contractor locator.

ELECTRICAL INFRASTRUCTURE

Once the number of chargers and level required to meet the building's needs are determined, an electrician can help ensure that your existing electrical infrastructure can support future EV demand. They can also provide information on smart charging solutions and/or increasing the size of the electrical panel to accommodate the increased electrical demand, if required.

Changes needed may include increasing the size of your electrical panel, adding transformers and installing electrical wiring to stalls for current and or future chargers.

It's important to conduct an analysis of your building's current and future demand for EV chargers. This will help in realizing savings and will ensure appropriate sizing of electrical infrastructure.

CAPACITY UPGRADES

Current building owners who plan to install EV charging stations should ensure that their building's current electrical service capacity can accommodate these new loads. Building owners should work with licensed electricians to ensure that additional electric loads fit within the installed service capacity and that panel and service replacements are not required. If a capacity upgrade is required, building owners should contact their local electrical utility (LDC) to inquire about available capacity that can be supplied, gather information on timelines and application requirements, and work in collaboration with a licensed electrician.

LOAD MANAGEMENT/SMART CHARGING

Load management changes the electrical power delivered to EV chargers in relation to the measured available capacity of your building's electrical system. This can be an effective alternative to costly infrastructure upgrades.

When a building's lighting and HVAC demand is high, this limits the amount of electricity that can be drawn by EV chargers. When there is more capacity available, more electricity can then be directed to EV charging. This option can be employed, for example, in a condo building, where the majority of EV charging occurs overnight.

EV load management platforms also provide scheduled EV charging. This allows users to charge their vehicles during off-peak hours, contributing to lower overall peak electricity demand in the building.

TYPICAL OVERNIGHT ELECTRIC LOAD PROFILE FOR A MULTI-UNIT RESIDENTIAL BUILDING

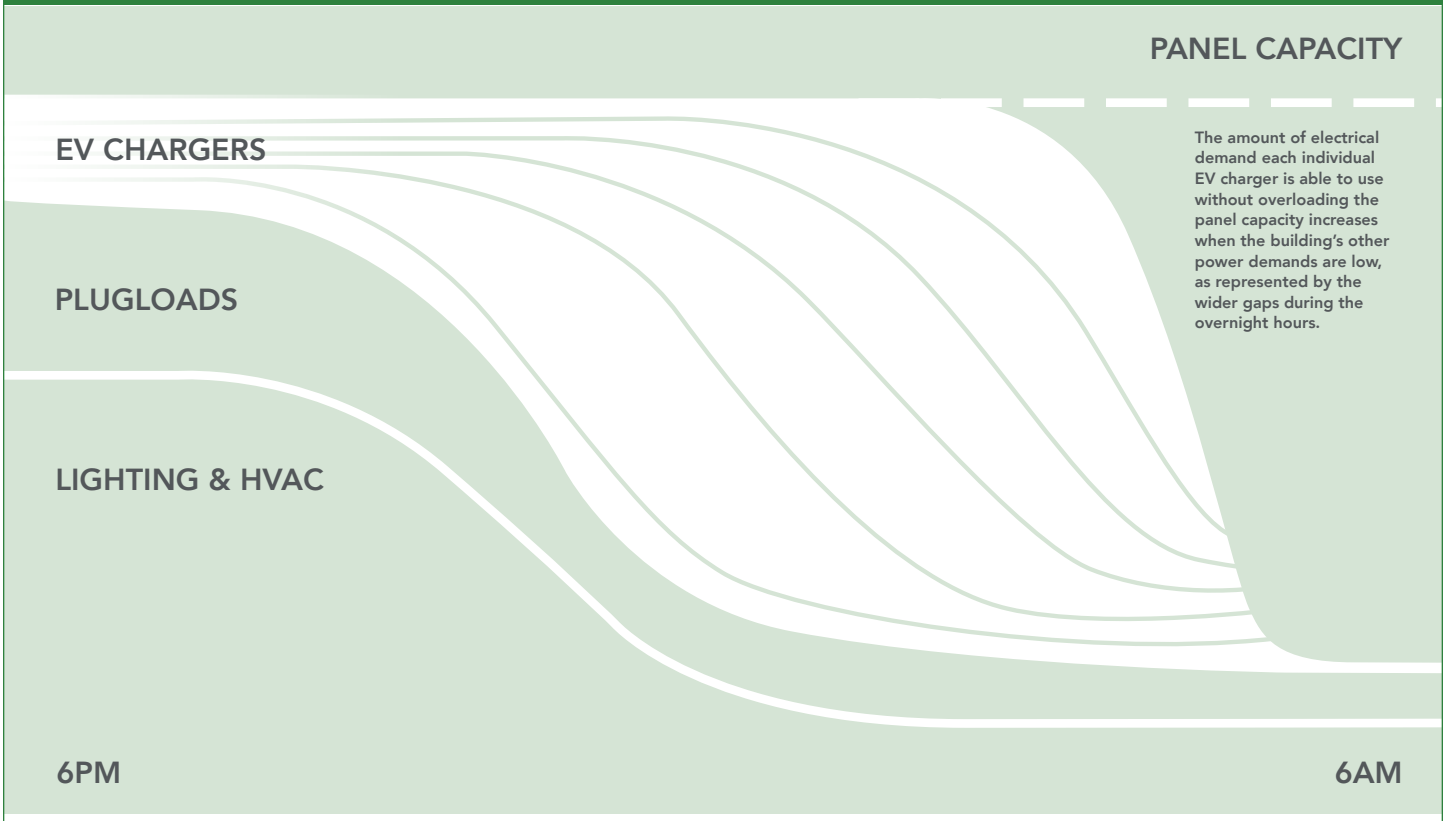

Figure 1: EV charging load management profile.

Load management can be achieved with either connected smart chargers and simple electrical infrastructure, or with simple chargers and smart infrastructure. Examples of load management solutions in Ontario include SWTCH Control, Flo PowerSharing and RVE's SMP or Evolute.

RVE OR EVOLUTE'S SMP SOLUTION

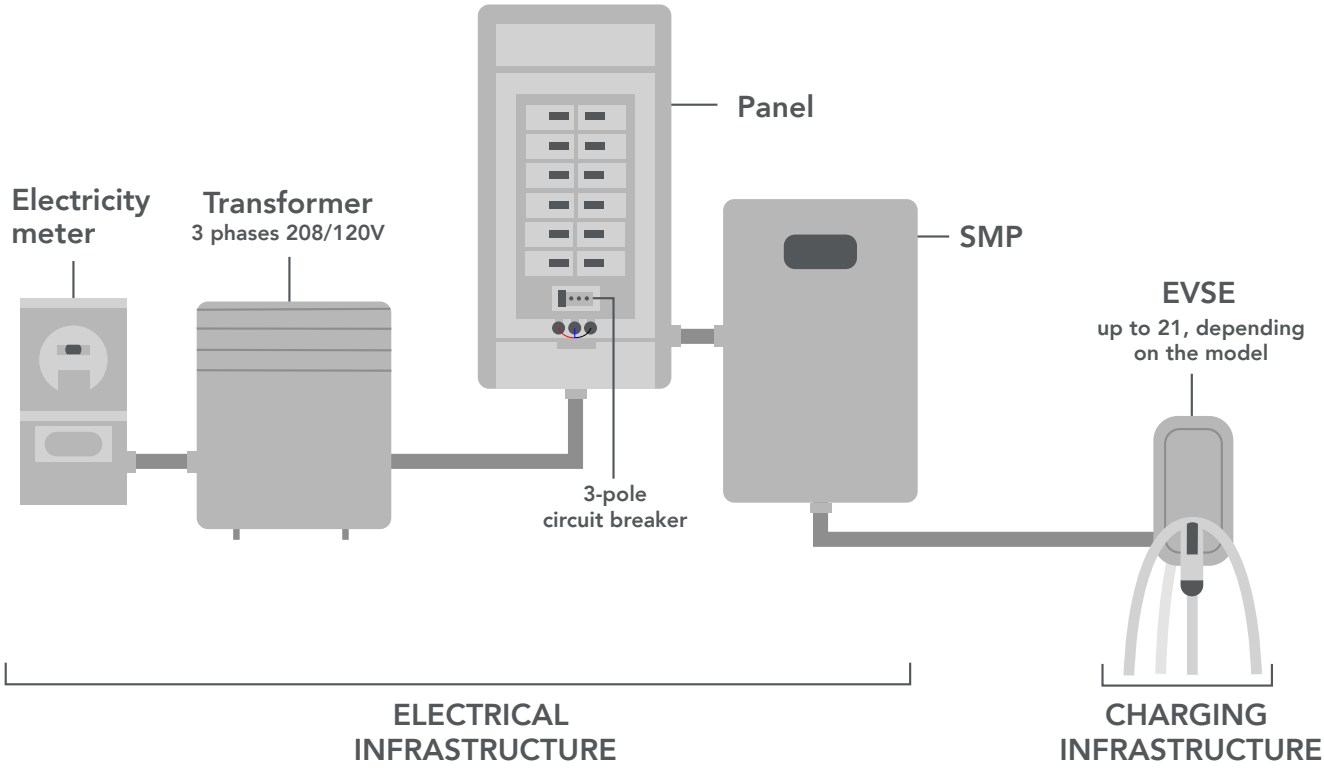

Figure 2: RVE infrastructure[4]

[4] RVE: rve.ca/wp-content/uploads/2024/04/DCC_RVE_Installation-manual_DCC-9_Gen3_V13-VF.pdf

Monitor the main electrical panel of the building or service to dynamically increase or decrease the system power based on real-time building demand.

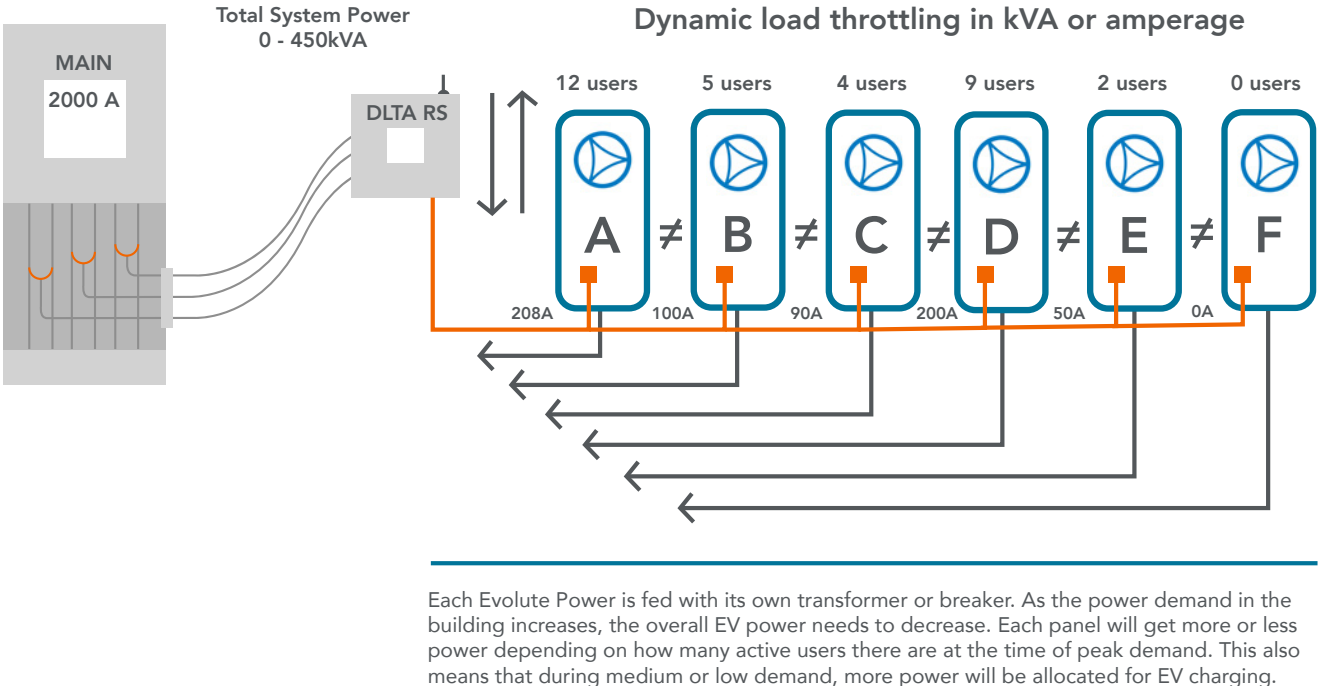

Figure 3: Evolute infrastructure[5]

[5] Evolute: evdirect.ca/smart-multi-user-ev-charging-system/

METERING: HOW IS ELECTRICITY BILLED TO THE USER?

For Level 3 chargers, users typically pay with a credit card or through a phone app.

The same payment options apply for Level 2 chargers where users are different each time. However, for Level 2 chargers used by the same vehicle owner each time (as is the case for condo buildings), the most cost-effective and convenient option for users is to install individual EV charging meters accessible from the garage, then wire those from the parking lot directly to the individual meter. EV charging management software and apps allow users to pay for their electricity usage easily.

FUNDING OPPORTUNITIES

There are funding programs available to help commercial buildings install EV charging infrastructure. These may be federal programs or programs offered by your LDC, municipal government or other organizations.

For example, in the Greater Toronto and Hamilton area, The Atmospheric Fund's EV Station Fund provides qualified organizations with rebates of up to 50 percent of the installation cost for up to 20 EV charging stations, to a maximum of $5,000 per Level 2 charger, $15,000 per DC fast charger and $50,000 per DC fast+ charger.

Check online for up-to-date information on the programs available in your area.

CONCLUSION

Integrating EV chargers in a building can pose a significant issue if the building's infrastructure isn't designed to accommodate additional electrical load. Before considering this new technology, building owners should ensure that they have adequate electrical service capacity. If capacity is constrained, it's recommended to conduct a service upgrade.

With the societal shift towards greater electrification and reduction of greenhouse gas emissions, we are transitioning to electric technology. Buildings should consider how to future proof their electrical infrastructure to accommodate increased electrical demand.