

## Electric Vehicles

### FEDERAL MANDATE

Transportation accounts for 25% of Canada's GHG and about half comes from cars and light duty trucks. As of February 4, 2022, the Federal Government has mandated that 100% of all cars and light trucks be electric by 2035 <sup>[1]</sup>.

### EMBODIED CARBON

The manufacturing of a small car releases 6 to 8.5 tonnes of CO<sub>2</sub>e, a medium size car releases 17 tonnes of CO<sub>2</sub>e, and a large car releases 35 tonnes of CO<sub>2</sub>e.

The manufacturing of a small electric car, including the battery, releases 14 tonnes of CO<sub>2</sub>e <sup>[2]</sup>.

Embodied carbon is usually not included in the CO<sub>2</sub>e of imported items which is problematic because it encourages outsourcing manufacturing to countries with poor environmental standards.

### EV CHARGING

There are several ways to charge an EV. All cars have an onboard charger which limits how fast the car can be charged. Cars plug into a device called an Electric Vehicle Supply Equipment (EVSE). The EVSE controls the current available to the onboard charger as well as providing safety lockout fault detection and scheduling. All cars can use Level 1 and Level 2 charging systems. Some EVs can use Level 3 chargers and Tesla cars can use Superchargers.

#### Level 1 Charging



**Level 1** chargers use a standard 120 volt AC household connection and a cable that usually comes with the car.

The cable has a standard SAE J1772 plug (also known as the J Plug) on the car end and a standard 120 volt plug on the other.



The EVSE is built into the cable to provide over current protection.

Level 1 chargers can charge at a rate of 7 to 12 km per hour depending on the car.

## Level 2 Charging



**Level 2** charging uses 240 volts AC and also requires an EVSE. The EVSE are normally residential units but they can be found at public charging locations.

As well as wall mounted EVSE devices, portable devices that plug into standard 220 volt outlet (dryer outlet) are also available. In either case, the cable plugs into the car with a standard J



Wall mounted Level 2 EVSEs can charge at a rate of 35 to 60 km per hour depending on the amperage of the onboard charger. There are several versions of the Level 2 EVSE that can supply either 40 amps, 48 amps or 80 amps<sup>[3]</sup>. The portable units are limited to approximately 30 amps.

Wall mounted Level 2 EVSE normally have a Bluetooth, Wi-Fi, or Ethernet connection to allow for off-peak scheduling and remote battery monitoring.

**Level 3** chargers (also known as fast chargers) use 480 volts DC and the EVSE are considered gas station replacements.



Level 3 chargers can charge at the rate of 5 to 30 km per **minute** (300 to 1,800 km per hour).

Level 3 chargers can charge most cars to 80% battery capacity in an hour.

There are 3 types of plugs used for Level 3:

- CHAdeMO used by most Asian cars
- SAE-Combo used by most North American and European cars
- Tesla have their own plug.



Most Level 3 EVSE have both SAE-Combo and CHAdeMO plugs. Adapter cables are available.



**Tesla Superchargers** EVSE only work with Tesla cars. Charging rates vary: Model 3 282 km in 15 minutes, Model Y 525 km in 30 minutes.

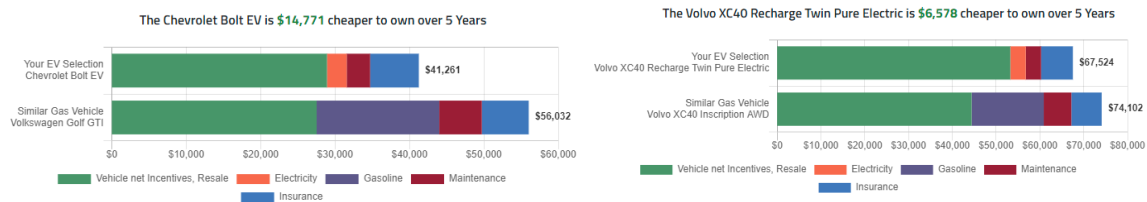
## Charging Times <sup>[4]</sup>

Car	Range	Level 1	Level 2	Level 3
Hyundai IONIQ	274	35.5 hrs	6 hrs	54 min
Chevy Bolt	417	66 hrs	9.9 hrs	77 min
Nissan Leaf	240	30 hrs	8 hrs	40 min
Volvo XC40	359	40 hrs	8-10 hrs	50 min

For current information on electric vehicles available in Ontario, see <https://ev.plugndrive.ca/>

## COST OF EV'S

The purchase cost of EV's is significantly higher than gasoline powered cars, however, if the cost of fuel is included in the total cost, the actual cost to own an EV for 5 years is comparable to owning a gasoline car <sup>[5]</sup>.



The examples from Plug 'N Drive shows the comparative cost of several cars. The comparison includes the Federal subsidy of \$5,000 for Zero-Emissions Vehicles <sup>[6]</sup>.

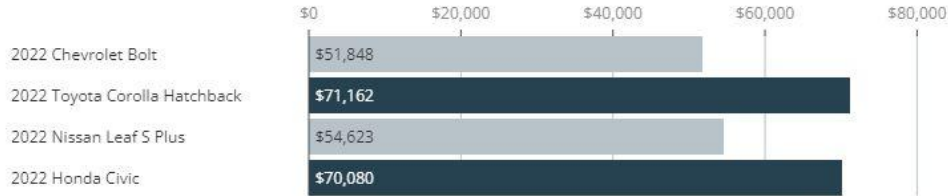
These comparisons assume that there will be little or no re-sale value for a used gasoline car in 5 years.

## Comparing cost of ownership between gas and electric vehicles

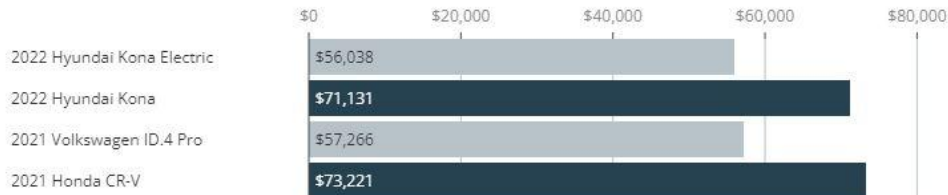
Total ownership cost includes price of fuel, depreciation and maintenance and repair estimates.

Electric Gas

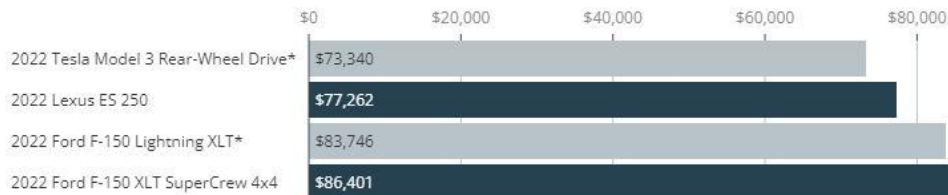
Sedan and hatchbacks



SUV and crossovers



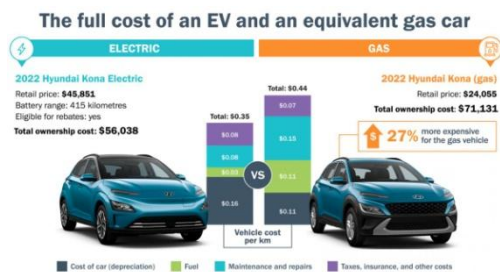
Premium vehicles



\*Less if eligible for electric vehicle rebates.

Chart: Dexter McMillan • Source: Clean Energy Canada

CBC News



For an analysis of the cost of owning an electric car, see the Clean Energy Canada report "The True Cost" [7].

The price of gasoline and the cost of owning a gasoline car will increase as the tar sands producers are forced to clean up their industry and as the carbon tax increases.

## REFERENCES

- [1] <https://www.nrcan.gc.ca/energy-efficiency/transportation-alternative-fuels/zero-emission-vehicle-infrastructure-program/21876>
- [2] <https://www.brusselsblog.co.uk/carbon-emissions-in-the-lifetimes-of-cars/>
- [3] <https://www.forbes.com/wheels/advice/ev-charging-levels/>
- [4] <https://www.canadadrives.ca/blog/car-guide/how-long-does-it-take-to-charge-an-electric-vehicle>
- [5] <https://www.cbc.ca/news/business/electric-vehicle-column-don-pittis-1.6403537>
- [6] <https://tc.canada.ca/en/road-transportation/innovative-technologies/zero-emission-vehicles>
- [7] [https://cleanenergycanada.org/wp-content/uploads/2022/03/Report\\_TheTrueCost.pdf](https://cleanenergycanada.org/wp-content/uploads/2022/03/Report_TheTrueCost.pdf)