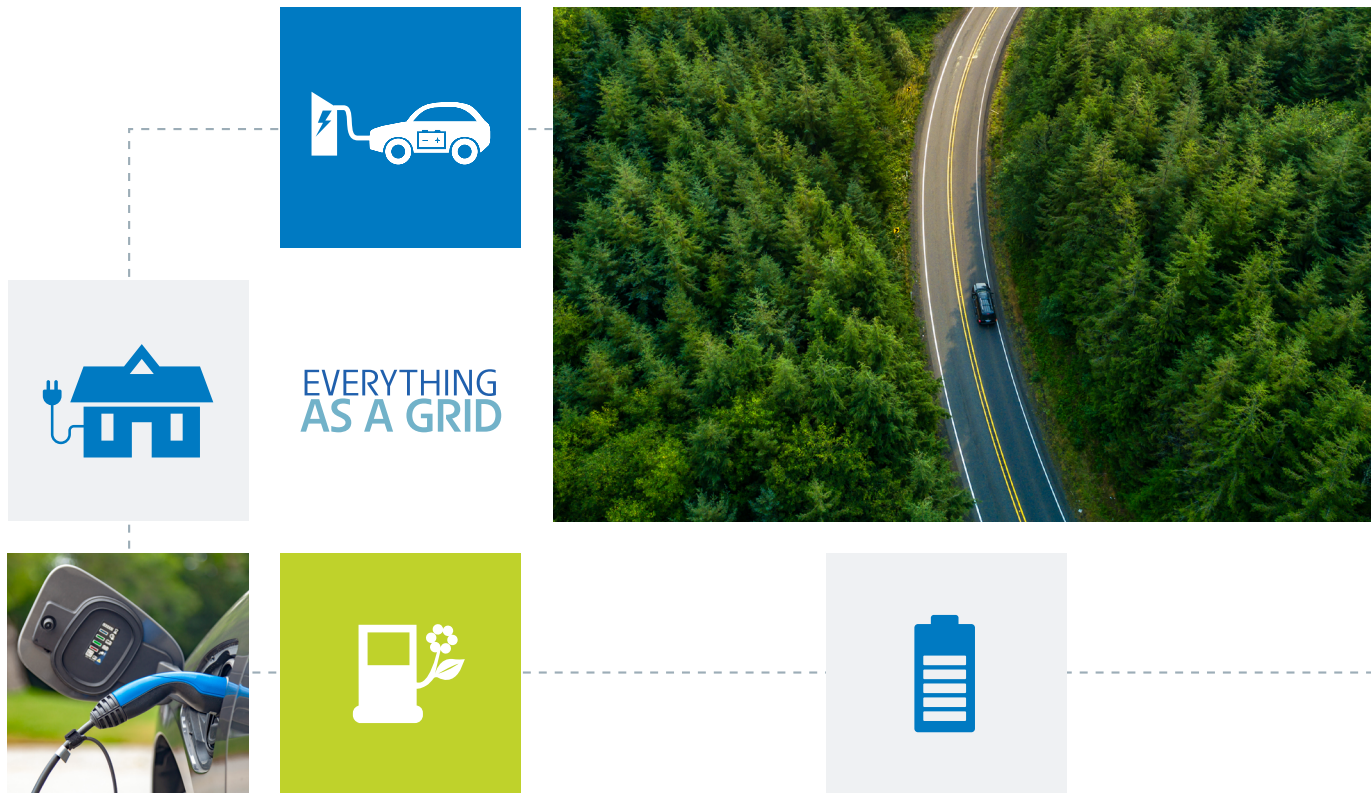


Plug in to electric vehicle charging

Consumer EV charging 101



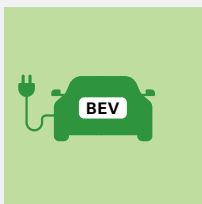
Summary

Congratulations on your decision to hit the road to electric vehicle (EV) ownership! Follow this roadmap to gain knowledge about all the details of EV charging.

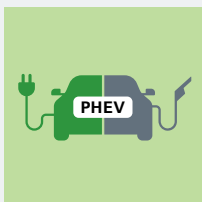
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Understand the different types of EVs

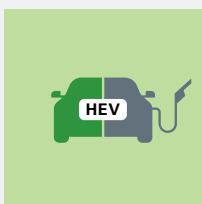
EVs are available in three primary types: Battery Electric Vehicle (BEV), Plug-in Hybrid Electric Vehicle (PHEV) and Hybrid Electric Vehicle (HEV). It is important to note that **only BEVs and PHEVs can be charged by an external electric charger.**



Battery Electric Vehicles (BEVs) are propelled by a battery-powered electric motor that relies exclusively on an external electrical source for charging and recharging. Battery sizes range from 30 kWh up to as much as 95 kWh for high-performance vehicles.



Plug-in Hybrids (PHEVs) include both an internal combustion engine and an electric motor, enabling them to switch between the battery and fuel sources such as gasoline or diesel. Battery size is usually between 6-15 kWh.



Hybrids (HEVs) include both a gas-powered engine and an electric motor, but all energy for the battery is generated through regenerative braking. Typical hybrids cannot plug into the grid to recharge.



Vehicle compatibility

To determine which EV charger you need, first look at the car's manual to understand its battery capacity. In addition to plug variations, EVs also have different battery sizes. Depending on whether the vehicle is a PHEV or BEV, its charging requirements and compatible charging methods will differ.

How long will it take to charge the car? The kW to kWh formula



7.7 kW

Kilowatts (kW) measure power. The higher the number of kilowatts offered by a charging station, the faster it will charge the EV, provided that the EV's onboard charger (OBC) can support the rate of charge. The OBC of most PHEVs is limited to either 3.4 kW or 7.4 kW, while BEVs range from 7 kW to 22 kW.



64 kWh

Kilowatt-hours (kWh) measure battery capacity. Every EV has a maximum kWh rating, which represents the maximum amount of energy it can store in its battery. The larger the kWh, the greater the EV's driving range will be.



7.7 kW

x



8.3 Hrs

=



64 kWh



When charging the EV battery, charging occurs at the full rate until the battery approaches 80%. At that point, the rate of charging will decrease.

	Traditional (ICE) vehicles	BEV Vehicles
Driving range	Miles	Miles
Consumption	Mile per gallon (MPG)	kWh/100 km
Refueling rate	Gallon/minute	Miles/minute
Engine performance	Horsepower or kW	Horsepower or kW

AC vs DC: how will you charge?

Unlike gasoline-powered vehicles that can pull into a service station on any corner and refuel in a matter of minutes, EV drivers require dedicated charging stations and adequate time to “refuel.” While electric cars can be charged using one of two power types — alternating current (AC) or direct current (DC) — EV batteries can only store power as DC so AC power must first be converted.

AC charging — EVs use an onboard charger (OBC) built inside the car, which converts power from AC to DC and then feeds it into the car’s battery.

DC charging — With DC chargers, the converter is included within, which allows it to feed power directly to the car’s battery without having to convert it using the onboard charger.

EV plugs

There are different types of charging plugs and sockets for both AC- and DC-charging EVs, with the vehicle’s inlet port and charger type determining which can be used.



AC plug options



J1772 plug /Type 1 — Standard for EVs manufactured in America and Asia, this single-phase plug allows drivers to charge at a speed of up to 19.2 kW, depending on the charging power of the EV and capacity of the receptacle.



Tesla — Proprietary connectors for AC and DC charging.

DC plug options



CCS Type 1 (Combined Charging System) — An enhanced version of the Type 1 plug, the CCS supports both AC and DC charging and includes two additional power contacts, enabling quick-charging at a speed of up to 350 kW.



CHAdeMO — This quick-charge system that was developed in Japan allows for very high charging capacities (up to 100 kW), as well as bidirectional charging.

Where and when to charge an EV

It's never been easier for EV drivers to 'refuel.' While many choose to engage in 'opportunity charging' — where charging is secondary to other activities such as shopping or going to work — advancements in EV charging technology have made it effortless for drivers to charge where they tend to spend most of their time: at home and work.

Settings for EV charging include:

Residential

Recharging at home has become as simple as it is convenient. Just plug in the EV and let the charger do its job, while you sleep, complete household chores or enjoy family time.

Workplace

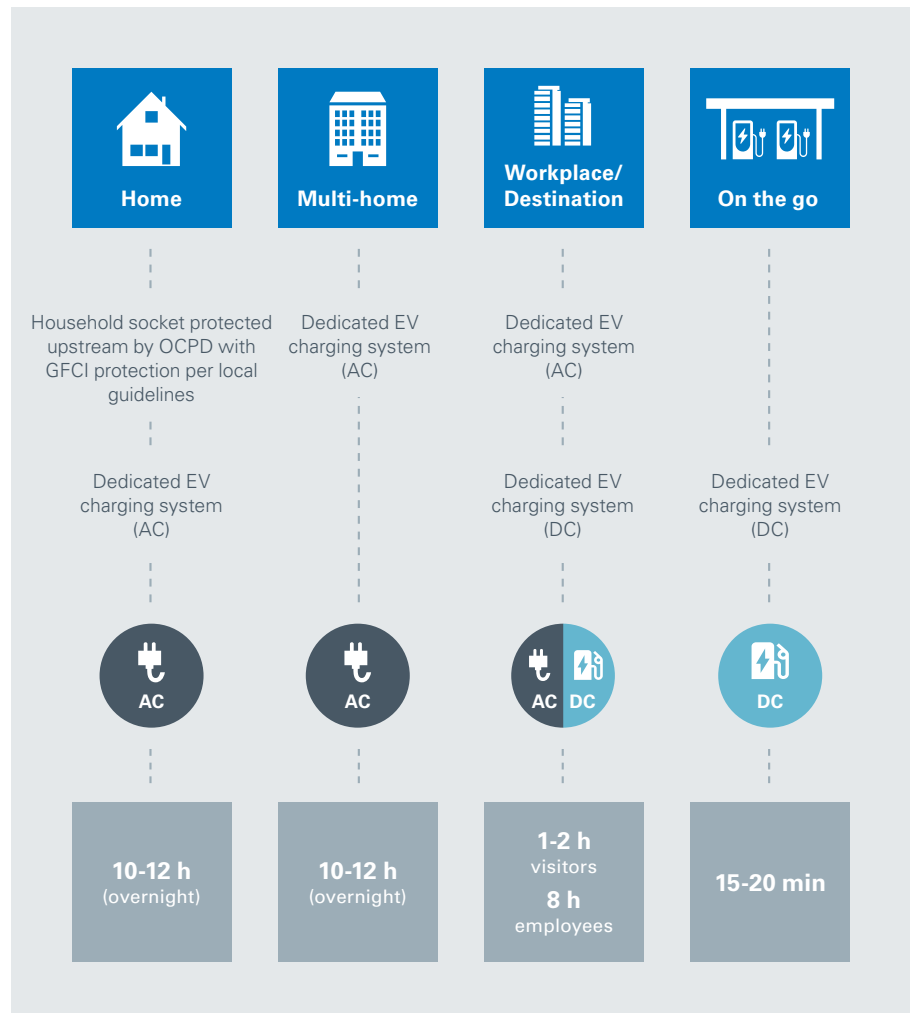
As charging points become increasingly common at places of employment, many EV drivers appreciate the convenience of recharging during the work day. Whether it's the traditional 9-to-5 or off-hours, EV charging at the office is a viable alternative.

Commercial

In locations that tend to be visited for shorter periods of time, such as supermarkets, shopping centers and business parks, AC charging is steadily being supplemented by DC charging points that can charge EVs faster, if the battery allows.

On-the-go

Speed of charge is essential at locations strictly intended to provide enough charge to continue a journey. These commercial service stations generally rely on DC charging to recharge EV batteries with a large quantity of power in as little as 20 minutes.



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