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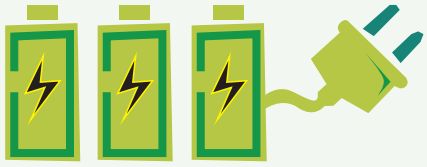
A REGIONAL TRANSPORTATION PARTNERSHIP

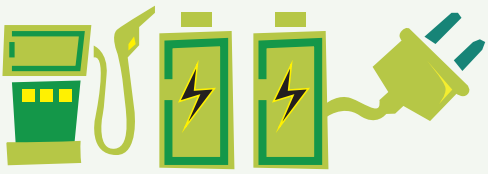
# Electric Vehicles 101

## What is an Electric Vehicle?

The term “electric vehicle” describes any vehicle powered by one or more electric motors for propulsion. The term covers a range of vehicles that are currently available in the market:



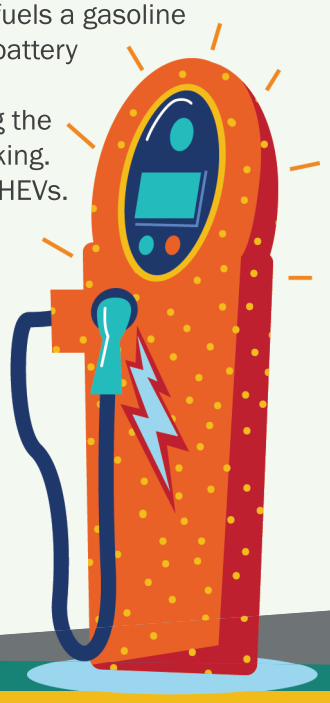
**Battery Electric Vehicles (BEVs):** These vehicles operate only on an electric battery and are also known as "all-electric vehicles". BEVs are powered only by electricity and are charged by an external power source. BEVs have a very large battery and can travel between 150 and 400 miles on a single charge. Some popular models of BEVs include Tesla Model 3, Nissan Leaf, and Rivian delivery vans.



**Plug-In Hybrid Electric Vehicles (PHEVs):** These vehicles have an electric battery that operates an electric motor in addition to a gasoline tank that fuels a gasoline motor. The electric battery can be plugged in to recharge and the gas tank can be refilled. PHEVs consume 14 - 47% less fuel than conventional vehicles when their batteries are fully charged. Using just the battery and electric motor PHEVs can travel between 20 and 40 miles on a single charge, but in the absence of electricity, PHEVs can also operate on gasoline. Some popular models of PHEVs include Chevrolet Volt, Chrysler Pacifica, and Ford Fusion Energi.

**Hybrid Electric Vehicles (HEVs):** These vehicles have an electric battery that operates an electric motor and a gas tank that fuels a gasoline motor. The gas tank can be refilled, but the electric battery cannot be plugged in to charge. Instead, the battery recharges through regenerative braking – converting the kinetic energy of a car into electric energy when braking. The battery is typically smaller than the battery for PHEVs. Some popular models of HEVs include Toyota Prius and Ford Maverick.

**Fuel Cell Electric Vehicles (FCEVs):** These vehicles use hydrogen to power an electric motor. They are not very commonly used as a personal vehicle but are gaining traction for commercial uses such as buses and long-haul trucks. Similar to gasoline powered vehicles, FCEVs have a tank that is filled with hydrogen at a centralized station (similar to a gas station).

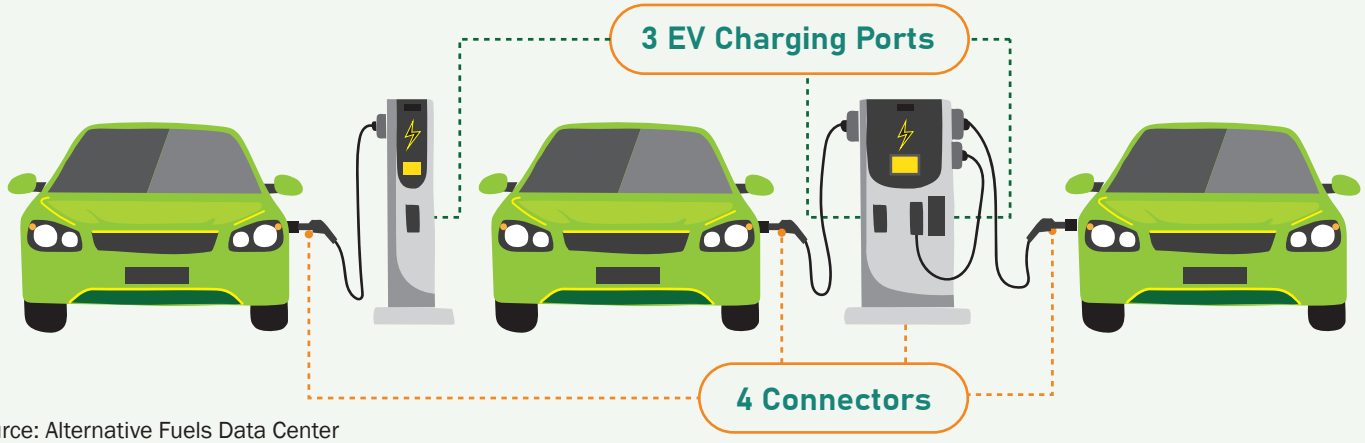


## Charging Infrastructure

Battery electric vehicles and plug-in hybrid electric vehicles charge by plugging a cable into a power source to allow for the movement of electrical current. At its most basic form, an EV can be charged by plugging into a standard wall outlet. However, more sophisticated charging stations can provide faster charging for vehicles.

The equipment used to charge EVs is known as Electric Vehicle Supply Equipment (EVSE). EVSE allows for the transfer of energy between the electric utility power and the EV. EVSE includes EV charge cords, charge stands (residential or public), attachment plugs, vehicle connectors, and protection. The vendors who supply EVSE are known as Electric Vehicle Service Providers (EVSP). EVSP delivers end-to-end EV charging, handling charging station installation, operations and maintenance.

Several terms are used to describe EV charging stations. A charging station is a location where there may be several chargers available. A charger is the equipment used to charge a vehicle. One charger may have multiple ports, used to distribute the power available to the charger between multiple vehicles.

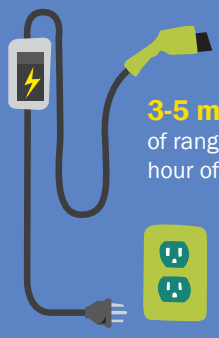



Source: Alternative Fuels Data Center

There are different types of chargers that charge EVs at different speeds. EVs can charge at three “levels”, each of which carries a different amount of electricity, measured using kilowatt-hours (kWh). Simply stated, the larger the kWh, the faster electricity is refueling the EV.

### LEVEL 1
**Slow Charge**

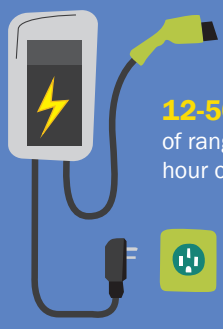
Can be publicly available but is frequently associated with at-home charging using standard wall outlets.



**3-5 miles** of range per hour of charge

### LEVEL 2
**Moderate Charge**

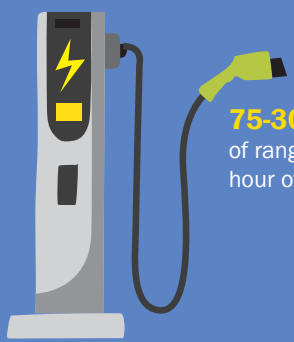
Generally found at public charging stations but can be installed in residential settings.



**12-50 miles** of range per hour of charge

### LEVEL 3
**Fast Charge**

Known as Direct Current Fast Charging (DCFC) equipment, it typically only available at public charging stations.



**75-300 miles** of range per hour of charge

As charging equipment has developed, different charging connectors have emerged from different vehicle manufacturers due to a lack of regulatory standards as well as proprietary technologies. This results in needing multiple connectors at charging stations. Many of the largest automakers have pledged to convert to the Tesla Supercharger standard for DCFC starting in 2025, although some 2024 vehicles can use adapters for the Tesla Supercharger standard.