

# Charging Basics

## Glossary:

- EVSE: Electric Vehicle Supply Equipment or also known as an EV charging station.
- Ports or Plugs: The plug on the end of the cable that connects the EV charger to the vehicle. Ports frequently refers to the number of plugs on a charging station.
- Cable: The cable that connects the vehicle to the charging station.
- kW: A common electrical unit of power - 1,000 watts.
- kWh: A kilowatt-hour is the unit of energy over time. One kWh is equal to 1,000 watts of power for one hour of time. A microwave oven or a hair dryer use about one kW. But not typically for an hour at a time. This is the energy the vehicle uses instead of gasoline.
- Electrical Panel: Contains circuit breakers and distributes electricity throughout the building through electrical wiring.
- Conduit: Steel or aluminum tubing used to route and protect electrical wiring.
- EVs: A full Battery Electric or a Plug-in Hybrid Electric Vehicle driven by an electric motor with power from the battery. The battery is primarily charged by a charging station.
- BEVs: Battery Electric Vehicles that are only powered by electricity.
  - Examples: Chevy Bolt EV/EUV, VW ID.4, all Tesla's, Ford F150 Lightning, Nissan Leaf, Hyundai IONIQ 5, KIA EV6
- PHEVs: Plug-in Hybrid Electric Vehicles with both a gasoline engine and a large battery that can be plugged in to recharge
  - Examples: Toyota RAV4 Prime, Prius Prime, Kia Niro PHEV, Chevy Volt
- Range or All Electric Range (AER): The distance that an EV can travel on a full charge.

## Charging

See the chart below for a comparison of the charging levels.

Slowest <span style="float: right;">→</span> Fastest			
Level	Level 1	Level 2	DC Fast Charging
Use Case	Home	Home/Work/Public	Public
Power	<2 kW <i>(Usually 1.2 kW)</i>	2.4 - 19.2 kW <i>(Usually 6.7 kW)</i>	25 - 350 kW <i>(Usually 150, 50, or 250 kW respectively)</i>
Plug Shape (Into Vehicle)	 J1772	 J1772	   CCS      CHAdeMO      Tesla
Outlet Shape	 120 V	 240 V	Electric Vehicle Supply Equipment (EVSE) 
Cost	\$	\$\$	\$\$\$\$
	3~4 MILES/HR	7-60 MILES/HR (Usually ~28)	80- 300 MILES/HR

### Added Miles per hour of charging

### Networked L2 Charging Features

Networked or “smart” chargers are connected to the internet usually through cellular or by WIFI or ethernet. Networked chargers enable full control of the charging stations, making the management of charging and chargers easier. See chart below for typical features of networked chargers.

Notable Features	Description
Access	Who can use the charger and sometimes when
Payment	By phone app, RFID, credit card, etc.

Notifications	Remotely communicates vehicle status to the user
Reservation systems	Users can remotely claim charging times
Revenue and Collection Options	Set pricing (per kWh, hour, or session), how to collect payment, idle (or overstay) fees
Power Sharing	Power is evenly or rotationally distributed to the chargers based upon available electrical capacity

## Parking

Types of parking at multi-unit dwellings:

**Shared:** Parking spaces that are unreserved spaces, usually first come, first-serve.

**Shared chargers:** EV chargers that are available to any EV that is allowed to park in the parking lot and are *shared* by any and all EVs that want to charge. A shared charger can provide charging to one EV per plug and may have a payment incentive structure if users move after a certain time.

**Assigned:** Parking spaces are controlled by a property manager and allocated to those in a specific unit. There are usually one or two assigned spaces per unit or may be available for a monthly fee.

**Deeded:** Parking spaces owned and controlled by the condominium owner.

**Dedicated chargers:** EV chargers that are for specific people assigned or deeded the specific parking space, and typically are only accessible to tenant or owner.

## Installation Cost Factors

Factors that can increase installation costs include:

- The electrical panel doesn't have enough capacity or available free space for the additional load/charger
- The electrical panel is far away from the installation location
- The electrical wiring needs to be run through a wall, ceiling, or underneath concrete
- The additional electrical service needs to be routed through a meter that is not nearby
- A new electric meter needs to be installed
- If networked, there is limited or no access to cellular signal or a strong Wi-Fi connectivity

In general, it is best to talk with a qualified electrician and get a quote, or to have a time and date for contractors to do a walk-through if the project will be going out to bid.

**New construction vs. Retrofits**

- New construction
  - Know your State’s regulations around EV-Readiness and EV-Capable parking space requirements. Check out the Department of Energy’s Alternative Fuels Data Center (AFDC): <https://afdc.energy.gov/laws/state>
  - Use Best Practices to build capacity and readiness into new construction. The cost of retrofitting/upgrading is much higher than the cost during new construction or renovations
- Retrofits
  - EV Charger installations in existing buildings may require costly electrical panel, or even service, upgrades to accommodate the additional electrical load from EV chargers

**Operational Expenses**

- Ongoing costs can include:
  - Maintenance
  - Network fees (if networked)
  - Electricity
  - Lease payments (if utilizing a lease or charging as a service-CAAS contract)
  - Insurance
- Maintenance and network costs will vary depending upon who the owner of the charging station is. See Chart below:

Condominiums		Apartments	
Dedicated	Shared	Dedicated (Not common)	Shared
Residents are responsible for costs toward their individual charger	Property management/HOA is responsible for allocating costs	Property management is usually responsible for costs	Property management is responsible for costs

- Updating HOA bylaws may be necessary to clarify cost allocation expectations and/or responsibilities
- Insurance expenses will be dependent on the owning entity, but is strongly advised

Commented [RT1]: WHAT is strongly advised???