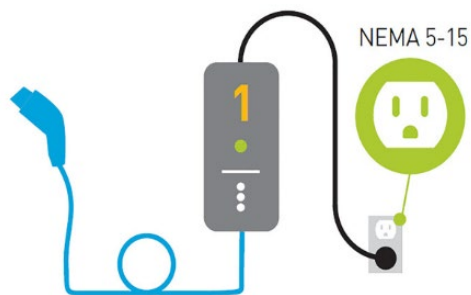


EV CHARGING

IN-HOME CHARGING

LEVEL 1 CHARGING




- Level 1 equipment provides charging through a 120-volt (V) AC plug.
- Most, if not all, EVs will come with a portable Level 1 cord set, so additional charging equipment is generally **NOT** required.
- On one end of the cord is a standard three-prong household plug and on the other end is a standard connector that plugs into the vehicle's charge port.
- **8 hours** of charging at 120 Volts can replenish about **40 miles** of electric range for a mid-size EV.

LEVEL 2 CHARGING



- Level 2 equipment offers EV charging through a 240-volt plug or 208-volt plug electrical service.
- Many of these units operate at up to 30 Amps, delivering 7.2 kW of power. This power output generally translates to 18-28 miles of range per hour. **An average EV can be fully charged in 8 hours or less.**
- These units require a dedicated 40-Amp circuit to comply with the National Electric Code.
- Most homes have 240-volt service available, but not all homes have a dedicated 240-volt plug in their garage.
- **Installing a level 2 charger can result in additional costs other than the Level 2 charging equipment.**

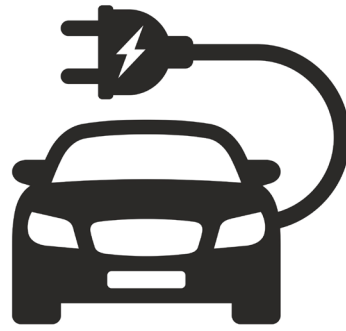


Existing Homes

- If your home already has a dedicated 240-volt circuit, the basic installation could cost as little as \$250-400
- **HOWEVER**, if you need to mount a station, it will cost roughly:
 - \$400-\$1,700 to run 50-amp dedicated wiring
 - \$1,500-\$4,500 to mount a new station, install a new service panel, run wiring, and/equip the 240-volt outlet
 - A utility transformer or electric service entrance upgrade may be necessary (e.g., 200-amp to 400-amp service)
- **Additional Cost Breakdown:**
 - Electricians typical run anywhere from \$40 to \$100 / hour
 - Installation of 240-volt and 50-amp outlet \$300-\$800
 - A 200-amp panel costs anywhere from \$1,800-\$2,500
 - Wiring is around \$8 per foot
 - Trenching \$4-\$12 per foot
 - Building Permits
 - Potential drywall or concrete repairs

New Construction

- The easiest and least expensive way to add electrical circuits is during the initial design and construction phase
- Choose a location in the garage or parking area for the electric vehicle
- Most Level 2 chargers require a 240-volt outlet with a dedicated 40 or 50-amp circuit
- The National Electrical Code requires an electrical circuit to be rated for 25% greater amperage than the output of the device (in this case an EV Charger)
 - **Example:** If you want to buy a 40-amp Level 2 Charger, you will need a circuit breaker rated for a minimum of 50 amps
- Even if you do not currently own an EV, it might be worth the small expense to add a 40-amp circuit and plug during home construction

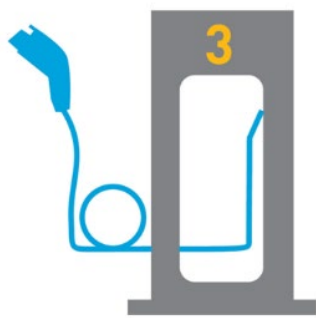


EV CHARGING

PUBLIC CHARGING

LEVEL 3 CHARGING

Level 3: 480V
DC Fast Charging/Commercial



- Level 3 (or DC fast) charging equipment enables rapid charging along heavy traffic corridors at installed locations.
- As of 2021, over 15% of public EVSE ports in the United States were DC fast chargers, and this number is projected to increase over the next decade significantly.
- In many cases, you can charge an EV's battery to **80% in 30 minutes.**

- EV owners can expect to pay a higher rate to charge their vehicles with a DC fast charging station.
 - **Level 3 chargers will cost between 30¢ and 60¢ per kilowatt-hour.**
 - **Comparatively, in-home chargers will cost between 9¢ and 12¢ per kilowatt-hour**
- Level 3 EV charging station networks can easily cost **more than \$50,000** to install.
- There are three types of DC fast charging systems, depending on the type of charge port on the vehicle:



CCS connector



CHAdeMO connector



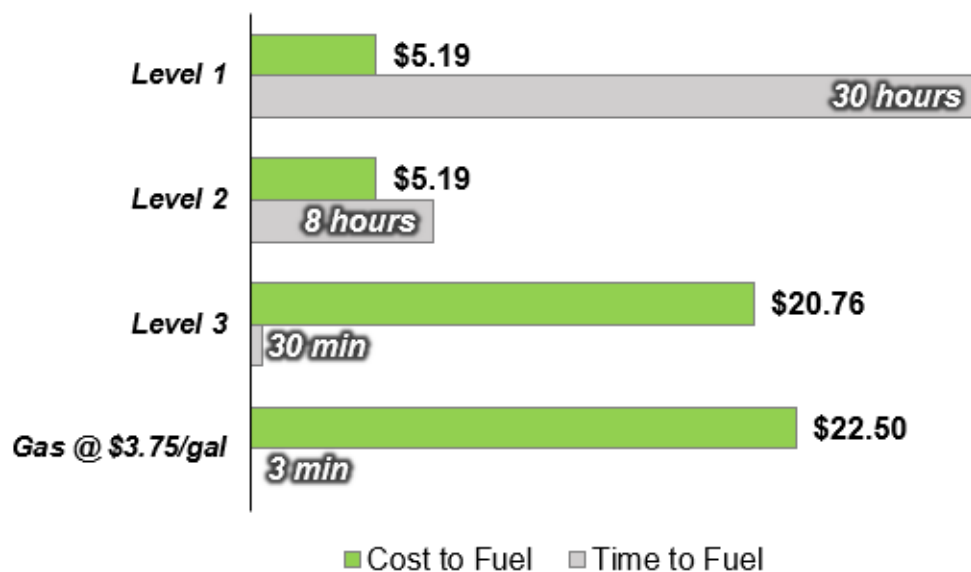
Tesla connector

Tesla vehicles have a unique connector that works for all their charging levels. Although Tesla vehicles do not have a CHAdeMO charge port and do not come with a CHAdeMO adapter, Tesla does sell an adapter.

COST OF EV CHARGING



Cost and Time Needed for 150 Miles of Range



Assumptions

- A traditional combustion vehicle = 25 miles of range per one gallon of fuel
- Level 1 Charging = 5 miles per hour of charging
- Level 2 Charging = 20 miles per hour of charging
- Level 1 Charging (In-Home) Price per kWh = 10¢
- Level 2 Charging (In-Home) Price per kWh = 10¢
- Level 3 Price Charging (Public) per kWh = 40¢
- Other items to consider include insurance, registration, and maintenance costs



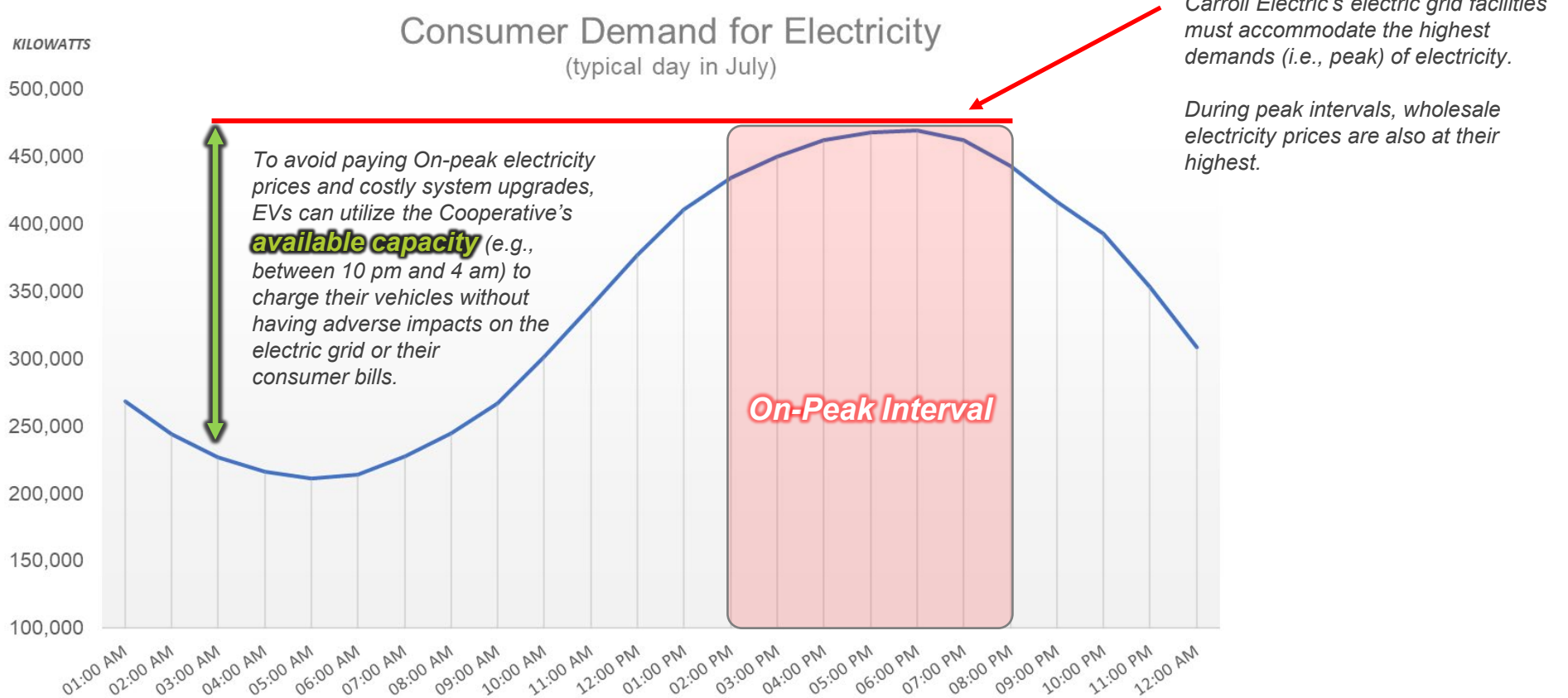
EV CHARGING

HOW ARE UTILITIES PREPARING?

CONSUMER EDUCATION

Utilities would generally agree that customer education and outreach are important when it comes to EV charging and its potential impact on the electric grid.

- Like any new load, an EV charger can have a negative impact on local distribution infrastructure.
 - Transformers may not be sized to handle the new load and utility protection schemes may need to be adjusted.
 - Excessive power draw at peak times can create power quality issues, such as dimming lights and related electrical supply quality characteristics.
 - When members plug their vehicles into a Level 2 charger or faster during periods of peak demand, they increase electricity demand, negate the effects of other load management and demand response programs, and can lead to higher energy supply costs. Even operating a Level 1 charger that draws 1.4 kW can impact load management/demand response initiatives.
 - On-peak EV charging (e.g., between 3 and 8 pm in the summer) can place additional stress on the electric grid and can also drive investments in utility infrastructure sooner than anticipated, which can put upward pressure on electric rates.
- Utilizing available capacity to charge electric vehicles during off-peak intervals is essential for utilities to avoid costly system upgrades to the electric grid.



EV RATE DESIGN



Utilities have started implementing Time-of-Use rates that incentivize EV charging during off-peak intervals (e.g., overnight).

- Carroll Electric is presently working on an EV rate design that intends to optimize the use of the electric grid to the benefit of all Co-op members