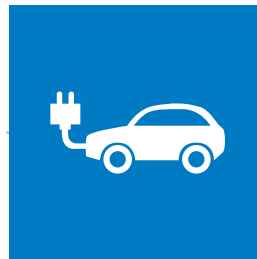
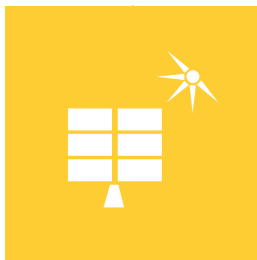


# The smart consumer's guide to electric vehicle charging



EVERYTHING  
AS A GRID

**EATON**

*Powering Business Worldwide*

**Simple, intuitive solutions**  
for home automation, connectivity  
and energy management.

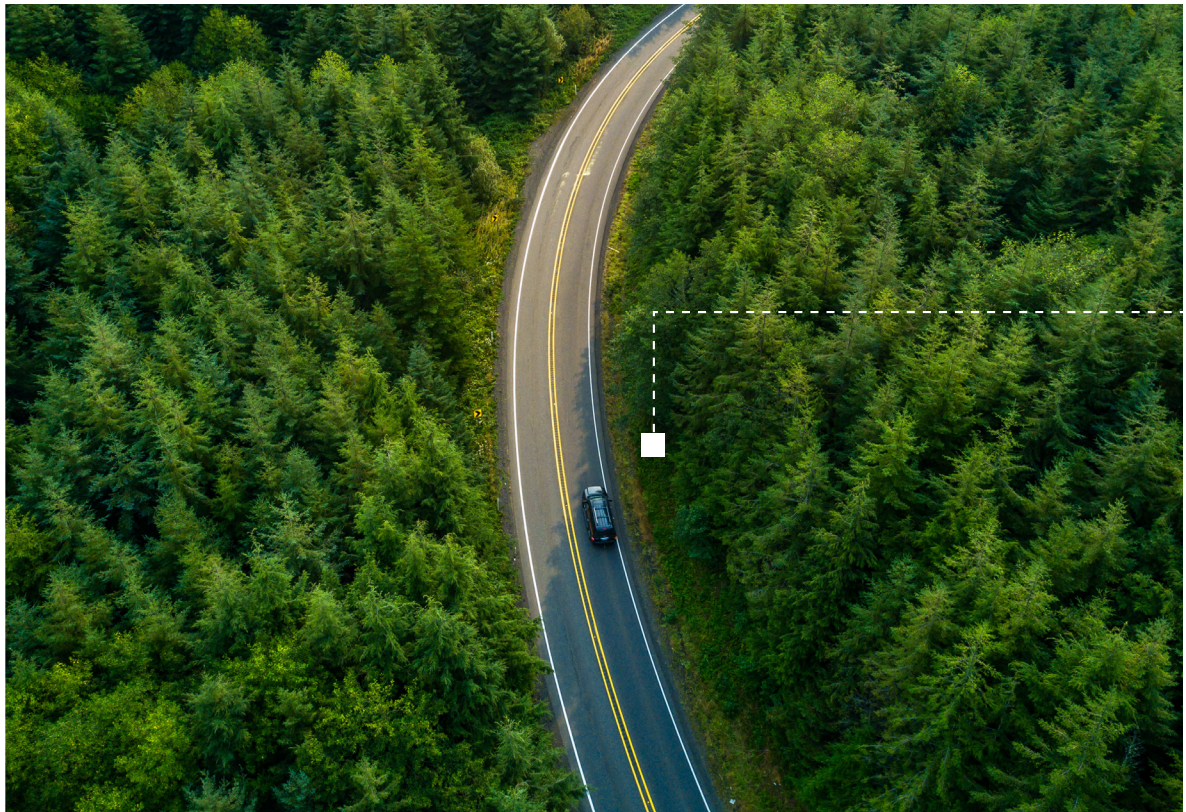
# Summary

Motivated by advantages such as fuel savings, reduced maintenance costs, enhanced performance and the ability to slash greenhouse gas emissions, a growing number of Americans are hitting the road to electric vehicle (EV) ownership. In fact, although auto sales as a whole declined in 2020 due to the COVID-19 pandemic, EV sales in the U.S. [grew by 40 percent year-over-year](#), according to Automotive News. Furthermore, forecasts predict that electric cars will double their market share in 2021, and could account for [10 percent of all new cars sold](#) by the middle of the decade.

Chances are, the prospect of purchasing an EV has crossed your mind at some point; in a recent Consumer Reports poll, [seven out of 10 drivers reported at least some interest](#) in owning an electric car in the future. Yet before you put the pedal to the metal on an EV purchase, it is important to understand that electric mobility goes beyond simply selecting your ride — you also need a reliable method to charge it.

To reduce headaches, hassles and costs further down the road, proper planning is essential. So before going any further, fasten your seat belt and **take the following considerations into account:**

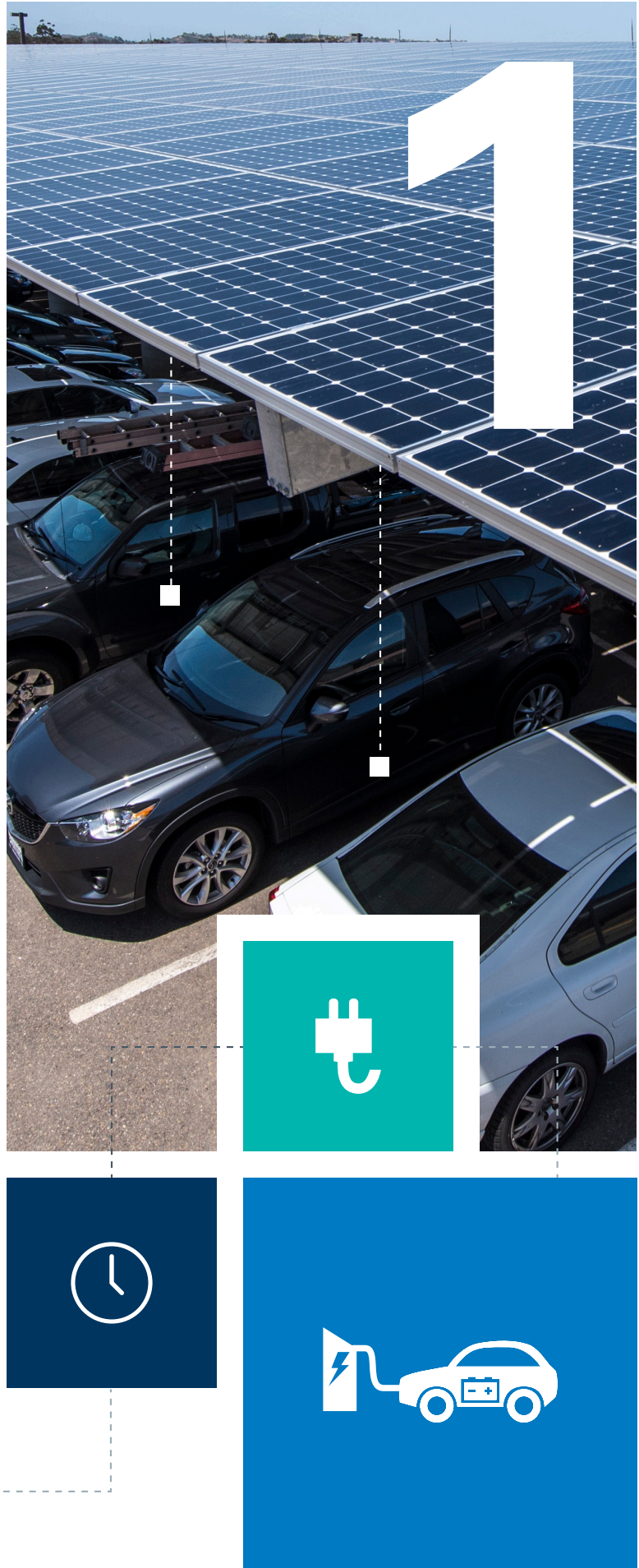
- 1 Understand the EV charging process
- 2 Determine when and where you want to charge your EV
- 3 Assess your utility capacity
- 4 Choose your charging system
- 5 Don't let installation be your blind spot



# Understand the EV charging process.

Because EVs do not operate on gasoline, the Environmental Protection Agency (EPA) rates them differently than traditional gas-powered vehicles. Rather than being assessed at miles per gallon, the battery-operated EV is rated by the number of kilowatt-hours (kWh) it takes for the car to drive 100 miles. To replenish its batteries, an electric vehicle must be able to plug into electric vehicle supply equipment (EVSE), also commonly referred to as a charging station or electric recharging point. Unlike traditional vehicles, when an EV is approaching “empty,” you can’t simply pull into the nearest gas station and refuel in under five minutes. Electric vehicles not only require a specialized charger, but also sufficient time to replenish their batteries.

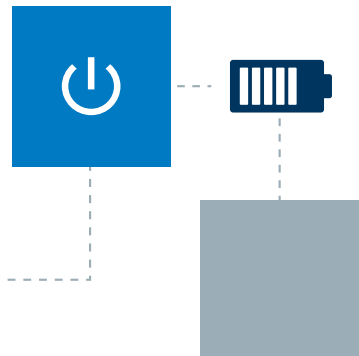
Prior to purchasing an EV, it is critical for drivers to evaluate their commute and typical driving distances against the particular model’s battery capacity. For example, if a driver’s daily round-trip commute registers 125 miles but their EV battery covers just a 150-mile radius, this mileage window may prove risky, especially considering that EV charging stations aren’t readily available at every corner like gas stations. The good news is, charging networks are continually expanding. To help motorists-on-the-go navigate their next charge more easily, [PlugShare](#) offers a convenient map that highlights every charging station across North America.



# Determine when and where you want to charge your EV.

Depending on the type of EVSE being used, recharging an electric vehicle to full capacity can take several hours. For this reason, it is important to consider where the EV will be stationed for the longest periods. Many electric vehicles are parked at home for eight to ten hours each night, providing ample time to restore battery capacity. Because residential charging is generally convenient and inexpensive, most EV drivers complete [more than 80 percent of their charging at home](#), according to the Office of Energy Efficiency and Renewable Energy. Charging at a single-family home, usually within a garage, allows EV drivers to take advantage of stable residential electricity rates. However, to ensure you are optimizing costs, [check your utility's](#) time of use parameters, as it may be less expensive to charge your EV during off-peak hours such as earlier in the day, overnight or weekends. Many utility companies also provide EV chargers to homeowners for free or at a subsidized rate, in exchange for agreeing to charge at designated times to help the grid. Additionally, [depending on the utility](#), homeowners often qualify for special time-of-use and discounted tariffs.

In addition to plugging in at home, EV drivers can also take advantage of destination charging locations, such as a work place, hotel, restaurant or shopping center. It can be helpful to research public charging options located along your commonly driven routes.



## Living in a multi-family complex doesn't have to stall your EV driving plans

EV drivers who don't live in single-family homes face unique charging considerations. If you reside in a multi-family dwelling such as a condominium or apartment complex, check to see if the community has already invested in EV charging stations. If not, you can request that EVSE be installed — an amenity that would provide property

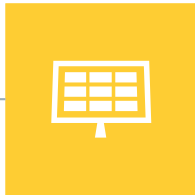
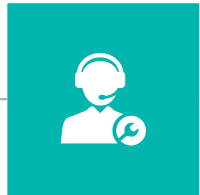
owners with a distinct advantage to help attract and retain residents, while fostering an environmentally sustainable community. Check with your local utility or EV manufacturer to see if they have additional resources that may help you advocate for the installation of EV charging stations where you live.

# 2

# Assess your utility capacity.

Before installing EVSE or making any modifications to your electrical system, it is imperative to check with your utility company and engage a licensed electrician to complete a [home assessment](#) so you are aware of your options. Be sure to speak with someone who is knowledgeable on power consumption, as existing electric circuits may need to be updated in order to support higher level charging stations.

If you discover that your existing power system is insufficient to accommodate your desired EV charging, you have several alternatives. One is to hire a licensed electrician to replace the load center. Another possibility is to use an Intelligent Home Energy Management system (HEMS) that will allow you to optimize energy consumption and help support additional loads. A third option is to install a backup power source such as battery storage or a solar system (see sidebar). Depending on your existing utility provision, you might also need to upgrade your electricity service.



## Consider linking solar, storage and EV technologies.

As new distributed energy resource (DER) technologies and capabilities continue to create opportunities for a net-zero energy future, some EV drivers are opting to recharge their ride with solar. By charging your electric vehicle with your own solar panels, you can offset the cost of grid power while further reducing your carbon footprint on the environment. In addition, many solar installation costs can be claimed in federal tax credits.

Additional benefits can be realized when a storage system is incorporated. Not only does this option enable excess energy generated by the solar panels be held in reserve and used to power loads in the home and the EV charger at night, but it also allows homeowners to leverage solar use during utility power outages. Federal and state level incentives also exist for solar/storage deployments.

As the EV market continues to magnify and mature, experts predict that electric vehicles will ultimately be utilized as a distributed energy resource (DER) — turning the batteries-on-wheels into mini grid/power stations.



# Choose your charging system.

While nearly every electric vehicle comes with a basic portable cord set that can be plugged into a standard wall socket, many EV owners opt to upgrade to a faster charging station for home use. Just as electric vehicles continue to be developed and improved, so do home-based charging systems, with current models available in a variety of shapes, sizes and price points. Prior to purchasing any EVSE, be sure to consult your vehicle's manufacturer to review potential equipment requirements or specifications. Also, before plugging an EV into any outlet, confirm that the circuit does not supply power to any other appliances, such as a refrigerator or lighting.

For residential charging, drivers have a choice of using either a Level 1 or Level 2 device. Delivering electricity through a standard 120 V AC plug, Level 1 devices add anywhere from 2 to 8 miles of range to a vehicle per hour of charging time. While this type of charger does not require any equipment other than an outlet, a dedicated branch circuit is needed.

Charging with Level 2 EVSE is significantly faster than a Level 1 device — adding approximately 10 to 60 miles of range to a vehicle per hour of charging time — but it does require special equipment that is more expensive to install. Because the Level 2 charger delivers electricity through a 240 V AC plug, it requires a dedicated electrical circuit of 20 to 100 amps. While most Level 2 chargers are 7.7 kW, which requires 40 A charging, some models vary.

For instance, Tesla chargers are 11.6 kW, necessitating a 60 A breaker. While it is true that the higher the kW rating, the faster your car will charge, it is important to note that this is dependent on the size of the EVSE load center; for example, if the load center is 40 A, you cannot use a larger kW charger.

Most homes already have 240 V service established for appliances such as clothes dryers and electric ranges. The price of Level 2 residential EVSE varies, but typically ranges from \$500 to \$2,000 before installation. However, check with your utility company about rebate options, as many offer considerable savings toward the EVSE or the total cost of installation.

Although EV charging stations are generally installed in garages, homeowners can also purchase devices that are constructed to withstand weather and other types of stresses. If you are planning to install a charger outside, look for one that is outdoor rated, includes a NEMA Type 3R protection rating against water damage, and features a durable, weather-proof case.



## LEVEL 1 CHARGER:

Provides 2-8 miles per hour

## LEVEL 2 CHARGER:

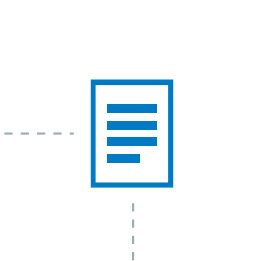
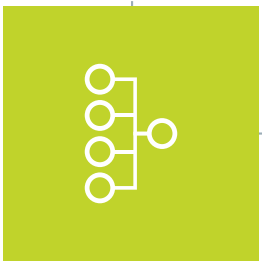
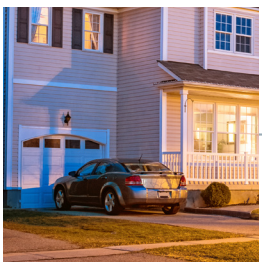
Provides 10-60 miles per hour

# Don't let installation be your blind spot.

Before installing EVSE or modifying your electrical system in any way, it is important to consult with a trusted electrical contractor.

These installations must comply with local, state, and national codes and regulations. Your contractor should know the relevant codes and standards, including local building, fire, environmental, and electrical inspecting and permitting authorities. In many areas, installers are required to submit a site installation plan to the permitting authority for approval prior to installation. For homes with adequate electrical service already in place, installation of EVSE is usually relatively straightforward. However, it can be substantially more complex if an electrical service upgrade is required, and you can experience headaches down the road if improper procedures are used or codes and standards are not followed.

As the EV market has grown, numerous options for turnkey installation and integration solutions have emerged. Some offer dedicated services that combine EVSE purchases with licensed electricians, while other networks help connect homeowners to certified installers in their area.

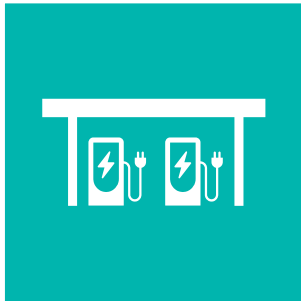




## Before you charge forward, take a spin over to Eaton

While the advantages of driving an electric vehicle are well documented, when the rubber meets the road, you want to make sure that you have carefully considered all aspects related to EV charging. Regardless of where you currently are on your EV journey, it's good to know that you have options — as well as a trusted resource to help navigate any bumps in the road.

As an expert in power and energy management, Eaton views EVs as an integral part of a smart, sustainable home. We can assist with identifying equipment, supporting installation requirements, exploring energy management options and connecting you to the optimal certified installation network. Through our Everything as a Grid approach, we are optimizing the energy the world relies on, while leading the change in how energy is distributed and managed. To support residential customers in integrating, managing and benefiting from renewable technologies, Eaton is building on its Everything as a Grid perspective with a new Home as a Grid approach, which combines an intelligent home energy portfolio with strategic partnerships.



Learn more at  
[Eaton.com/myhome](https://Eaton.com/myhome)

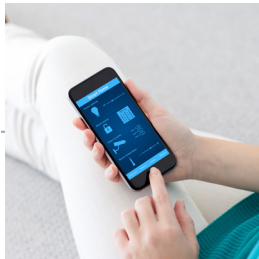
## About Eaton

Eaton's electrical business is a global leader with deep regional application expertise in power distribution and circuit protection; power quality, backup power and energy storage; control and automation; life safety and security; structural solutions; and harsh and hazardous environment solutions. Through end-to-end services, channel and an integrated digital platform & insights Eaton is powering what matters across industries and around the world, helping customers solve their most critical electrical power management challenges. Eaton's mission is to improve the quality of life and the environment through the use of power management technologies and services. We provide sustainable solutions that help our customers effectively manage electrical, hydraulic, and mechanical power – more safely, more efficiently, and more reliably. For more information, visit [Eaton.com](http://Eaton.com)

Everything as a Grid is our approach to helping partners across the world embrace energy transition, on their terms. Today, energy flows through the grid in more directions and through more devices than ever before. And although that decentralization creates more complexities and challenges, it also creates new potential. By viewing Everything as a Grid, we're simplifying those complexities, meeting those challenges and reinventing the ways power is distributed, stored, and consumed. The future is one of low-carbon, renewable power. The future is Everything as a Grid.



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