



Electrify Everything: Electric Vehicles

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Electric Vehicles



RECOMMENDATION

Try the included 120V / 15A Level 1 charger that comes with your EV. It charges around 4 to 5 miles of range for every hour it's charging, and it's fairly low power. If that's not enough, you can get a Level 2 charger.

AVOID: If you can afford it, don't drive your gas car until it's breaking down. Getting an EV is one of the highest impact things you can do.

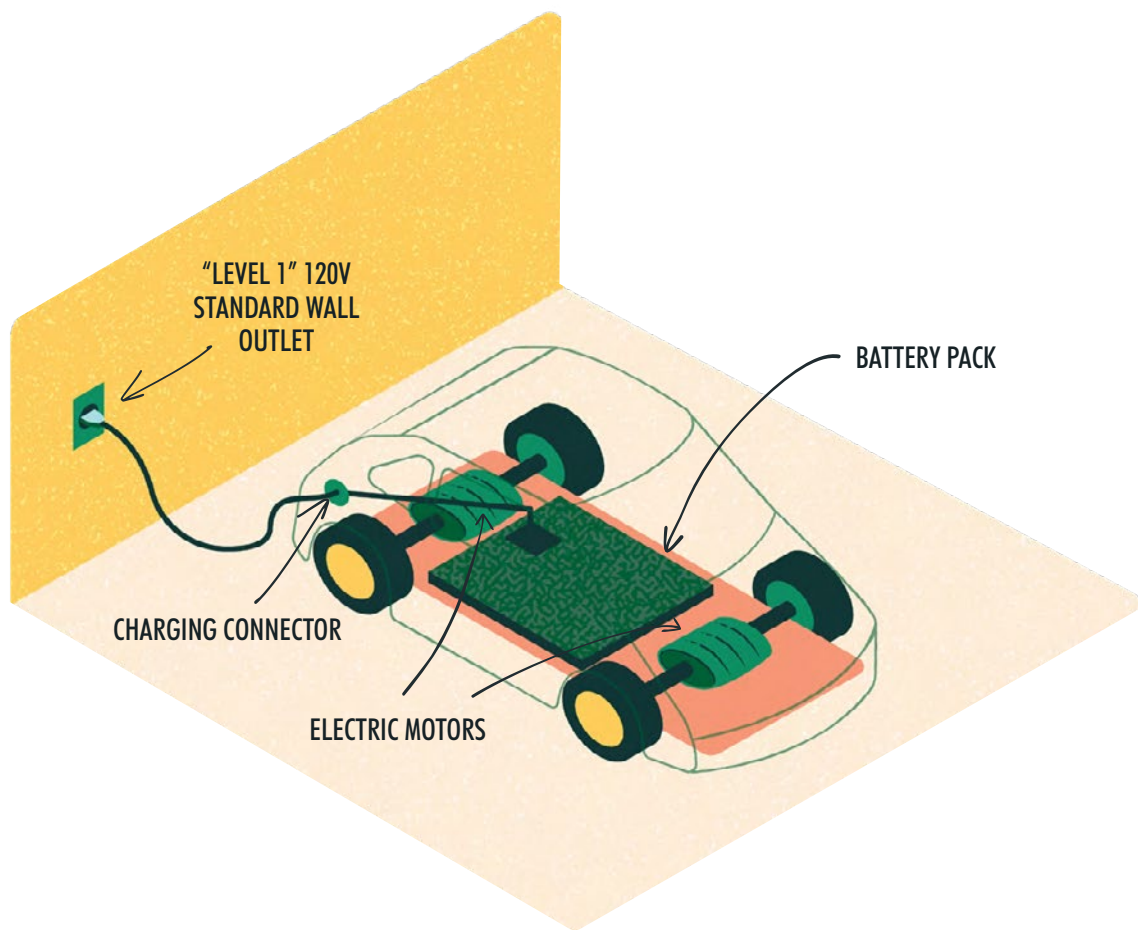
Electric Vehicles (EVs) might be the best-known electrification project from this whole guide. Getting an electric car is much more visible to your neighbors than getting a heat pump. And the change is pretty seamless once you sort out where, when, and for how long you can charge. Once you switch, EVs are better in almost every way than gas cars. Still, there are some things to consider before heading to the dealership for a test drive.

| | |
|----------------------|---|
| DIFFICULTY: | EASY |
| UPFRONT COST: | \$10,000 (used) and up |
| IMPACT: | High |
| CONTRACTORS: | None if charging on 120V standard outlet |
| DO NOW: | Consider how far you drive in a day to start thinking about range, and look online for public charging stations nearby to start planning where else you can charge. |
| RENTER: | Same. |

FEWER PARTS, BETTER PERFORMANCE

EVs use batteries and electric motors to move the car, versus the gasoline burning in the complex internal combustion engine of gasoline cars. EVs also don't need a radiator, exhaust system, or catalytic converter, so there are fewer things to break down, and thus maintenance costs are lower. Regenerative braking puts energy from stopping back into the battery, and also preserves the brakes.

Fewer parts also allows for more space in the vehicle. In most EVs, the space under the hood where the engine would be is now storage space (called a "frunk" for "front trunk"), and the interiors are roomier. Since the batteries are often below the floor, it can help improve vehicle handling, and make the vehicle less likely to flip. Electric motors can also deliver 100% of their power instantly, which lets them accelerate quicker than gas vehicles — these are no go-karts.



LESS POLLUTION & LOWER LIFETIME COST

EVs really are better for the environment. On average, EVs in the U.S. produce the carbon dioxide emissions equivalent of a car that drives 88 miles-per-gallon of gasoline. But that depends a lot on how the grid is powered. In places where the grid supplying the electricity is cleaner, EVs get well over 100 miles-

per-gallon-equivalent emissions, while dirtier power generation puts it closer to 39 miles-per-gallon-equivalent — still close to very efficient gasoline cars, and which will just keep getting better as the grid adds renewable energy.¹ Studies also show that in addition to much lower emissions due to EVs, they also have considerably lower lifetime costs when compared to gasoline cars.²

UNDERSTANDING YOUR EV OPTIONS

There are now a wide variety of EVs to choose from, with more options constantly coming to market. The two main types are:

- **Plug-in Hybrid Electric Vehicles (PHEV):** These have both gasoline engines and batteries and motors, working together in some combination to drive the car. As the name implies, they get plugged in to charge, but can also be filled at the gas station. Some versions have limited electric-only driving ranges, while others mostly run on electric and only use the engine to generate electricity and extend the range.
- **Electric Vehicles (EV):** These run fully on batteries turning electric motors. EVs have no engine, and need to be recharged either at home or at a recharging station.

Car finders

With so many choices, a number of sites have appeared where you can filter cars based on manufacturer, model, type of EV, range, and other criteria. Try searching here:

- PlugStar Shopping Assistant — **plugstar.com/guide**: Helps you drill down using several criteria, including where and how you plan to charge.
- PG&E's EV Savings Calculator — **ev.pge.com**: The page for each individual car gives the relative cost savings versus an equivalent gasoline car over ten years. Note that any incentive pricing listed is California-based.
- Department of Energy's Find and Compare Cars — **fueleconomy.gov/feg/findacar.shtml**: Shows the MPGe (miles-per-gallon equivalent) and total range for both current and older cars, which can be helpful for researching used cars. You can also compare cars side-by-side.
- EVLife — **evlife.co**: Has car pricing with incentives listed, and you can enter your zip code to look for other state and local incentives.
- MyEV — **myev.com/cars-for-sale**: Has used cars for sale, searchable by zip code (other used car sites can also be searched for EVs).

RANGE IS THE MAIN DIFFERENCE

There are now enough EVs on the market to let you choose based on the type of vehicle you need (e.g. sedan, SUV, truck), number of doors, interior space, and other common vehicle purchasing criteria. The main difference between EVs is the “range,” which is how far it can drive before needing to be refueled.

Most new EVs have a range over 200 miles, which is comparable to a tank of gasoline. But you can also find EVs for around \$10,000 with a range of 60 miles that might be good enough for commuting and getting around town. For now, EV prices are largely determined by the range, so figure out how much you need to drive, and see if your budget matches the car prices for that range.

BATTERY DEGRADATION AND WARRANTIES

Concerns about EV batteries wearing out and requiring expensive replacements have turned out to basically be a non-issue. Most batteries are lasting the life of the car.³ One estimate is that on average, batteries lose about 2.3% of their capacity each year, which means a 150 mile range car might lose 17 miles over five years.⁴ You can get a sense of the degradation for a car you’re interested in — [geotab.com/fleet-management-solutions/ev-battery-degradation-tool](https://www.geotab.com/fleet-management-solutions/ev-battery-degradation-tool).

Federal regulations mandate EV battery warranty at eight years or 100,000 miles. Some manufacturers will replace the battery if it reaches a specified reduced capacity percentage — usually 60%-70% — while under warranty.⁵ The warranty for the rest of the vehicle varies by manufacturer.

You should ask the dealer about the most up-to-date warranties for all aspects of the vehicle you’re considering, including basic coverage, powertrain, corrosion, battery, and roadside assistance. MyEV has a chart comparing 2019 warranties for particular EVs — myev.com/research/buyers-sellers-advice/evaluating-electric-vehicle-warranties.

RANGE DROPS ON COLD AND HOT DAYS

Batteries work best in temperatures that are comfortable for people, around 70°F. At both lower and higher temperatures, the range decreases. You can use GeoTab’s Temperature Tool for EV Range to check on how the cars you’re considering perform as you slide the temperature up and down — [geotab.com/fleet-management-solutions/ev-temperature-tool](https://www.geotab.com/fleet-management-solutions/ev-temperature-tool).

Most EVs include a thermal management system for the batteries to keep them around 70°F. Many EVs also use heat pumps to efficiently heat and cool the interior space — check whether the EVs you're interested in have a heat pump available as part of standard equipment, as part of a cold-weather upgrade, or as a feature.

Since space heating is part of what uses a lot of battery power on hot and cold days, some tips for extending the range include:⁶

- Use heated seats and steering wheel: If your car has them, this can save a lot of battery power instead of using the cabin space heating on a cold day.
- Pre-condition your vehicle: Before unplugging to go out on a hot or cold day, get the cabin to a comfortable temperature to help preserve the battery while out.
- Keep your vehicle plugged in on extreme cold or hot days, both at home and when parked. This lets your car's battery thermal management keep working without using the battery.

INCENTIVES & FINANCING

There is a Federal Tax Credit worth up to \$7,500 available for people who purchase new EVs. That means that if you owe taxes over \$7,500, this can reduce your bill when you file your taxes, but you don't get back extra money if you owe less tax. The amount varies depending on whether it's a full EV or a PHEV, and depending on how many cars the manufacturer has already sold, phasing out for more popular EVs. The Department of Energy maintains a list — [fueleconomy.gov/feg/taxevb.shtml](https://www.fueleconomy.gov/feg/taxevb.shtml).

The Federal Tax Credit only goes to the registered owner of the vehicle, so if you lease, the manufacturer gets the credit. If you're leasing, look for a dealer that will roll the credit into a lower monthly payment.⁷

A number of states also offer rebates on EVs (California, New York, Oregon, Massachusetts, Oregon, and New Jersey).⁸ The Department of Energy maintains a database that lets you search for such programs in your state — afdc.energy.gov/laws/search. Make sure to also check with your utility to see if there are additional incentives, and ask your dealer if they know of other programs like HOV or carpool lane access for EVs, and emissions testing exemptions.⁹

LEASE OR BUY?

A report from 2018 found that around 80% of EVs are leased, which is much higher than the 30% of all vehicles that are leased.¹⁰

One argument in favor of leasing an EV is that since the technology is changing so quickly, you can get the newest tech when your lease ends. Leasing also lets you get a new car, with a new battery after a few years (but note that battery wear is proving not to be a big deal in the real world — see “Battery degradation and warranties” section above). Another argument in favor of leasing is that it puts more EVs on the market, because when your lease expires, your car becomes a used EV for someone else.

One reason to buy instead of lease is that you’ll be eligible for the federal tax credit and other rebates, which can greatly reduce the cost of the car (though some states give rebates for leased and used EVs).¹¹ Another benefit of buying over leasing is that you won’t have a car payment after you pay off the car.

NEW OR USED?

EVs break down slower than gasoline vehicles because they have so many fewer parts. They don’t leak oil, their single-speed transmission doesn’t fail, and they don’t have issues passing inspection. And the price of a used EV might be lower than a comparable gasoline car, though that might be changing as people realize how durable used EVs are.

Used EVs are generally priced according to their range. Something to consider with both new and used EVs is that if over time your car’s range decreases below what you need, you can sell it to someone else who is looking for that range — whether it’s 60-mile, 100-mile, 150-mile, or 200+ mile.

If you’re buying a used EV and you’re concerned about the battery health, ask the owner or dealer for a copy of a recent scan of the battery. You could also try a service like Recurrent, which can help you understand battery degradation for a specific car you’re looking at — recurrentauto.com/for-shoppers.

TYPES OF CHARGING

To charge an EV, you have to plug it in. Since the actual battery charging electronics are built into the EV, the different plugs are basically just extension cables for connecting to an outlet. That said, the type of outlet varies by how quickly they can charge. Below are images of the charging connector types found in the U.S., followed by descriptions of the charging levels.¹²

EV CHARGING CONNECTOR TYPES

LEVEL 1 CHARGING



STANDARD
WALL PLUG

LEVEL 2 CHARGING



J1772



TESLA

DC FAST CHARGING



CHAdeMO



CCS COMBO



TESLA
SUPERCHARGER

Home charging

- **Level 1:** Your car will come with a cable that plugs your car into a regular 120V AC standard wall outlet. This is called a “Level 1” charger, and will charge your car 4 to 5 miles every hour. If you’re driving 40-ish miles a day (e.g. 15,000 miles per year), you should be fine with Level 1 charging overnight. You can try using this initially to see if it will work for you. Note that the outlet you use should be on a dedicated circuit from your electrical panel, with no other appliances on it. You might also want a hook or shelf for the cord so it doesn’t pull on the outlet.¹³
- **Level 2, home:** If you need faster charging or more range, consider installing a faster “Level 2” charger. It uses a 240V AC outlet and can charge 15 to 25 miles every hour — useful if you drive 200-ish miles a day (e.g. 70,000 miles per year). The standard connector is the J1772, and Tesla’s proprietary connector has an adapter for this.

Public charging stations

- **Level 2, public:** Many parking lots outside shopping centers and office buildings now have public Level 2 chargers. The cost for using them ranges from free for some chargers, to about twice the cost of charging at home. See “Finding public charging stations” section below.
- **Level 3, aka “DC Fast Charging”:** As the name implies, this is the fastest available charging method. It uses up to 800V DC, and can add 50 to 90 miles in 30 minutes. Tesla’s Supercharger stations can charge even faster, up to 170 miles in 30 minutes. Non-Teslas can’t yet use Supercharger stations, but Tesla is working on changing that.¹⁴ Most U.S. EVs use the CCS (“Combined Charging System”) Combo connector for DC fast charging. The Nissan Leaf and Mitsubishi Outlander use a Japanese standard called CHAdeMO, but that connector is being phased out in the U.S.¹⁵

Finding public charging stations

Here are some places to search for public charging stations, both to plan your local day-to-day charging, and to plan road trips:

- PlugShare — **plugshare.com**: Has a map of public charging stations, and includes a trip planner if you register. It maps out the thousands of stations from companies like Electrify America, EVGo, and ChargePoint, which let you charge your car using an app or card.¹⁶
- Open Charge Map — **openchargemap.io**: A free & open option for locating chargers.
- EVmatch — **evmatch.com**: It's like Airbnb for EV chargers, where you join to either rent time on someone else's charger, or rent out your own home or business charger.

CHARGING COSTS

The cost to “fill up” an EV using electricity is a lot cheaper than gasoline¹⁷ The average person in the U.S. drives around 1,000 miles every month,¹⁸ and the average U.S. car gets 24 miles per gallon,¹⁹ which means each driver burns almost 42 gallons of gasoline every month. If gas is \$3.00 per gallon, that's \$125 a a month (and even more at \$4 or \$5 per gallon).

For home charging, the average U.S. cost for a “kWh” (kilowatt-hour) of electric energy is around \$0.12 cents (though it varies widely by location — check your utility bill). If a rule of thumb is that electric cars get 3 miles of range for every kWh, it takes around 333 kWh to be able to drive 1,000 miles, which is \$40 a month. In this example, that's a savings of around \$85 a month, or \$1,000 a year by using electricity instead of gasoline.

For public charging, in California it's around \$0.30 cents per kWh to charge on Level 2 (~\$100 a month for 1,000 miles), and \$0.40 cents per kWh for DC fast charging (\$133 a month for 1,000 miles).²⁰ So even if you only used DC fast charging, it would still be about the same cost as driving on \$3.00 gasoline.

FUEL USE COMPARISONS

The fuel efficiency of gas vehicles is given in MPG (“miles-per-gallon”), while EVs are rated in MPGe (“miles-per-gallon-equivalent”). An efficient gas car might get 40 MPG, while a Tesla Model 3 can get more like 121 MPGe — a significant improvement!²¹

EVs are also rated in “kWh/100 mi” (kilowatt-hours per hundred miles), which is more useful for getting a sense of how much it will cost to charge the car. For example, 121 MPGe is equivalent to 28 kWh/100 mi. If your home electricity costs \$0.12 cents for each kWh, then it will cost \$3.36 to charge up for driving 100 miles.

GAS -POWERED BACKUP CAR

When getting an EV, you can potentially keep a gasoline car around as a backup. Or get rid of the gasoline car and consider using a bicycle, public transit, ride-share, taxi, or car rental as needed.

HOME POWER BACKUP USING YOUR CAR

Currently, the Nissan Leaf and Mitsubishi Outlander allow you to plug your car into your home to use it like a backup battery. More cars are coming that allow such “bi-directional charging,” also known as Vehicle-to-Home (V2H). Audi is working on a system for its e-tron line,²² Volkswagen is planning to make all of its EVs bi-directional in 2022,²³ and Ford’s new electric F-150 Lightning is planned to be bi-directional.²⁴

USING THE EV AND PRESERVING THE BATTERY

Note that battery degradation is turning out to not be a big problem, with EVs from 2011-2013 still having 80% capacity, and newer cars demonstrating even slower degradation. But here are some suggestions for how operate your battery extra cautiously:

- Don’t fully charge or fully discharge your battery. Aim to charge to 80% and discharge to 30%, which is better for the battery. You can charge to full capacity when you need to drive farther.

- Try not to quick-charge too often. Since your battery gets hot during quick charging, and hot batteries degrade faster, it's better to quick charge only when necessary. But don't go crazy worrying about it — regular use might cost 1% of capacity per year.²⁵
- If leaving your EV for a while (e.g. vacation), keep it plugged in and charging to around 50% if possible.²⁶
- Try not to expose your car to extreme temperatures — park in the shade or a garage when possible to keep the battery closer to 70°F.
- Before taking a road trip, practice charging a few times locally first.
- Driving slower will let your battery last longer.
- If you run completely out of power, try shutting the car down and leave it for a short while, maybe half an hour to an hour, and you might have enough power to drive a couple more miles.²⁷

ELECTRIC BICYCLES, SCOOTERS, & SKATEBOARDS

Instead of (or in addition to) an EV car or truck, you might also consider getting an electric bicycle. They range from a few hundred to a few thousand dollars, they've gotten much better in recent years, and they might eliminate many of your car trips — including your commute. Start learning more — [rei.com/learn/expert-advice/how-to-choose-an-ebike.html](https://www.rei.com/learn/expert-advice/how-to-choose-an-ebike.html). You can also consider electric scooters and electric skateboards, which are now pretty advanced.

EV Charger (240V EVSE)



RECOMMENDATION

Buy a Level 2 charger with an adjustable current setting between 20A to 40A, and start with it set to 20A.

The Level 1 charger that comes with your EV plugs into a regular 120V outlet and adds around 4 to 5 miles of range every hour, good for 40-ish miles per day (or 15,000 miles per year). If that's not fast enough for your needs, you can install a Level 2 Charger (15-30 miles every hour), also known as an EVSE ("Electric Vehicle Supply Equipment").

Technically an EVSE is not the "charger" that converts AC to DC electricity — the "charger" is built into the car itself. An EVSE is a way to connect your EV to a 240V outlet. One site says "you should not overthink the selection and installation of an EVSE."²⁸ That said, there are some things worth considering. Here's a checklist from PG&E that might be helpful — [pge.com/global/common/pdfs/solar-and-vehicles/options/clean-vehicles/electric/EV-Charger-Install.pdf](https://www.pge.com/global/common/pdfs/solar-and-vehicles/options/clean-vehicles/electric/EV-Charger-Install.pdf).

DIFFICULTY: EASY

UPFRONT COST: \$500-\$2,500

IMPACT: Low

CONTRACTORS: Electrician

DO NOW: If you have a garage, check if you already have a 240V appliance outlet for a faster "Level 2" charger.

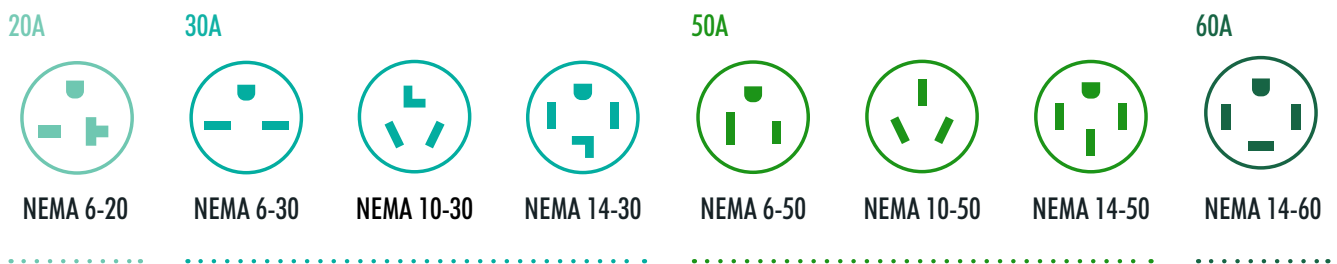
RENTER: Ask your landlord and employer about installing a Level 2 charger.

FINDING AN ELECTRICIAN

An EVSE by itself can cost between \$200 to \$1,000, and installation can range from around \$800 to \$1,300. An electrician will do the installation, so get quotes from multiple electricians, and try to get one who installs lots of EVSEs. Permits might be required to install an EVSE, so check with your electrician or local government.

If you're having an electrician come to your home, consider adding outlets for other electrification projects at the same time.

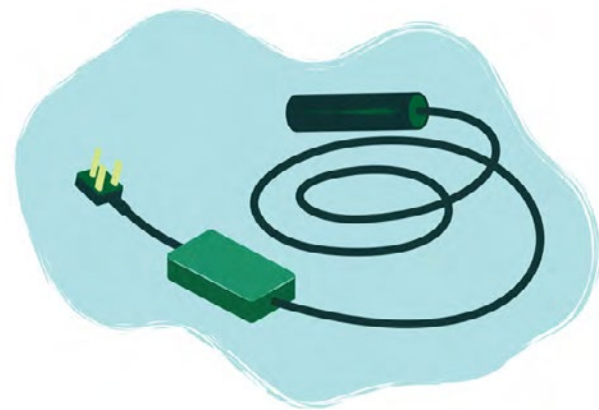
240V SOCKET TYPES



ELECTRICAL REQUIREMENTS

A rule of thumb is that an EVSE that can supply a current of 30A will give about 30 miles of range in an hour of charging, and that 30A charger will require a 40A circuit and two spaces on your electrical panel.²⁹

You might already have a 240V appliance outlet in your garage, like the kind that clothes dryers plug into. If that's the case, you can get a portable EVSE that plugs into it (see image right). Just make sure the plug on your charger matches the socket you're planning to use, since there are multiple types of three- and four-prong socket configurations (see image above).³⁰



You can also hardwire your EVSE. In that case, it should be around four feet off the ground. Consider how you want it mounted — whether attached to the building (see picture on previous page), or on a stand-alone post (left).³¹ If you're installing it on a post and the wiring will run underground, check with DigSafe (or equivalent) before digging.³² And if the charger is left exposed outside, consider having it covered in a cabinet, or with a small roof.

It's possible that your electrical panel won't have enough space for another 240V connection, in which case you might consider upgrading your electrical panel and electrical service. You can also consider getting a "Smart Circuit Splitter" for sharing one outlet between the EVSE and another appliance you want to electrify, like a heat pump dryer.

INCENTIVES AND REBATES

There is a Federal Tax Credit for 30% of the cost of purchasing and installing an EV charger — up to \$1,000 — if installed by December 31, 2021, when it expires (though it has been extended before).³³

Individual states and utilities also have rebates for EVSEs. Some EVSE manufacturers maintain a list of rebate programs:

- Chargepoint — chargepoint.com/incentives
- ClipperCreek — clippercreek.com/evse-rebates-and-tax-credits-by-state
- Search online for your specific utility's programs.

CHARGER SEARCH TOOLS

Here are a couple of sites to help find a charger that works for you:

- Home Charging Advisor lets you set the estimated installation cost, and includes incentive discounts by zip code — homecharging.electricforall.org
- PlugStar Shopping Assistant suggests chargers based on specific vehicles, but doesn't include incentives — plugstar.com/chargers

CHECK WITH YOUR UTILITY ABOUT EV RATES

Switching from paying the gas station to paying your electric utility to fill up your car is going to increase your electric bill (but overall save you money by eliminating your gasoline bill). Check with your utility to see if there is an EV rate plan that will reduce your costs if you charge during specific hours — especially at night, when the grid is being used less.

RENTER'S RIGHTS

Even if you're a renter or live in an apartment, you should consider asking your landlord or Home Owner's Association (HOA) if you can install either a 240V outlet or standalone charger. Some states, including California, Colorado, Florida, and Oregon, prohibit "unreasonably" denying a tenant's request to install an electric car charger.³⁴ Here are some resources to help you approach your HOA or landlord:

- Chargepoint resources — [chargepoint.com/drivers/apartments-and-condos](https://www.chargepoint.com/drivers/apartments-and-condos)
- Tesla's form letter — <https://www.tesla.com/sites/default/files/support/home-charging-installation/letter-requesting-approval-charging-installation.docx>
- Veloz tips — [veloz.org/wp-content/uploads/2017/08/MUD_Guidelines4web.pdf](https://www.veloz.org/wp-content/uploads/2017/08/MUD_Guidelines4web.pdf)
- Department of Energy help — afdc.energy.gov/fuels/electricity_charging_multi.html

CHARGING AT WORK

If you drive to work and there's not yet a charging station there, ask your employer about installing one. Chargepoint has suggestions and a guidebook about bringing EV charging to your workplace, which you can share with your employer — [chargepoint.com/blog/six-tips-bringing-ev-charging-your-workplace](https://www.chargepoint.com/blog/six-tips-bringing-ev-charging-your-workplace). Search online to see if your state has a program for helping to finance business charging installations.

EVSE AS ELECTRIFICATION HUB

It's worth noting that new types of EVSE are coming out as the EV market grows. One example is the dcbel r16, which supports bi-directional charging, allowing you to power your home from your car's battery instead of needing a separate home battery. The r16 also connects to your PV array as the inverter, letting you directly charge your car with your solar panels.³⁵ Ford and Sunrun are also teaming up to enable the F-150 Lightning electric pickup truck to power the home through the Ford Charge Station Pro.

Endnotes

1. <https://blog.ucsusa.org/dave-reichmuth/are-electric-vehicles-really-better-for-the-climate-yes-heres-why>
2. <https://www.nytimes.com/interactive/2021/01/15/climate/electric-car-cost.html>
3. <https://www.caranddriver.com/research/a31875141/electric-car-battery-life/>
4. <https://www.geotab.com/blog/ev-battery-health/>
5. <https://www.myev.com/research/ev-101/10-questions-to-ask-yourself-before-buying-an-electric-vehicle>
6. <https://www.geotab.com/blog/ev-range/>
7. <https://americantaxservice.org/tax-credits-for-electric-vehicle-car>
8. https://energycenter.org/sites/default/files/docs/nav/transportation/cvrp/presentations/2021-07_Williams-CSE_Collab-for-ZEV-Success_handout.pdf
9. <https://www.truecar.com/blog/electric-vehicle-tax-credits-and-rebates-explained/>
10. <https://insideevs.com/news/335662/nearly-80-of-electric-cars-minus-tesla-are-leased-not-bought-in-us/>
11. Oregon gives rebates for leased, and even used EVs: <https://goelectric.oregon.gov/incentives-rebates>
12. <https://www.ucsusa.org/resources/electric-vehicle-charging-types-time-cost-and-savings>
13. <https://www.hsph.harvard.edu/electric-cars/ev-types-plugs-home-charging/>
14. <https://insideevs.com/news/524006/tesla-supercharger-sharing-analyzed/>
15. <https://insideevs.com/news/433929/nissan-switches-to-ccs-in-us-europe/>
16. <https://www.electrifyamerica.com/> and <https://www.evgo.com/> and <https://www.chargepoint.com/>
17. <https://www.kbb.com/car-news/how-much-does-it-cost-to-charge-an-ev/>
18. <https://www.caranddriver.com/research/a32880477/average-mileage-per-year>
19. <https://afdc.energy.gov/data/10310>
20. <https://driveclean.ca.gov/electric-car-charging>
21. <https://www.fueleconomy.gov/feg/PowerSearch.do?action=noform&year1=2020&year2=2020&make=Tesla&baseModel=Model%203&srctyp=yym>
22. <https://electrek.co/2020/07/24/audi-bi-directional-charging-electric-cars-store-solar-energy/>
23. <https://electrek.co/2021/04/06/vw-electric-vehicles-bi-directional-charging-next-year/>
24. <https://techcrunch.com/2021/05/19/ford-f-150-lightning-electric-pickup-truck-can-power-your-home-in-an-outage/>

Endnotes

25. <https://www.pluginCars.com/eight-tips-extend-battery-life-your-electric-car-107938.html> and <https://www.myev.com/research/interesting-finds/is-dc-fast-charging-bad-for-your-electric-car>
26. <https://clippercreek.com/extend-life-ev-battery/>
27. <https://insideevs.com/news/404632/winter-range-test-best-evs-cold-weather/>
28. <https://www.pluginCars.com/quick-guide-buying-your-first-home-ev-charger-126875.html>
29. <https://www.pluginCars.com/quick-guide-buying-your-first-home-ev-charger-126875.html>
30. <https://www.splitvoltage.com/ev-socket-interface-types/>
31. <https://www.hsph.harvard.edu/electric-cars/aesthetic-outdoor-home-charging-stations/>
32. <https://www.hsph.harvard.edu/electric-cars/ev-types-plugs-home-charging/>
33. <https://clippercreek.com/tax-credits/>
34. <https://insideevs.com/features/368272/apartment-dweller-owning-charging-electric-car/>
35. <https://mashable.com/article/dcbel-electric-vehicle-fast-charger-battery/>