



# A guide to the different types of electric vehicles

Electric cars are becoming more and more popular. There are many reasons for this, including that they help reduce greenhouse gas emissions and save on fuel costs - and they're amazing to drive! But with so many types of electric cars, it can be difficult to know which one's right for you. Here, we'll take a look at the different types of electric cars to help you make a decision about which one would best fit your lifestyle.

## Battery electric vehicle (BEV)

BEVs are powered solely by electricity stored in batteries, with no tailpipe emissions. BEVs have electric motors instead of petrol or diesel engines, getting their power from rechargeable battery packs. Most BEVs use lithium-ion batteries because they offer the best balance of energy density, weight, and safety. When fully charged, [a battery electric vehicle can travel between 100 and 300 miles](#), depending on the model. As they produce no tailpipe emissions, BEVs are considered to be a zero-emissions vehicle.

### Advantages of BEVs compared to other types of electric cars

- They generate zero emissions, which is great for the environment.
- They have lower running costs than petrol and diesel cars, as well as other electric car types.
- They're eligible for some [government grants](#) and [tax benefits](#).
- They're quiet when running, making them ideal for city driving.

### To keep in mind before getting a BEV:

- They're still relatively expensive to buy outright compared to traditional petrol and diesel cars - which makes EV leasing a really attractive option for most people when making the switch to electric.
- When using a slow charger it can take a good few hours to charge the battery all the way up, but you can make the most of this by charging overnight when fuel prices are cheaper. Rapid chargers can top a car battery up in as little as 30 minutes when you're on the move.
- There's currently a smaller range of models of EV available compared to traditional fuel powered cars, but this is changing as more manufacturers enter the market and there are loads of exciting models in the pipeline that have been announced over the coming years. There's now an electric car on the market to suit every driver, and all major car manufacturers have committed to making electric models. The future of EVs is looking bright!

## Plug-in Hybrid Electric Vehicles (PHEV)

Plug-in hybrid electric vehicles are similar to battery electric vehicles, but they also rely on a petrol or diesel engine to give them longer range. This means that, when the battery is low, the PHEV can switch to using its conventional engine, just like a regular hybrid. The main difference is that PHEVs can be charged by plugging into the mains but hybrids cannot. PHEVs offer the ability to complete shorter journeys in electric mode, with a conventional engine for longer trips.

### Advantages of PHEVs:

- They can go further than BEVs, as they can switch to using their petrol or diesel engine when the battery is depleted. But, their zero emissions range (when they drive purely off battery alone) is much less than what a BEV can do.
- They may emit lower levels of CO<sub>2</sub> than conventional petrol or diesel cars depending on the make and model, but that's not always the case.

### Disadvantages of PHEVs:

- They still produce emissions from the petrol or diesel engine, so they're not as environmentally friendly as BEVs.
- They can be more expensive to buy than conventional cars.
- The weight of the batteries and engines affects the overall efficiency of the car.
- They have a smaller fuel tank than conventional cars, which can mean more frequent fill-ups on longer journeys.

## Hybrid Electric Vehicles (HEV)

HEVs are powered by a petrol or diesel engine and an electric motor. The electric motor is used to assist the engine, providing power when accelerating, overtaking another car or climbing hills. This means that HEVs tend to use less fuel than conventional petrol or diesel cars, and they emit lower levels of CO<sub>2</sub> in a [WLTP test cycle](#). This may not be the case in a real world example.

### Advantages of HEVs:

- They are slightly more efficient than conventional petrol or diesel cars, so they use less fuel and emit lower levels of CO<sub>2</sub>.
- Some have regenerative braking so the batteries are recharged when the brakes are applied. Both BEVs and PHEVs have this feature too.
- They are cheaper to buy than BEVs and PHEVs.

### Disadvantages of HEVs

- They can be less efficient on longer journeys, as the electric motor is only used to assist the petrol or diesel engine.
- The battery is charged by a petrol or diesel engine which is one of the least efficient ways to generate electricity, and can't be plugged in to charge.

- The electric range is very limited, as the battery is only used to power the electric motor and not to drive the car on its own.
- Most new hybrid vehicles will only be sold until 2032, as sales of new diesel and petrol cars are set to end by then.

## **Mild Hybrid Electric Vehicles (MHEV)**

MHEVs are similar to HEVs, but the electric motor is less powerful and it can't be used to drive the car on its own. The battery is also smaller, as it only needs to power the electric motor and not the whole car.

### **Advantages of MHEVs:**

- They're cheaper to buy than HEVs and BEVs.
- They offer a small boost in fuel economy compared to conventional petrol or diesel cars.

### **Disadvantages of MHEVs:**

- They're not true hybrids, as the electric motor cannot power the car on its own.
- They don't offer the same fuel economy benefits as HEVs or BEVs.

## **Range-extended Electric Vehicle (RE-EV)**

RE-EVs are similar to BEVs, but they have a small petrol or diesel engine that is used to generate electricity to extend the range of the car. The engine isn't connected to the wheels, and it doesn't provide any power to the car. The engine only charges the battery.

### **Advantages of RE-EVs:**

- They're more efficient than HEVs on longer journeys, as the electric motor is used to power the car and not just assist the petrol or diesel engine.
- The clever technology means that the engine is only used to generate electricity to give more miles of range in the electric battery.

### **Disadvantages of RE-EVs:**

- There's a limited choice of cars.
- The weight of the engine affects the overall efficiency of the car.

## **Hydrogen vehicle (FCEV)**

FCEVs, or hydrogen vehicles, are powered by a hydrogen fuel cell. The hydrogen is combined with oxygen from the air to create electricity, which powers an electric motor. In the past, many manufacturers thought that hydrogen was the future of mobility, but every major manufacturer is now developing BEVs faster and with more funding than FCEVs.

## **Advantages of FCEVs:**

- They're emissions-free, as the only by-product of the reaction is water vapour.
- The refuelling process is similar to petrol or diesel cars, so it's easy and quick.
- Great range, similar to that of an EV.

## **Disadvantages of FCEVs:**

- The technology is expensive, so the cars are, too.
- There are only 14 filling stations in the whole of the UK, so it's highly likely you'll have to travel out of your way to find one - and who knows if you'd even make it to your final destination.

Ready to make the switch to an EV? Our [EV salary sacrifice scheme](#) makes the switch easy by saving you money and tax on a brand new EV. Or, if you're looking for a [personal lease](#), we do that too. Simply [browse all electric cars](#) to find the perfect one for you. If you're still unsure, our friendly experts are on hand to help – so don't hesitate to get in touch.

# Electric vehicles

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2. [Electric vehicles explained video](#)
3. [Types of electric vehicles](#)
4. [Benefits of electric vehicles](#)

[Why you can trust our data](#)

## Benefits

- lower servicing and maintenance costs
- lower or zero rate of vehicle excise duty until 2025
- cheaper to refuel than petrol or diesel vehicles

Choosing an electric car can help you save money and reduce your carbon footprint.

Our guide will tell you more about the different types of vehicles available and how you can save money on purchasing an electric car.

Electric vehicles are an increasingly attractive option, due to their lower running costs, the expanding choice of models available and intensifying concerns about air quality and climate change.

Learn more about the types of electric vehicles and their benefits.

## What is an electric vehicle?

This short video will explain what electric vehicles are and the benefits of driving one instead of a petrol or diesel equivalent.

## Types of electric vehicles

- **Battery-electric vehicle (BEV)**

A vehicle powered only by electricity, also known as a 'pure' or 100% electric car.

The vehicle is charged by an external power source, i.e at a chargepoint. These vehicles do not produce any tailpipe emissions.

Most battery-electric cars have a real-world range of 220 miles on a full charge.

- **Plug-in hybrid electric vehicle (PHEV)**

This is a vehicle that has a battery, electric drive motor and an internal combustion engine (ICE). It can be driven using the ICE, the electric drive motor, or both, and can be recharged from an external power source.

Typical PHEVs will have a pure-electric range of up to 50 miles. Once the electric battery is depleted, journeys can continue in hybrid mode, meaning that there is no range limitation.

PHEVs are only efficient if they are charged regularly, otherwise they can be more expensive to run than a conventional petrol or diesel vehicle.

- **Extended range electric vehicle (E-REV)**

These are a version of plug-in hybrids. An E-REV combines a battery, an electric drive motor and a small petrol or diesel generator. The electric motor always drives the wheels, with the ICE acting as a generator when the battery is depleted.

The range of these vehicles can be between 150-300 miles.

## **Benefits of electric vehicles**

While the initial upfront purchase price of an electric or plug-in hybrid vehicle can be higher, this is usually offset by lower running costs.

Electric vehicles offer savings including:

- A full charge in a pure electric vehicle will give a typical range of around 220 miles and will cost approximately £23 if charging at home. Driving 220 miles in a petrol or diesel car will cost around £41 in fuel, which can be three or four times more than the cost of charging the electric car. The cost savings will be most significant when owners charge at home and have access to an off-peak overnight electricity tariff.
- There are fewer mechanical components in an electric vehicle compared with conventional vehicles, which often results in lower servicing and maintenance costs.
- [Lower or zero vehicle excise duty](#) (VED). However, from 2025 VED will also be charged on electric vehicles. The first-year rate will still be lower for electric vehicles – only £10 compared to £120-£945 for petrol or diesel vehicles – but after that all vehicles will be charged a standard rate of £165 per year.
- Zero emission vehicles – those emitting 0g/km CO<sub>2</sub> – qualify for the [cleaner vehicle discount](#) available until December 2025. All other vehicles, regardless of their emissions status will be required to pay the congestion charge.
- The lower or zero emissions of plug-in vehicles mean that they will attract lower charges from clean air zones being implemented around the UK and London's ultra low emission zone (ULEZ).
- Free parking for electric vehicles is available in some towns and cities.

If you have any additional questions about the benefits of Electric Vehicles (EV) we hope our [EV engagement FAQ](#) will help answer some of them as well as links to provide you with further information. We have also developed a [EV flow chart](#) designed to help with the decision-making process with some helpful suggestions for anyone who is considering or not sure about an EV as their next purchase.

- **Electric vehicle support in Scotland**

If you're living in Scotland and want advice on electric vehicle and funding that may be available to you, get in touch with Home Energy Scotland on 0808 808 2282 or through the [contact form](#).

[Advice](#)

[Buying a second hand electric car or van](#)

[Advice](#)

[Charging electric vehicles](#)

[Advice](#)

[Smart charging for electric vehicles](#)

[Advice](#)

[Electric vehicles for disabled drivers](#)

## **Further reading**

### **Electric cars**

Many businesses have already realised the benefits of EVs, with electric and plug-in hybrid cars becoming mainstream in the company car market.

### **Electric vans**

Electric vans are becoming increasingly popular and can be a great choice for private and public sector fleets.

### **Electric motorbikes, mopeds and microcars**

Find out more about electric motorbikes, mopeds and micro cars, also known as zero emission powered light vehicles for commuting or leisure.

# CNET

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Our expert, award-winning staff selects the products we cover and rigorously researches and tests our top picks. If you buy through our links, we may get a commission. [Reviews ethics statement](#)

- [Cars](#)

## Every EV Available in 2024, Ranked by Range

There are over 40 electric cars, trucks and SUVs on sale in the US today -- more than ever before. We've gathered them all along with how far they'll go on a charge.



**2023 Lucid Air**  
516 miles

[See at Lucid Motors](#)



**2023 Tesla Model S**  
405 miles

[See at Carvana](#)



**2023 Hyundai Ioniq 6**  
361 miles

[See at Carvana](#)



**2023 Tesla Model 3**  
358 miles

[See at Carvana](#)



**2023 Mercedes-Benz EQS**  
350 miles

[See at TrueCar](#)



**2023 Tesla Model X**  
348 miles

[See at Carvana](#)



**2023 Tesla Model Y**  
330 miles

[See at Carvana](#)



**2023 GMC Hummer EV Pickup and SUV**  
329 miles

[See at TrueCar](#)



**2023 Rivian R1T**  
328 miles

[See at Rivian](#)



**2023 BMW iX**  
324 miles

[See at TrueCar](#)



**2023 Rivian R1S**  
321 miles

[See at Rivian](#)



**2023 Ford F-150 Lightning**

320 miles

[See at Carvana](#)



**2023 BMW i7**

318 miles

[See at TrueCar](#)



**2023 Cadillac Lyriq**

312 miles

[See at Carvana](#)



**2023 Ford Mustang Mach-E**

312 miles

[See at Carvana](#)



**2023 Kia EV6**

310 miles

[See at Carvana](#)



**2023 Mercedes-Benz EQS SUV**

305 miles

[See at TrueCar](#)



**2023 Nissan Ariya**

304 miles

[See at Carvana](#)



**2023 Hyundai Ioniq 5**  
303 miles

[See at Carvana](#)



**2023 BMW i4**  
301 miles

[See at Carvana](#)



**2023 Genesis Electrified G80**  
282 miles

[See at TrueCar](#)



**2023 Volkswagen ID 4**  
275 miles

[See at Carvana](#)



**2023 Polestar 2**  
270 miles

[See at Polestar](#)



**2023 Audi Q4 E-Tron SUV and Sportback**  
265 miles

[See at Carvana](#)



**2023 Chevrolet Bolt EV**  
259 miles

[See at Carvana](#)



**2023 Hyundai Kona Electric**  
258 miles

[See at Carvana](#)



**2023 Kia Niro Electric**  
253 miles

[See at Carvana](#)



**2023 Toyota BZ4X**  
252 miles

[See at Carvana](#)



**2023 Genesis GV60**  
248 miles

[See at TrueCar](#)



**2023 Chevrolet Bolt EUV**  
247 miles

[See at Carvana](#)



**2023 Jaguar I-Pace**  
246 miles

[See at Carvana](#)



**2023 Porsche Taycan Sedan, Sport Turismo and Cross Turismo**  
246 miles

[See at Carvana](#)



**2023 Mercedes-Benz EQB**  
245 miles

[See at Carvana](#)



**2023 Audi E-Tron GT and RS GT**  
238 miles

[See at Carvana](#)



**2023 Subaru Solterra**  
228 miles

[See at Carvana](#)



**2023 Audi E-Tron SUV and Sportback**  
226 miles

[See at Carvana](#)



**2023 Volvo Xc40 Recharge and C40 Recharge**  
226 miles

[See at Carvana](#)



**2023 Nissan Leaf**  
212 miles

[See at Carvana](#)



**2023 VinFast VF 8**  
207 miles

[See at Vinfast](#)



**2023 Lordstown Endurance**  
174 miles

[See at Lordstown Motors](#)



**2023 Mini Cooper SE**  
114 miles

[See at Carvana](#)



**2023 Mazda MX-30**  
100 miles

[See at Carvana](#)

If you've been thinking about making the switch to an electric car or truck, you've probably put at least a little thought into driving range -- how far an EV will go on a single charge before needing to be plugged in to get more juice. It's a crucial part of ensuring a battery-powered car or truck fits your lifestyle. And while range certainly isn't the only factor you'll want to consider when choosing whether an EV is right for you -- there's also charging speed, reliability, economy and safety -- for many, it's the most important.

If you're looking for that information, you've come to the right place. We've rounded up every EV on sale today and ranked them by their EPA-estimated range. You'll find all that info below, so get to scrolling.

**Editors' note:** This list only includes vehicles that have been certified by the US Environmental Protection Agency. More EVs might be in the news, but they will not be added to this compilation until they're about to go on sale in the US and have official EPA range ratings. Also, all prices include destination charges, but may not include available incentives or tax breaks.



Tyler Clemmensen/CNET

## 2023 Lucid Air

516 miles

Now that the 520-mile Dream Edition is out of production, the longest range version of the 2023 Lucid Air is the **516-mile Grand Touring sedan**. That still puts the Air ahead of the pack by a healthy margin. With more than 100 more miles than Tesla's Model S, the Lucid is the longest ranged electric car you can buy today. There's a hefty cost to be the boss, however, with the 2023 Air starting at \$87,400 and that Grand Touring model tipping the scales at \$138,000.

[See at Lucid Motors](#)



Tesla

## 2023 Tesla Model S

405 miles

The Model S has been around in more or less the same form since 2012. It's gotten several updates to its hardware, styling and performance. Recently, it also got a price drop to \$89,880 for the **405-mile Long Range** model before adding options like different wheels, paint, the awkward yoke steering wheel replacement or Tesla's dubiously named Autopilot and Full Self-Driving features. Stepping up to the more powerful Plaid model gets you a 200 mph top speed, 0-60 mph in under 2 seconds and a slightly lower **396 miles** of range for \$110,130.

[See at Carvana](#)



Hyundai

## 2023 Hyundai Ioniq 6

361 miles

Hyundai's Ioniq 6 takes the stellar battery electric powertrain from the Ioniq 5 SUV and tucks it under a curvaceous compact sedan. It isn't quite as spacious as its big brother, but I'm more impressed with the additional range that the aerodynamic sedan boasts over its

predecessor. The Ioniq 6 starts at \$42,715, but the longest-ranging \$46,615 SE RWD configuration is the sweet spot, cruising for up to **361 miles** between charges.

[See at Carvana](#)



Tesla

### 2023 Tesla Model 3

358 miles

This is the EV to which all other midpriced electric vehicles have to answer. The Model 3 is just that good. It's comfortable, fun to drive, has tons of cargo space and the best ranges in its class. For 2023, the Model 3 is available in three optimized specs. The single-motor Standard Range model starts at \$41,630 before incentives, returning **272 miles** of range. At **358 miles** between charges, the dual-motor Long Range model will set you back \$48,630 and the fastest Performance AWD spec steps up to \$54,630 and down to **315 miles** of range.

[See at Carvana](#)



Antuan Goodwin/Roadshow

### 2023 Mercedes-Benz EQS

350 miles

It's a good thing that Mercedes-Benz's flagship EQS electric sedan is so comfortable, because with up to **350 miles** of range, it could be a long time between stops. The 2023 Mercedes-Benz EQS 450 4Matic starts at a lofty \$105,550 for the 329-horsepower single-motor configuration. If that's not enough power, Merc also offers the 649-hp dual-motor AMG EQS for a lot more money (\$148,700) and a little less range (**277 miles**).

[See at TrueCar](#)



Tesla

### 2023 Tesla Model X

348 miles

The Tesla Model X is like the Model S in that it's fast and expensive, but it's also bigger, roomier and has the wildest doors of any production car this side of the Lamborghini Aventador. Thanks to a similar update to the Model S, the X also comes in just Long Range (**348 miles**) and Plaid (**333 miles**) configurations. The 2023 Tesla Model X starts at \$99,880.

[See at Carvana](#)



Tim Stevens/CNET

### 2023 Tesla Model Y

330 miles

Think of the Tesla Model Y as the Model 3 with a bit more headroom and (somehow) seating for up to seven passengers. It's rocking the same powerful electric powertrain as the 3 and, according to the EPA, it'll do an impressive **330 miles** on a full charge in Long Range spec. The Performance model offers better, well, performance at the cost of a few miles range (**303 miles**). And, for 2023, the base model is back offering **279 miles** of range for \$48,880 before available incentives.

[See at Carvana](#)



Andrew Krok/CNET

### 2023 GMC Hummer EV Pickup and SUV

329 miles

Technically, the GMC Hummer EV pickup truck and SUV shouldn't make this list at all. Weighing in at over 9,000 pounds each, the Hummers are classified as "heavy duty" trucks, so the EPA doesn't actually list official range and efficiency estimates for them. Powered by an equally mammoth 200 kWh battery pack (nearly four times the size of the Bolt EV's), the Hummer EV pickup manages an impressive **329 miles** of range, while the smaller Hummer EV SUV roams for up to **320 miles**.

[See at TrueCar](#)



Rivian

## 2023 Rivian R1T

328 miles

More adventure vehicle than work truck, the quad-motor 2023 Rivian R1T gets a slight bump to **328 miles** of range when equipped with 21-inch wheels and the "Large Pack" battery (\$73,000). That should be plenty of reserve to get you and your mountain bikes deep into the great outdoors, especially while taking advantage of Rivian's Adventure Network of fast charging stations at trailheads and campsites. We're still waiting on the upcoming "Max Pack," which should push the range even higher, but we don't have final estimates for that just yet.

[See at Rivian](#)



Antuan Goodwin/CNET Cars

## 2023 BMW iX

324 miles

Somewhere between the sporty i4 and the flashy i7 is the practical 2023 BMW iX crossover. The electric SUV boasts a more flexible cabin than its sedan siblings -- especially for drivers looking to fill its hatchback with cargo -- and its 111.5 kWh battery is the biggest of the bunch. Even with its more upright aerodynamic profile, the iX is able to cruise up to **324 miles** between charges in its base xDrive50 configuration (\$88,095) or **288 miles** in sporty M60 guise (\$112,495). After driving both, I prefer the less expensive, longer range spec.

[See at TrueCar](#)



Tim Stevens/CNET

## 2023 Rivian R1S

321 miles

The 2023 R1S, Rivian's second electric vehicle, ditches the pickup bed in favor of a two-box SUV profile. This makes room for more passengers (up to seven) between its three rows or additional protection for cargo out back. Aerodynamic and weight differences

account for the SUV's slightly lower **321 miles** of range between charges, not that we think you'll miss those last 7 miles too badly. The 2023 Rivian R1S starts at \$78,000.

[See at Rivian](#)



Antuan Goodwin/CNET

### 2023 Ford F-150 Lightning

320 miles

The F-150 Lightning is one of the best modern full-size pickups that I've driven, electric or not. Ford has fine-tuned its F-Series formula for over a dozen generations and the Lightning combines that experience with a high-tech electric powertrain with up to 580 silent horsepower and, in the longest ranging 4WD Extended Range trim, up to **320 miles** between charges. The 2023 Ford F-150 Lightning starts at \$66,869.

[See at Carvana](#)



BMW

### 2023 BMW i7

318 miles

Everything about BMW's i7 electric flagship is big, from the full-sized sedan chassis to the available 31-inch 8K rear display, to the hefty price tag that starts at \$125,245. It's also packing a big 107.8 kWh battery and up to **318 miles** of range between recharges when equipped with 19-inch wheels. Opt for the larger 20- or 21-inch wheels, however, and the range drops as low as **296 miles** -- a fairly small price for a pretty big flex.

[See at TrueCar](#)



Andrew Krok/CNET

### 2023 Cadillac Lyriq

312 miles

The 2023 Lyriq is quite literally the "Cadillac of Electric Cars." Caddy's first

dedicated EV builds on the strong foundation of GM's Ultium electric car platform with a 102 kWh battery pack and up to 340 hp. Interestingly, the EPA estimates the cruising range for the sold-out 2023 launch model at **312 miles**. Cadillac is currently taking orders on new 2024 models -- starting at \$58,590 -- but stating a lower maximum 308-mile range. We'll have to wait for the EPA to update its estimates to be sure.

[See at Carvana](#)



Antuan Goodwin/CNET

### 2023 Ford Mustang Mach-E

312 miles

Ford's Mach-E may be a Mustang in name alone, but it's an EV through and through.

This electric SUV is offered in a variety of configurations, from the single-motor "Select" spec starting at \$43,995 to the Premium AWD Extended range model at \$54,400. However, drivers looking for the most range possible should check out the rear-driven California Route 1 Edition with up to **312 miles** with a full charge.

[See at Carvana](#)



### 2023 Kia EV6

310 miles

Based on the same electric vehicle platform as the Hyundai Ioniq 5, Kia's EV6 is the

sportier sibling with more windswept proportions, a firmer suspension and a bit more edge. (Figuratively, the Ioniq still boasts more actual edges in its more geometric design.) Also like the Ioniq, the EV6 is available with two battery sizes and single- and dual-motor configurations. The longest range setup being the single-motor, big-battery model, at **310 miles**. The 2023 Kia EV6 starts at \$50,025.

[See at Carvana](#)



Mercedes-Benz

### 2023 Mercedes-Benz EQS SUV

305 miles

The SUV variant of Mercedes-Benz's flagship EQS expands on the formula with even more space for passengers and their cargo spread across three rows. With more mass to move around, the EQS SUV's range drops to **305 miles**. Interestingly, the starting price is the same as the sedan at \$105,550.

[See at TrueCar](#)



Nissan

### 2023 Nissan Ariya

304 miles

Nissan's electric second act is the all-new Ariya SUV. Larger than the Leaf, the Ariya boasts up to an 87 kWh battery, up to **304 miles** in Venture Plus FWD trim and as much as 389 hp for dual-motor configurations. The 2023 Nissan Ariya starts at \$44,525.

[See at Carvana](#)



Andrew Krok/Roadshow

### 2023 Hyundai Ioniq 5

303 miles

The Hyundai Ioniq 5 makes a statement with its low-poly style and pixel-themed details, but it's more than just a pretty face. The electric crossover boasts an excellent balance of performance, range and value. The angular EV starts at \$42,785 for the **220-mile** SE Standard Range entry point, but for the maximum **303 miles** of range per charge, you'll want to upgrade to the SE Long Range battery pack for \$46,835.

[See at Carvana](#)



Antuan Goodwin/CNET Cars

## 2023 BMW i4

301 miles

BMW's i4 sedan is the most "normal"-looking electric car in the automaker's lineup. (You'd be hard pressed to spot the difference between it and the gas-powered variant at a glance.) It's also one of my favorite new EVs on the road today, combining the dynamic performance of a sports sedan with the whisper-quiet comfort and efficiency of a fully electric powertrain. Currently, the i4 Gran Coupe is offered in two configs: the 335-hp, **301-mile** eDrive40 (\$58,095) and the high-performance 536-hp, **271-mile** M50 (\$69,695).

Soon, an even less expensive eDrive35 base model (\$52,995) will join the lineup, but its expected 256 miles of range hasn't yet been EPA-confirmed.

[See at Carvana](#)



Genesis

## 2023 Genesis Electrified G80

282 miles

The Genesis Electrified G80 is a surprisingly luxurious sedan packing a potent 365 hp dual-motor electric powertrain. With **282 miles** of EPA-estimated range and a starting price of \$80,920, the G80 is a compelling alternative (and in many ways preferable) to its six-figure competition from BMW and Benz.

[See at TrueCar](#)



Craig Cole/Roadshow

## 2023 Volkswagen ID 4

275 miles

Volkswagen's ID 4 electric SUV is now available in more configurations for the 2023 model year, including the single-motor ID 4 Pro. So equipped, the VW's range climbs to **275 miles**. There's also an even more budget-

friendly ID 4 Standard with a smaller 62-kWh battery (versus the Pro's 82 kWh) and less range (**209 miles**) for a lower \$40,290 starting price.

[See at Carvana](#)



Antuan Goodwin/CNET Cars

## 2023 Polestar 2

270 miles

The Polestar 2 fastback -- a sort of tall, liftback sedan chimera -- hits the ground running with impressive interior appointments and gorgeous Scandinavian style. New for 2023 is a single-motor configuration that stretches the battery to **270 miles** per charge with a more affordable \$49,800 starting price. Dual-motor models also see a range increase to **260 miles** and a reshuffling of available options that brings the starting price down to just \$53,300, making it much more competitive in its class.

[See at Polestar](#)



Audi

## 2023 Audi Q4 E-Tron SUV and Sportback

265 miles

The Audi Q4 E-Tron SUV and its Sportback variant repackages the full-size E-Tron's formula in more bite-sized proportions. That means a smaller footprint, a lower \$50,995 starting price and a smaller 82 kWh battery. The reduction in mass balances the reduced power reserve and the Q4 E-Tron quattro's **236 miles** of range (**242 miles** for the Sportback) improves over its larger sibling. Additionally, the 2023 Q4 is now also available in a single-motor configuration that stretches to **265 miles** between charges.

[See at Carvana](#)



## 2023 Chevrolet Bolt EV

259 miles

The awesome little Bolt EV is not long for this list. GM announced that production of the plucky compact electric hatch will come to a close at the end of this year. Starting at just \$36,620, the Bolt EV is currently the

most affordable long-range electric car, climbing to **259 miles** after its recent redesign.

[See at Carvana](#)



Hyundai

## 2023 Hyundai Kona Electric

258 miles

The Kona Electric is another excellent compact electric crossover that won't break

the bank, starting at just \$34,885. The Kona's slow DC charging speed might make road trips something of a chore, but the **258 miles** of range between charges is more than enough for commuting and running errands around town. That said, you might want to wait for the larger next-generation Kona EV coming later this year. It'll offer more standard features, more range and a possible price increase.

[See at Carvana](#)



Kia

## 2023 Kia Niro Electric

253 miles

While everyone was distracted by the shiny new EV6, Kia was also quietly updating its

other electric crossover, the 2023 Niro EV. Compared to its sibling, the full-electric Niro EV's range is more modest at **253 miles** per charge, but so is the starting price of \$40,875 -- a savings of almost \$10K.

[See at Carvana](#)



Andrew Krok/CNET

## 2023 Toyota BZ4X

252 miles

The 2023 Toyota BZ4X is an angular crossover built from the ground up around its battery-electric powertrain. Roughly the size of a RAV4, the BZ4X starts at \$43,335 and is available in either a **252-mile** single-motor configuration or a dual-motor setup with up to 228 miles depending on equipped options.

[See at Carvana](#)



Andrew Krok/CNET

## 2023 Genesis GV60

248 miles

At the top of the Hyundai Motor Group's electric crossover trio is the premium Genesis GV60. Its cabin features significantly higher quality materials than the EV6 or Ioniq 5 and its battery-powered drivetrain is tuned for increased power and poise. Dual-motor all-wheel drive is standard with **248 miles** of range starting at \$69,415.

[See at TrueCar](#)



Andrew Krok/Roadshow

## 2023 Chevrolet Bolt EUV

247 miles

Larger and longer than the Bolt EV, the 2023 Chevrolet Bolt EUV boasts the same 65 kWh battery pack and 200 hp electric motor as its little brother. Range drops to **247 miles** per charge and the price climbs to \$38,495, but the EUV is still one of the best bargains on a new electric car. Plus, it's the least expensive way to experience GM's hands-free Super Cruise highway driving assistant.

[See at Carvana](#)



Antuan Goodwin/Roadshow

## 2023 Jaguar I-Pace

246 miles

Jaguar's I-Pace is getting a bit long in the tooth, but the electric crossover looks fantastic, drives like a Jag and continues to

be updated with more range and features. With up to **246 miles** of range in its latest incarnation, the 2023 I-Pace starts at \$73,275.

[See at Carvana](#)



Porsche

## 2023 Porsche Taycan Sedan, Sport Turismo and Cross Turismo

246 miles

There's not a vehicle on this list that's more fun to drive than the Taycan, Porsche's first dedicated electric car. Recently, the automaker has improved the EV's charging speed, massaged its efficiency and improved the battery's thermal management, all with software updates that are also backwards-compatible with previous model years. The result is more range, with up to **246 miles** between recharges for the 2023 Taycan GTS sedan (\$140,950). The Sport Turismo wagon and Cross Turismo tall wagon body styles also get more range, stretching up to **233** and **235 miles**, respectively, depending on trim.

[See at Carvana](#)



Mercedes-Benz

## 2023 Mercedes-Benz EQB

245 miles

Mercedes' EQB electric crossover flies under the radar. Sharing its body and design

with the gasoline GLB-Class, you may have pulled up next to one and not even realized it was an EV. Sharing its bits with an established model helps keep costs low (for a Benz), starting at \$53,900 for the **245-mile** EQB 250 Plus spec.

[See at Carvana](#)



## 2023 Audi E-Tron GT and RS GT

238 miles

Audi's E-Tron GT is a high-performance EV halo car, showcasing the automaker's battery tech and electric all-wheel drive powertrain in a sleek, low-slung package. The \$106,395 four-door sport sedan cruises up to **238 miles** between charges, if you can resist the temptation of 522 hp and a 0-60 mph sprint in just 3.9 seconds. Not enough oomph for you? The even more potent RS E-Tron GT offers up to 637 hp and 0-60 mph in 3.1 seconds with just a small dip in range to **232 miles**.

[See at Carvana](#)



Jessica Walker/Subaru

## 2023 Subaru Solterra

228 miles

The 2023 Solterra is Subaru's first dedicated full-electric vehicle. The fruit of a joint partnership with Toyota, it's also exactly identical to the Toyota bZ4X in almost every way. However, while the Toyota is available in a single-motor configuration, the Subie makes dual-motor all-wheel drive standard, capping its maximum range at **228 miles** per charge. The Solterra starts at \$44,995.

[See at Carvana](#)



Chris Paukert/Roadshow

## 2023 Audi E-Tron SUV and Sportback

226 miles

Audi's first purpose-built battery electric SUV has seen multiple tweaks to its options and features over the years -- the largest being the addition of the Sportback model with its windswept, coupe-like silhouette. However, behind the scenes, software and hardware

updates have helped the E-Tron to stretch its 95 kilowatt-hour battery to an EPA-estimated maximum range of **226 miles** for the upright SUV model (\$71,995) and **225 miles** for the sportier Sportback (\$75,195).

Another round of updates, a name change (Q8 E-Tron) and even more range are just around the corner for the 2024 model year, so watch this space for updates.

[See at Carvana](#)



Emme Hall/CNET

### **2023 Volvo Xc40 Recharge and C40 Recharge**

**226 miles**

The Volvo XC40 Recharge and its crop-topped C40 Recharge variant aren't the best value in their compact electric SUV class, but they certainly look and feel more premium than the rest. The XC40 starts at \$54,645 and the C40 at \$56,395, returning **223 miles** and **226 miles**, respectively, for the trouble. However, a major update is coming later this year, including a new motor, a more capacious battery and an available single-motor configuration.

[See at Carvana](#)



Nissan

### **2023 Nissan Leaf**

**212 miles**

Nissan's Leaf is the granddaddy of all affordable, mass-market electric cars, hitting the road way back in 2010. Now approaching the end of its second generation, the Leaf sticks closely to its original formula despite modest improvements here and there. The face-lifted 2023 model strangely loses a bit of range compared to its previous max of 226 miles and simplifies to just two available configurations -- a **149-mile** base model starting at \$29,135 and the **212-mile** SV (\$37,135).

[See at Carvana](#)



VinFast

### **2023 VinFast VF 8**

207 miles

American roads earlier this year. The 2023 VF 8 is currently only available in California, starts at \$40,290 and roams for up to **207 miles**, according to the EPA's estimates.

The first battery-powered SUV from Vietnamese EV startup VinFast arrived on

**See at Vinfast**



Lordstown Motors

### **2023 Lordstown Endurance**

174 miles

truck, the Endurance, out the door. The pickup looked ready to begin limited production late last year with an EPA estimated range of **174 miles** per charge, but quickly ran into delays after just a handful of deliveries.

Ohio-based EV startup Lordstown is having a rough time getting its debut electric pickup

**See at Lordstown Motors**



Steven Ewing/CNET

### **2023 Mini Cooper SE**

114 miles

market, starting at \$31,895 before incentives. There's a catch: limited range. The Mini Electric is only estimated at **114 miles** of range, about as short an e-leash as you'll find today.

The 2023 Mini Cooper SE Electric promises to be one of the most affordable EVs on the

**See at Carvana**



Craig Cole/Roadshow

## 2023 Mazda MX-30

100 miles

Mazda's first step into electric vehicles is a tepid one. The 2023 Mazda MX-30 is a subcompact SUV that was originally designed to be a plug-in hybrid model, so its battery pack is on the small side, delivering just 100 miles of range between charges. The 2023 MX-30 is currently only available in California starting at \$35,485 -- more expensive than the Mini Cooper SE and the Nissan Leaf, with less range than either.

[See at Carvana](#)

## Every EV available for 2023

Make and model	Range	Starting MSRP
Audi E-Tron GT	238	\$106,395
Audi E-Tron SUV, Sportback	226	\$71,995
Audi Q4 E-Tron SUV, Sportback	265	\$50,995
BMW i4 Gran Coupe	301	\$58,095
BMW i7	318	\$125,245
BMW iX	324	\$88,095
Cadillac Lyriq	312	\$58,590
Chevrolet Bolt EUV	247	\$36,620
Chevrolet Bolt EV	259	\$38,495
Ford F-150 Lightning	320	\$66,869
Ford Mustang Mach-E	310	\$43,995
Genesis Electrified G80	282	\$80,920
Genesis GV60	248	\$69,415
GMC Hummer EV Pickup, SUV	329	\$112,595
Hyundai Ioniq 5	303	\$42,785
Hyundai Ioniq 6	361	\$42,715
Hyundai Kona Electric	258	\$34,885
Jaguar I-Pace	246	\$73,275
Kia EV6	310	\$50,025

<b>Make and model</b>	<b>Range</b>	<b>Starting MSRP</b>
Kia Niro Electric	253	\$40,875
Lordstown Endurance	174	TBD
Lucid Air	516	\$87,400
Mazda MX-30	100	\$35,485
Mercedes-Benz EQB	243	\$53,900
Mercedes-Benz EQS	340	\$105,550
Mercedes-Benz EQS SUV	305	\$105,550
Mini Cooper SE	114	\$31,895
Nissan Ariya	304	\$44,525
Nissan Leaf	212	\$29,135
Polestar 2	270	\$49,800
Porsche Taycan	246	\$92,550
Rivian R1S	321	\$78,000
Rivian R1T	328	\$73,000
Subaru Solterra	228	\$44,995
Tesla Model 3	358	\$48,880
Tesla Model S	405	\$89,880
Tesla Model X	348	\$99,880
Tesla Model Y	330	\$48,880
Toyota bZ4X	252	\$43,335
Vinfast VF 8	207	\$40,290
Volkswagen ID 4	275	\$40,290
Volvo XC40, C40 Recharge	226	\$54,645

A few truly charming electric cars have disappeared from the list this year and will be missed, but overall, the list is longer than ever. That means more choices running a wider gamut of ranges, prices and body styles. That's good news for electric car enthusiasts, early adopters and regular drivers looking for flexible and reliable transportation. And there will be more to come even by the end of 2023.

For a list of just our favourite electric vehicles, check out our [best electric cars](#) roundup. There's also our list of the [best kids' electric cars](#), because it's never too early to cultivate a love of cars -- electric or otherwise.

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# HOW DO ELECTRIC CARS WORK?

## HOW DOES MINI ELECTRIC WORK?

If it looks just like a car, for example, and drives just like a car. What is it that makes an Electric car so different?

As a fully electric car it gets 100% of its power from the battery, instead of a combustion engine. Get the lowdown on how it all works below.

## ELECTRIC MOTOR.

Electric cars work by receiving energy from the battery, which is converted into power by an electric motor. This power is used to drive the wheels. An electric motor generates more torque, and eliminates the need for a traditional transmission and so the power goes straight to the wheels for instant acceleration. An electric motor provides for example 135kW of power, which is equivalent to a max power output of 184 horsepower. This means 200 lb-ft of torque to the front wheels delivering smooth acceleration from 0-62mph in just 7.3 seconds.



## ELECTRIC DRIVETRAIN.

The high voltage lithium-ION battery (1) is arranged under the floor and positioned along the length of the vehicle. The centre of gravity is much lower than with a petrol-powered car, for enhanced stability and agile handling.

The single electric motor (2) is located at the front and directly powers the front wheels. It produces the same power as a 2.0-litre, petrol-powered car.

The transmission and other integrated electronic systems (3) are located in the front under the bonnet of the new electric car. The charging port (4) is located on the side scuttle on some, on the rear or front of others.

### **CHASSIS.**

If Electric cars look familiar from the outside, that's because they use the same chassis as their fossil fuel equivalent. But look closer at the signature front grille and you'll notice an important difference. There's no air intake, because the Electric motor and batteries require very little cooling.

### **REGENERATIVE BRAKING.**

As well as slowing you down, the Electric brakes can also help you extend the range. Thanks to regenerative braking, when you lift off the accelerator your speed (kinetic energy) is converted back into electricity to top up the battery. With two different braking modes available, you can adjust the level of regenerative braking to suit your driving style.



### **BATTERIES.**

An Electric's battery is one of its weightiest components, which is why we had to think carefully about where best to place it. To maintain our famous go-kart handling we arranged the battery in a T-shape on the vehicle floor between the front seats and below the rear seats. The result? A low centre of gravity with even weight distribution. Perfect.

### **CHARGING.**

Relax and charge up your Electric from the comfort of home using a standard domestic socket or from a wall-mounted charger. Away from home, charge by using fast charging units commonly found at motorway service stations and on main routes. Electrics are usually equipped with both of the charging cables you need for topping up at home or away.

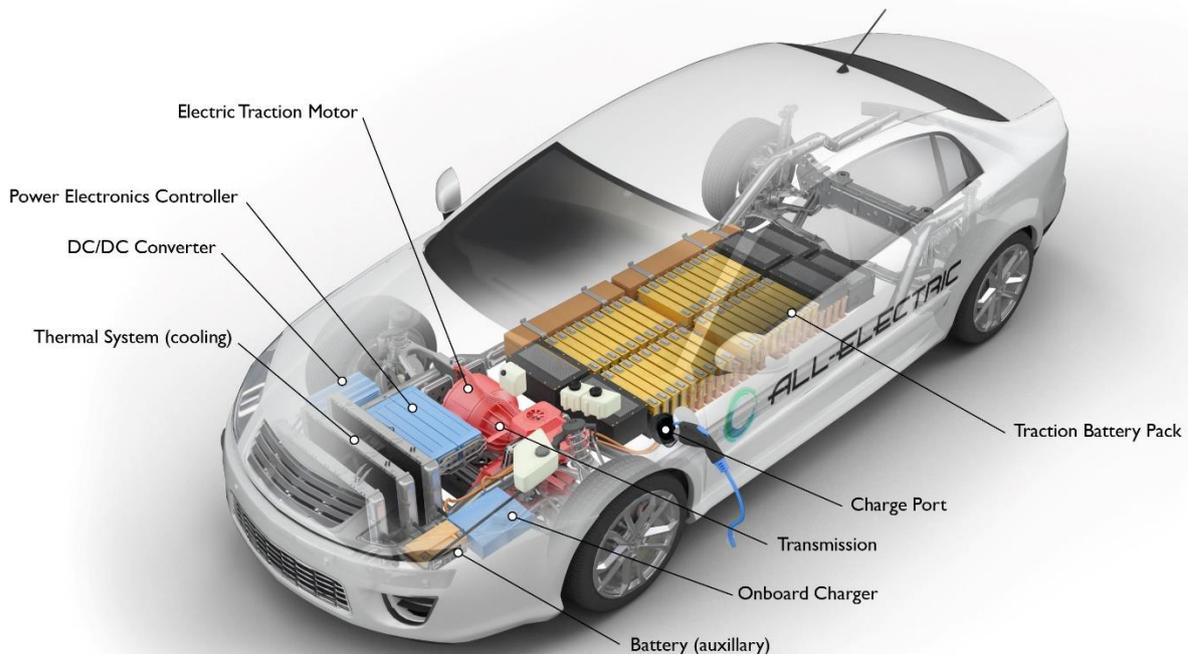
### **THE DIFFERENCE BETWEEN FULL ELECTRIC AND HYBRID.**

Electric is a full electric car, which means it doesn't require any fuel or oil, and produces zero emissions. Hybrid cars, on the other hand, use an electric motor as well as a conventional engine. However, they can be heavier, require more parts and still produce emissions.

## How Do All-Electric Cars Work?

All-electric vehicles, also referred to as battery electric vehicles (BEVs), have an electric motor instead of an internal combustion engine. The vehicle uses a large traction battery pack to power the electric motor and must be plugged in to a wall outlet or [charging equipment](#), also called electric vehicle supply equipment (EVSE). Because it runs on electricity, the vehicle emits no exhaust from a tailpipe and does not contain the typical liquid fuel components, such as a fuel pump, fuel line, or fuel tank. [Learn more about electric vehicles.](#)

### All-Electric Vehicle



afdc.energy.gov

### Key Components of an All-Electric Car

**Battery (all-electric auxiliary):** In an electric drive vehicle, the auxiliary battery provides electricity to power vehicle accessories.

**Charge port:** The charge port allows the vehicle to connect to an external power supply in order to charge the traction battery pack.

**DC/DC converter:** This device converts higher-voltage DC power from the traction battery pack to the lower-voltage DC power needed to run vehicle accessories and recharge the auxiliary battery.

**Electric traction motor:** Using power from the traction battery pack, this motor drives the vehicle's wheels. Some vehicles use motor generators that perform both the drive and regeneration functions.

**Onboard charger:** Takes the incoming AC electricity supplied via the charge port and converts it to DC power for charging the traction battery. It also communicates with the charging equipment and

monitors battery characteristics such as voltage, current, temperature, and state of charge while charging the pack.

**Power electronics controller:** This unit manages the flow of electrical energy delivered by the traction battery, controlling the speed of the electric traction motor and the torque it produces.

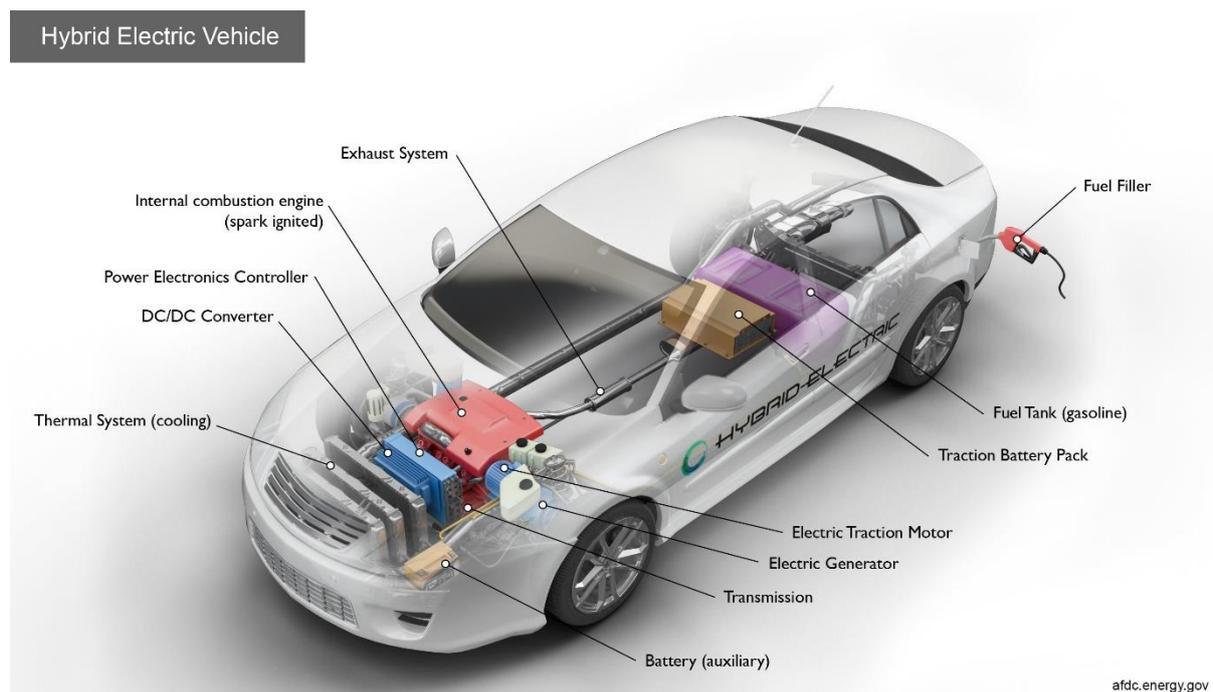
**Thermal system (cooling):** This system maintains a proper operating temperature range of the engine, electric motor, power electronics, and other components.

**Traction battery pack:** Stores electricity for use by the electric traction motor.

**Transmission (electric):** The transmission transfers mechanical power from the electric traction motor to drive the wheels.

## How Do Hybrid Electric Cars Work?

Hybrid electric vehicles are powered by an internal combustion engine and one or more electric motors, which uses energy stored in [batteries](#). A hybrid electric vehicle cannot be plugged in to charge the battery. Instead, the battery is charged through regenerative braking and by the internal combustion engine. The extra power provided by the electric motor can potentially allow for a smaller engine. The battery can also power auxiliary loads and reduce engine idling when stopped. Together, these features result in better fuel economy without sacrificing performance. [Learn more about hybrid electric vehicles.](#)



### Key Components of a Hybrid Electric Car

**Battery (auxiliary):** In an electric drive vehicle, the low-voltage auxiliary battery provides electricity to start the car before the traction battery is engaged; it also powers vehicle accessories.

**DC/DC converter:** This device converts higher-voltage DC power from the traction battery pack to the lower-voltage DC power needed to run vehicle accessories and recharge the auxiliary battery.

**Electric generator:** Generates electricity from the rotating wheels while braking, transferring that energy back to the traction battery pack. Some vehicles use motor generators that perform both the drive and regeneration functions.

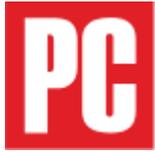
**Electric traction motor:** Using power from the traction battery pack, this motor drives the vehicle's wheels. Some vehicles use motor generators that perform both the drive and regeneration functions.

**Exhaust system:** The exhaust system channels the exhaust gases from the engine out through the tailpipe. A three-way catalyst is designed to reduce engine-out emissions within the exhaust system.

**Fuel filler:** A nozzle from a fuel dispenser attaches to the receptacle on the vehicle to fill the tank.

**Fuel tank (gasoline):** This tank stores gasoline on board the vehicle until it's needed by the engine.

**Internal combustion engine (spark-ignited):** In this configuration, fuel is injected into either the intake manifold or the combustion chamber, where it is combined with air, and the air/fuel mixture is ignited by the spark from a spark plug.



PCMag UK [Computers & Electronics](#) [Cars & Auto](#)

# EV 101: How Do Electric Cars Work?

Eyeing a more environmentally friendly alternative to your gas-powered car? Electric vehicles are growing in popularity; here's how they get you from point A to B.



by [John Bogna](#), [Emily Dreibelbis](#)

Sep 25, 2023



With their smooth handling and fast acceleration, electric vehicles (EVs) are an appealing way to avoid high gas prices or mitigate the environmental impact of gas-powered vehicles. Their upfront cost might be higher than gas cars on average, but there are several models under \$40,000, federal tax credits to soften the blow, and a steadily improving charging infrastructure to help quell range anxiety. But how do they actually work?

# The Basics of Electric Cars

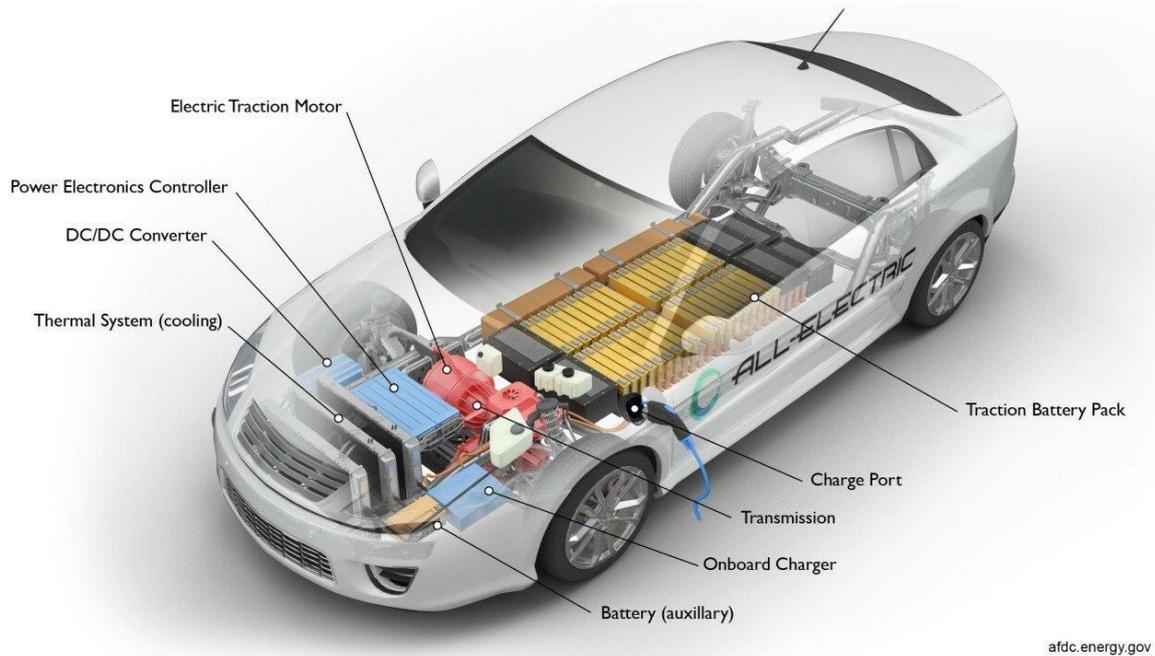


2021 Audi Q5 55 TFSI E Quattro

Unlike a typical internal combustion engine (ICE) vehicle that runs on gas, EVs don't require explosive combustion via burned fuel to generate the energy needed to move. Instead, they use electrical energy stored in their battery packs to turn the electric motor (or motors) connected to the wheels and drive the car forward. As such, EVs have fewer moving parts than a gas vehicle and generally require less maintenance (no oil changes).

There are several different types of vehicles that could qualify as EVs, from plug-in hybrids to fully battery-powered vehicles, and even hydrogen fuel cell-powered cars. While hybrids use a small amount of electricity, they are still generally considered gas-powered vehicles, though more efficient ones. We'll focus specifically on how all-electric vehicles work here.

## The Science Behind the Battery



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## Electric vehicle interior

Every EV has a battery pack made up of groups of lithium-ion batteries, or cells, that supply the power needed for everything from moving the car to running the air conditioning. It's usually located at the bottom of the vehicle between the wheels.

An electric car's battery charges in much the same way the lithium-ion battery in your cell phone does, just on a much larger scale. You connect it to the grid via an outlet or charging station, and it draws energy until it's charged. How much energy an EV's battery can hold will depend on its capacity, measured in kilowatt-hours (kWh). The higher the number, the higher the capacity, and the farther you can drive that EV on a single charge.

Battery sizes differ for each EV, and many models also offer multiple size options (the bigger the battery, the more expensive the car). For example, the upcoming 2024 Hyundai Kona Electric comes with a smaller battery option for short trips (48.6kWh for 197 miles of range) and a larger one (64.8kWh) with a 260-mile range. Large, performance-focused vehicles like the Rivian R1T pickup have double or more the battery capacity. Rivian offers three different battery sizes—the standard pack (270-mile range, 105 kWh), the large pack (321-mile range, 135 kWh), and the max pack (410-mile range, 180 kWh).



Rivian battery

Making matters even more complicated, there are now two main types of EVs on the market. In the past, most US-made EVs had nickel cobalt manganese (NCM) batteries, which are energy-dense and offer high power and range. More recently, automakers have been quietly switching to a new type of battery, called lithium iron phosphate (LFP), in their base models. Tesla, Ford, and Rivian have adopted them because they cost less—no expensive cobalt and nickel—and achieve same EPA-estimated range. However, LFP batteries lose range more quickly in cold weather and have less power. Therefore, NCM batteries are still generally considered a more desirable, premium option reserved for upper-tier trims.

In the end, both battery types still generally follow the same basic principles. Unlike the electricity coming from a typical wall outlet, they put out direct current (DC) power. In order to generate rotational force, that power needs to be converted to alternating current (AC). That's where the design of an EV's motor comes in.

## The Design of the Motor

An EV's electric motor doesn't have to pressurize and ignite gasoline to move the car's wheels. Instead, it uses electromagnets inside the motor that are powered by the battery to generate rotational force.

Inside the motor are two sets of magnets. One set is attached to the shaft that spins the car's wheels, and the other is inside the housing surrounding that shaft. Both sets of magnets are charged so that their polarity is the same, and they repel one another. The force of the magnets pushing away from one another turns the shaft, spins the wheels, and moves the car forward.



Components of the Rivian dual motor on display at the factory.

In order to maintain a constant state of repulsion between the magnets, their polarity has to constantly change as the shaft turns. Otherwise, they'd eventually rotate back to a point where they would attract instead of repel one another and lock themselves in place. AC power does this automatically, constantly alternating between positive and negative. But since the power from an EV's battery is DC, a device called an inverter is needed to keep flipping the polarity of the magnets.

An EV's inverter flips polarity quickly, around 60 times per second, to keep the rotational force going. A separate DC converter is used to direct power to other vehicle systems (heating, infotainment, and lighting) that don't require alternating current. The frequency of the current sent to the motor can be changed by the driver, and the higher the frequency the more frequently the polarity flips. This generates more rotational force, or torque, and spins the wheels faster.

# The Art of Charging



ChargePoint Home Flex Electric Vehicle Charger

With gas-powered cars, you fill up the tank and head out. With EVs, there are three different levels of charging stations in the US, from slowest (level 1) to fastest (level 3).

- **Level 1** chargers are typical, 120-volt wall plugs, and are most useful in private homes where you can juice up overnight. It's slow: An 8-hour charge adds about 40 miles of range; a full charge can take 20 hours or more.
- **Level 2** stations step up to 240 volts and output anywhere from 10-25kW for a full charge in about eight hours. This makes them the common solution for overnight charging at home or at locations like hotels. Tesla

Level 2 stations are known as Destination Chargers (versus Superchargers). If you don't have the appropriate plug, a 240-volt outlet or home charging station would need to be installed to recharge an EV at your house.

- **Level 3** DC fast charging (DCFC) stations deliver the most power; they can charge an EV battery to around 80% in about 30-60 minutes depending on the station's charging speed (50-350kWh), the maximum charging speed the vehicle can support, and external factors such as weather (very cold weather can take longer).



Level 3 Tesla Supercharger station in Beaver, Utah, with up to 250kW charging.

All EVs come with a level 1 cord that plugs into the vehicle on one end and a standard wall outlet on the other, save for Tesla, which stopped including level 1 chargers in 2022. This is a great start for new EV owners to juice up while they evaluate whether they need to install a level 2 charger for faster home charging speeds.

Level 3 chargers are not available to install at home, as they draw significant power beyond what a home's electrical capacity can support. They're commonly located along highways for road trippers, as well as around town and in the city. Brands like Electrify America, EVGo, and Tesla Superchargers are common. Recently, an increasing number of automakers have announced they will switch to Tesla's charging port, and will build it into their vehicles after 2025. That will effectively make Tesla Superchargers the go-to stations for many EV buyers.



Level 3 Electrify America station in Illinois with up to 350kW charging.

There's some debate over whether using level 3 fast-charging stations all the time can have a deleterious effect on your EV's battery. The jury's still out on that one, although a recent study found no extra degradation in Teslas that routinely fast charge compared with those that rarely do, Electrek reports. For now, you should probably just use what makes the most sense for you based on where you live and what you can afford.

Given the time it takes to charge, the most optimal approach is to routinely top off the charge throughout the day when parked at home, work, or anywhere else the vehicle is parked throughout the day—at work, running errands, or at the gym. This prevents the battery from losing too much charge throughout the day and means less time charging the vehicle or sitting at a charging station.

EVs also come with a regenerative braking system that harnesses kinetic energy from stopping the car and channels some of it back to the battery pack to be stored as electrical energy. This won't totally recharge your EV but can make it much more efficient in the right circumstances.

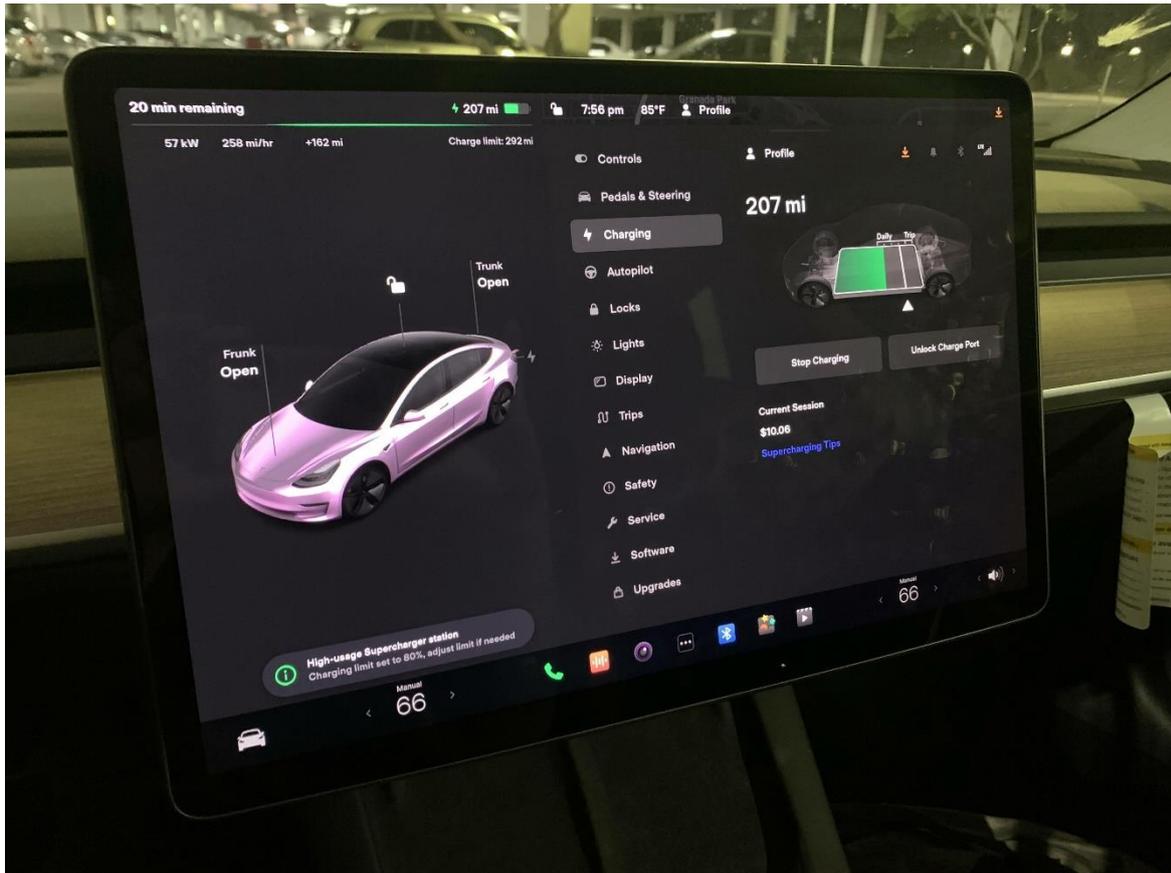
# How Far Can an EV Get on a Charge?



Lucid Air Grand Touring has an estimated 516-mile range.

The most common EV concern is range anxiety. Will an EV will get the same mileage on a charge as a gas car gets on a full tank? The answer is: It depends.

The average EV range at the time of this writing is 220 miles, according to data aggregated by Electric Vehicle Database. But the upper and lower ends of the spectrum vary widely, from 114 miles on the 2023 Mini Cooper EV (though the next generation Mini Coop may promise more) to the Lucid Air's 500+ mile range. Multiple variables can affect that range, both in the moment and over the lifetime of the vehicle.



Tesla Model 3 charging at a Phoenix Supercharger.

The size of an EV's battery is one of the most consequential factors when it comes to range. But whatever its capacity, an EV's range can be reduced by continuous highway driving, frequent quick accelerations, overuse of fast charging, extreme weather, and natural aging over time.

Modern electric cars are becoming a more competitive option every year, causing more drivers to switch to them. In the US, EVs make up 7% of new car sales. In other places, like Europe, they're up to 21% as of August 2023—and a whopping 85% in Norway. Still, charging infrastructure needs some work. The best case scenario for EV drivers is charging at home and work, which essentially relegates any concept of "making a special trip to fill up the car" a thing of the past.

While they have some kinks to work out, and won't save us from climate change by themselves, EVs can be part of a larger comprehensive movement to rethink transportation and build greener alternatives.

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## What is an electric car? How do electric cars work?

If you're new to the EV game and find yourself asking 'What is an electric car?', don't be shy. TG explains all...



[Joe Holding](#)

Published: 06 Apr 2023



If you're on the hunt for a new car (or even a used one, come to think of it) for the first time in a blue moon, it won't have escaped your attention that [electric cars](#) are now *everywhere*.

Virtually every mainstream manufacturer either has a range of electric cars on sale already, or will do in the very near future. Not least because the sale of new petrol and diesel vehicles [is set to be outlawed in 2030](#). Even hybrids - which mix engines with electric power - will be [banned by 2035](#). Nope, emissions really aren't trendy any more.

Anyway, those deadlines mean lots of people are now at the start of what we'll regrettably refer to as their 'electric car journey' (ugh), and so will be asking themselves questions like 'What is an electric car, exactly?' and 'How do electric cars work?'

You may be among them. If so, congratulations! You're in the right place to have your most pressing electric car questions answered. Keep scrolling and we'll bring you up to speed with the very basics of this exciting new land on the Planet Car map...

## What's an electric car? And what's an EV?

Let's start at the very beginning: an electric car is very simply any car that uses electricity as its primary source of propulsion. Instead of an engine and fuel tank, most electric cars use one or more electric motors to generate propulsion, which are fed by a battery; much like the one you'll find in your smartphone. Only bigger. Much bigger.

'EV' stands for 'electric vehicle', and the shorthand version has become common parlance among car-writing types who easily get fed up of typing out 'electric vehicle' every time it comes up. Lazy so and so's, eh?

## And what does BEV mean?

Ah, BEV is merely an extension of EV meaning 'battery electric vehicle'. This term is usually deployed to differentiate between various types of 'electrified' vehicle, as in those that have an electric component in the powertrain but aren't themselves fully electric. Ever heard the phrases 'self-charging hybrid' or 'plug-in hybrid'? Yup, those are *not* BEVs.

The battery in an electric vehicle is usually (but not always) located in the floor of the car, and comprises hundreds (if not thousands) of individual cells. You charge an electric car by plugging it into a socket via a cable, again much like your phone.

## How do electric cars work?

Not all electric-car set-ups are the same, but generally speaking electric cars work by using energy stored in a battery to feed one or more electric motors to provide drive. Mechanically speaking they are much simpler than internal combustion powertrains as they feature only one moving part, with motors harnessing the force that's generated by running a current through a magnetic field (yup, *electromagnetism*, physics fans).

Almost all electric cars make do without a gearbox, which means there's no clutch pedal; just a brake and an accelerator. So they drive like automatics, even though, technically, they aren't.

Something you'll need to get used to is that electric cars are virtually silent, with very little motor noise compared to that of a typical engine. Very weird at first, but you'll get used to it.

Another side benefit of using electric motors is something called regenerative braking: when you lift off the throttle to slow down, the motors can be reversed to harvest recycled electricity from that forward momentum, which slows you down without using the brake pedal and simultaneously gives you a bit more juice for driving. Neat, huh?

## **Are all electric cars zero emissions?**

All electric cars have zero *tailpipe* emissions, because they have, er, no tailpipe. Basically, when you drive around there isn't a steady stream of CO<sub>2</sub> and other harmful gases spewing out the back. And at the very least that's good for air quality, especially in built-up areas.

But are electric cars truly zero-emission things? That's where people are divided. Some people (quite fairly) point out that if the electricity has been generated by a coal or gas power station, then there's still a CO<sub>2</sub> cost to factor into EV driving. This is something that will improve over the coming decades as we (hopefully) adopt more green sources of energy.

Critics also highlight that electric cars tend to be more damaging to manufacture than internal combustion vehicles, due to the precious metals used in current battery technology (think cobalt, lithium etc) and the need to pack them onto shipping containers to feed production lines. Again, it's a long-term issue that should improve the greener we go and the more advanced the tech gets.

## **Is an electric car right for me?**

Ah, now that's the million pound question. We won't go into a fully-fledged personal assessment here, but you'll need to weigh up a few things: firstly, the purchasing/lease costs of an EV (because the tech is new, they tend to be more expensive than equivalent petrol and diesel cars) and how much you'd make back from running on electricity (which, if you charge up at home, should be cheaper per mile than if you were using fuel from a pump).

Then you need to factor in what kind of driving you do: lots of short trips to and from home, or long-distance travel from one end of the country to the other? Electric cars are somewhat limited by range, with [the longest-range electric cars](#) offering 300+ miles from a single charge. Is that enough for you? And if it isn't, can you find an ultra-fast charging point on your route to top up as needed? Welcome to the dilemmas of electric-car driving.

Intrigued? Why not read our [10-step guide on how to buy an electric car?](#)

## **MYTH: “lights and wipers kill your range”**

It’s a dark wet night and you’re gripped by range anxiety. How much better it’d be, you think, if you could do without those power hungry headlights and wipers. Ah well, there are street lamps, so perhaps you could get by on only sidelights, and running the wipers on intermittent.

Nah, don’t worry, because they make little difference. Your screenwipers on full speed only draw about 100W – they have a 12V motor that runs less than 10 amps. So you’d need to run your wipers for 10 hours to use even 1kWh of battery energy. Many or indeed most electric vehicles nowadays have LED lights and they draw even less power, so although you might have them on for longer than the wipers, they still aren’t a concern.

More of a current draw might be the demisting, especially if your car doesn’t have a heat pump. You’ll have the air con running to dry the air and the resistive heater to warm it. But if you hit the max demist button, the system should clear the screen in a couple of minutes. Then you can shut off the air con and turn down the fan – and volume of warmed air – to a dribble just to maintain a clear view. At least unless you have a pack of big wet dogs steaming away in the back.

More likely to staunch your range, or your fuel economy in an internal combustion car, is the energy that is absorbed by tyres in clearing the water and creating spray. This can be a 5–10 per cent penalty.