

ELECTRIFYING.COM

PRODUCED WITH



Department
for Transport

BEGINNERS' GUIDE TO

GOING ELECTRIC

EVERYTHING YOU NEED TO KNOW
FROM THE ELECTRIC EXPERTS™



⊕ MYTH-BUSTING

⊕ ACRONYMS EXPLAINED

⊕ BATTERY FACTS

⊕ TOP OWNING TIPS



Welcome to the guide



At Electrifying.com we're proud to be the electric car experts. But that wasn't always the case and despite the fact that I've driven hundreds of different cars over the years, making the switch to electric still took quite a bit of getting used to.

But I'm now hooked on electric cars (even though I made a few mistakes along the way!) and it's great to have teamed up with the Department for Transport to share the knowledge I've picked up about them in our handy **Beginners' Guide to Going Electric**.

Why do we need one? Well, although electric cars are incredible simple to drive and own, they do require a change of mind-set – especially for those of us who are switching after decades of driving petrol and diesel cars.

I hope the following pages help clear the air, but if you have any questions about electric cars then feel free to send them over to us on social media (the links are on the back page of this guide) or through the website and we'll do our best to answer them.

Ginny Buckley
Founder and CEO
Electrifying.com

Driving is woven into the fabric of our everyday lives, and as we prepare for the mass adoption of electric vehicles, driver awareness and knowledge of zero emission vehicles is a crucial part of the transition.

Our vision is to have one of the best infrastructure networks in the world for electric vehicles, and we want chargepoints to be accessible, affordable and secure. That's why we have announced £1.3 billion to accelerate the roll out of charging infrastructure, targeting support on rapid chargepoints on motorways and major A roads to dash any anxiety around long journeys, and installing more on-street chargepoints near homes and workplaces to make charging as easy as refuelling a petrol or diesel car.

We want drivers to feel confident in making decisions about what's right for them and we know that people are bound to have questions and concerns with any new technology. That is understandable. The most powerful advocates are those who have already made the switch – like Ginny and I – and I'm proud to share this guide; to demystify your concerns and to provide clear answers to some common questions.

Rachel Maclean MP
Minister for the Future of Transport
and Decarbonisation



THE **FIVE** THINGS YOU NEED TO KNOW BEFORE BUYING AN ELECTRIC CAR

It's no secret that we're big fans of electric cars, and there's no doubt that they can bring advantages for you, your pocket and the air we all breathe. But there are a few things you need to check and research to make sure it is the right choice for you, as it will involve some changes to your normal driving routine.

Here are the top five things we'd advise you to check before you sign on the dotted line.

1. Do your sums

Firstly, work out how many miles you do in a week. Just simply make a note of the journeys you do and add them up at the end of the month. The average motorist covers around 20 miles in a day, so it's going to be easy to switch to an electric car. How often do you do a big trip of 150 miles or more? If it's once or twice a year, you don't need a car with a big battery as you will be financially much better off just charging on the way when you break for a coffee and a comfort break.

2. Work out your charging

One of the many advantages of owning an electric car is that you can 'refuel' from the comfort of your own home. Even if you arrive with just a few miles left in your battery, by the time you wake up the next morning, you can be topped up and ready to go again. No more having to leave 10 minutes early the next morning to factor in a petrol station trip.

If you can't charge at home or the office, all is not lost, but you will have to rely on the public charging network. This isn't as tricky as it sounds. If you are doing 20 miles a day you could have a car with a couple of hundred miles of driving range. You can easily top up the battery every week on a public charger, either overnight or at a rapid charger while you shop, eat a meal or go to the gym.

The latest electric car models can travel for more than 300 miles on a charge and have ultra-fast charging. This makes them perfect for longer journeys



3. Work out the total cost of ownership

It's easy to look at the list price of an electric car and immediately dismiss it as too expensive. It's true that they do cost a fair chunk more than a petrol car if you were going to go into a dealership and write a cheque for the full amount.

But the purchase price isn't the only expense you need to consider when running a car. Once you've driven away from the forecourt you need to fuel it, pay road tax, have it serviced and pay tolls. Then eventually you will want to sell it and see how much value it has lost. Add all these factors into the mix and it could well mean the total cost of ownership is lower. Here are the sums you need to do to see if an electric car could save you money:

1. Finance

Most of us will buy our cars using some form of finance – such as a lease, contract purchase or salary sacrifice. Compare the cost of the electric version versus a conventional alternative. As the electric car tends to lose less value, it might be cheaper than you expect. Take in the other savings below and factor them in too.

2. Fuel

This is the big one. We are all used to hosing petrol or diesel into our cars, paying £70 or so and thinking no more about it. But with an electric car you'll never need to visit a petrol station again, unless you want to buy a pasty or some Jelly Babies. Charge at home overnight and a complete charge will cost around £2 and take you 150 miles or more. Even if you pay the UK average price for electricity you'll pay about a quarter of the amount you are used to spending at the petrol station.

3. Servicing

They might seem complicated, but electric cars are actually very simple to maintain. There's no exhaust pipe, clutch or engine oil and far fewer moving parts. In addition, the brakes aren't worked as hard because the energy from slowing down is recycled back into the battery by using the motor as a generator. It means you'll spend less at the dealer on servicing, with costs around half what you'd pay for a diesel. Some electric car service plans are less than £100 per year.

4. Taxes

The road tax on an electric car is free, which will be quite a change if you're used to paying £500+ to keep your big diesel SUV legal. But the advantages if you can run an electric car through a business are even greater. Electric company cars attract a benefit-in-kind rate of just 1%, saving you thousands every year compared to an equivalent petrol or diesel car. It also means you can lease an electric car through a salary sacrifice scheme and have the money taken out of your pre-tax pay packet. That's going to mean a saving of at least 20% on the payment.

5. Tolls

Many towns and cities already have incentives for electric cars, including free or cheaper parking and exemption from tolls. Many more will follow London soon by starting to restrict entry to central areas for polluting cars in order to protect air quality. If you don't want to get turned away or charged extra fees, you'll need to go electric.

Do your sums and you'll discover that the higher purchase price of an electric car can be recouped by much lower running costs



4. Get the grants

The government is really keen for you to get an electric car too, so offers a nice selection of incentives to help persuade you and make the sums add up. In some cases, they are incredibly generous and make it a no brainer decision, so you'll want to make sure you are taking advantage of them. For example, leasing the car through your employer's salary sacrifice scheme will mean the money is taken out of your gross pay, just like you might have with childcare vouchers or a cycle to work scheme. That can lop 40% off the lease payments and make an electric car cost less per month than you currently spend at the petrol station.

Or, if you are entitled to a company car, the tax liability is just 1% of the car's value - compared to the hundreds or even thousands of pounds you'd need to pay every year for a petrol or diesel car. Your company will be pretty keen too, as there are tax advantages for having an electric car on the company books.

Even if you aren't lucky enough to get a company car, you'll still be able to get £2,500 off the price of an electric car if it's priced below £35,000, and the government will throw £350 in the pot for a wallbox charger to be fitted by an approved installer.

"The average motorist covers around 20 miles in a day, so it's going to be easy to switch to an electric car."

5. Long journeys

Some electric car drivers will never take them on a long journey and are happy to just charge at home. But once you realise how cheap an electric car is to run, it's likely you'll want to use it for far flung adventures.

But your first experience of driving a long distance in an electric car and needing to top up your battery could be stressful, unless you've done your homework. The good news is that the charging situation is getting much better every week. But there are still some things you'll need to know.

Firstly, you'll be needing apps to help you out. At Electrifying.com, we're devotees of zapmap.com, plugshare and Wattsapp, and recommend them all. What makes these apps indispensable is that they show live information from the vast majority of the UK's charging network.

You'll need them as the UK's motorway rapid charging network can be, to put it politely, woeful. But the charge point provision is being transformed, the entire motorway and A-road network being upgraded at quite a pace. A vast 24-unit hub has just opened on the M6 near Rugby, while existing units are being ripped out and replaced at existing sites at a rate of 10 locations a week. These points are super fast too, meaning you'll spend less time at them.

Until the upgrades have happened however, we'd suggest you need to take precautions. Always arrive at a charging point with enough range to reach an alternative. When you plan your journey, look at your charging point app and see what other points are in the area.

If you can find a location that has two or more units (increasingly common now), head there first. Even if one unit is offline or being used, your odds of success are far greater. Double or quad unit sites are also generally much newer and generally more reliable. If you are planning to charge at your destination, such as a hotel or shopping centre, check the website just to make sure the points are still working and haven't been dug up.



The latest generation of electric cars can charge at high speeds and offer long ranges in excess of 250 miles

CHARGING YOUR CAR

We explain watts what when you need to plug in



If you're making the switch to an electric car, there's one aspect of ownership that might seem a little baffling at first. Yes, we're talking about charging. You need to get to grips with cables, kilowatts and connectors. No wonder it seems confusing!

But the good news is that charging is actually very simple once you understand how it works. And we promise, you don't have to be a scientist to get to grips with it all.

Understand the acronyms

When it comes to electric cars, there's loads of new jargon and acronyms to familiarise yourself with and the first one to get your head around is kWh. It stands for kilowatt hour and is a unit for measuring how much electricity (or energy) you're using. The size of an electric car's battery is measured in kilowatt hours. In very simple terms, think of the battery as the fuel tank of an electric car. The higher the kWh figure, the bigger the battery and the more fuel (electricity) you can get into it.

For example, the least expensive battery on the Volkswagen ID.3 is 48 kWh, which means it can store a maximum of 48 kilowatt hours of electricity. Put simply, it would run a 1kW appliance like a kettle for 48 hours. Check out our guide to acronyms on page 9.

Know your kWh from your kW

The next acronym (see, we told you there are lots) is kW. And yes, you've guessed it, it stands for kilowatt. A kW is a measurement of the power created by a motor or engine but it's also used to describe how quickly a charging point can fill up your car's battery.

Power outputs of chargers range from 3.6kW right up to 350kW. The higher the number the faster the flow of electricity into your battery, with the most common being 7kW. But bear in mind that not all electric cars can charge at higher rates and you'll be limited to the speed at which your car takes power.

Figure out the charging times

There are currently more than 30,000 public charging points around the UK and when it comes to delivering power, the king of the jungle is the ultra-fast charger. With the right electric car, a 350kW ultra-fast charger can add up to 200 miles of range to your car's battery in around 15 minutes, so if you need to stop mid-journey for a quick top-up then this is the charger for you.

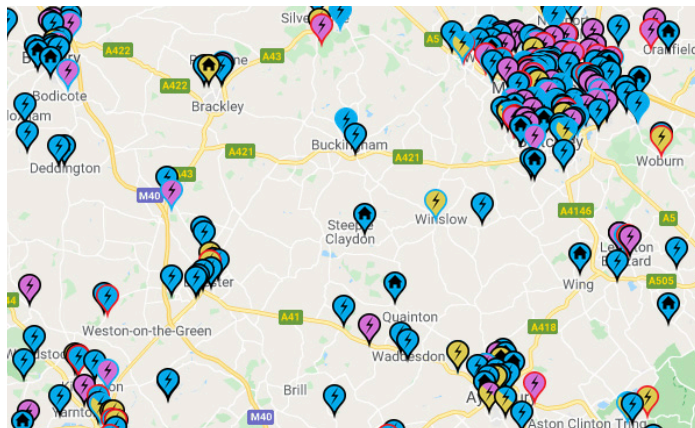
The most common rapid chargers in the UK are 50kW units, with thousands dotted around the network. A Volkswagen ID.3 48kWh will take around 45 minutes to charge from 10 to 80 percent with one of these. Finally, we have what are called destination posts. They're often found in public car parks, supermarkets and workplaces. You'd usually use one of these points if you're planning to be away from your car for a few hours. So if you're at work or doing a spot of retail therapy, these are perfect. These use an AC connector, so make sure you have your cables with you.



Rapid chargers like these new 350kW units at the Electric Highway charging hub on the M6 can recharge your electric car within minutes

Know where to charge

Wondering where to charge an electric car? Basically, anywhere there's electricity! But if you can park off-street at home, most of the time you'll use your home charger, which is great as it means your car is filling up whilst you're sleeping. But if you are planning a longer trip, or don't have access to off-street parking at home, you'll need to do a little research.



Smartphone apps such as Zap-Map.com will show you the location of your nearest charger and can also tell you whether it's available. You can also filter results for charger speed and network

There are a number of apps such as Zap-Map that will show you the location, status and cost of chargers in the UK. Most have live information, so you can see if someone is using the charger and how long they've been charging for.

We suggest you download one of the apps and familiarise yourself with the location of charging points close to places you visit regularly, like work, friends or the gym. If you don't have access to off-street parking at home then charging once a week for half an hour or less at a rapid charger could give you enough charge for your weekly driving. Most networks also have their own apps that will show you the status and price of their units.

Get connected

It's easy to get confused with cables and connectors as they come in a few different flavours. There are three main ones: CHAdeMO, CCS and Type 2, along with an extra one known as a 'granny charger' with a three-pin plug which can be used in emergencies to add range. It only charges at around 2kW so it's very slow and shouldn't be used regularly as it draws maximum power from your sockets, so you'll have to check that your electrics and fuse box are in tip-top condition. Otherwise, you might start melting things. Which isn't good.

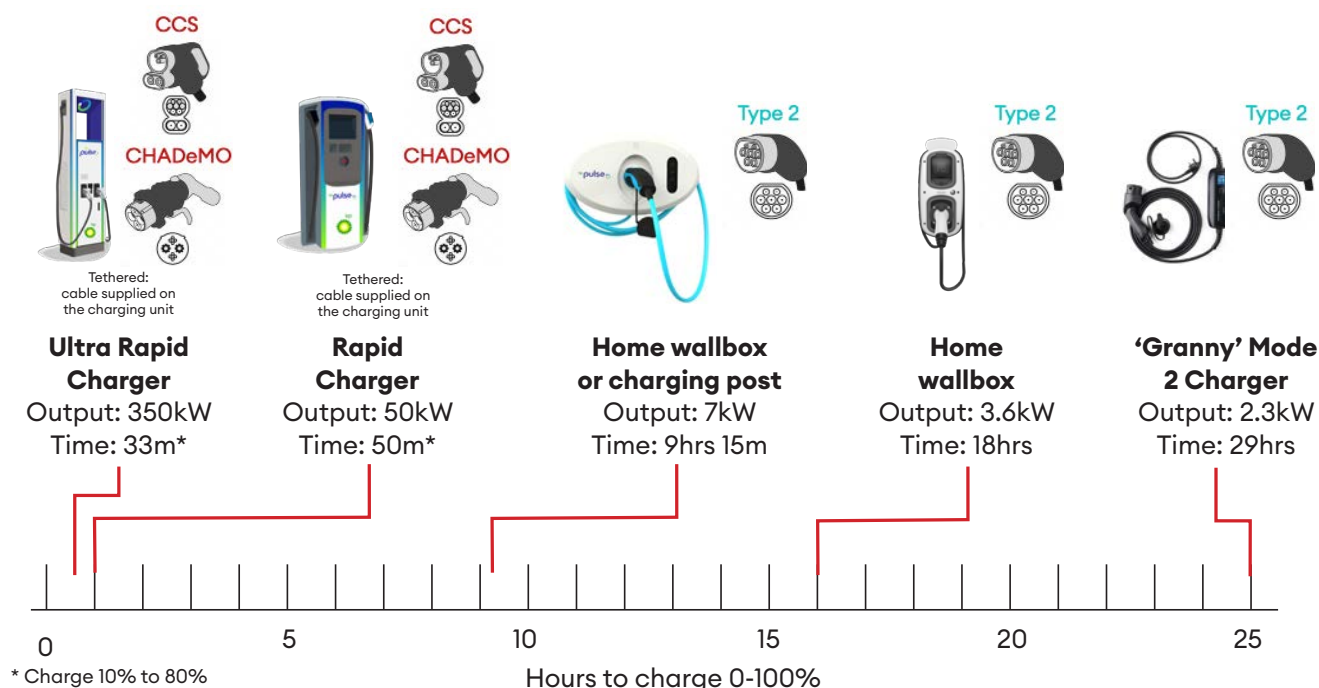
Your choice of car, and how quickly you're going to charge, will determine which kind of cable you use when you are out and about. See our image at the bottom of the page for details.

CHAdeMO is mainly used on Japanese designed cars such as the Nissan Leaf and Mitsubishi Outlander PHEV while the CCS connector is used on pretty much everything else. All you need to do when you arrive at a charging point is pay via the app, website or using contactless payment or access card, connect the correct cable to the car and let the machines do their magic. If you're charging overnight at home all you need to do is plug your car in to the wallbox and you'll experience the joy of waking up every morning to a battery full of off-peak electricity ready to start your day.

At an AC charge point you'll be using your own cable, which has a connector called a Type 2 at one end and the correct fitment for your car at the other. You simply connect it to your car, use the app, website or your access card to activate the charging post and then plug in. Once you've finished charging you just stop the electricity flow using the same app, web page or card and the cable will be released.

However you charge it will soon become second nature, just like charging your phone. Waking up with a full 'tank' is bliss and topping up while you get on with working, shopping or working out at the gym makes complete sense. Better than that, it's cheaper too and you'll never have to fill up with fuel again!

What plugs in where? Understanding what cable and connector you'll need (and how long you'll need to plug in for...)



All times shown are for an electric car with a 58kWh battery pack and maximum charging speed of 125kW

Understand why car makers quote charge rates 'up to 80 percent'

This is something that continues to confuse electric car drivers - and it's easy to see why. You wouldn't tell someone that a train journey takes two hours to do 80 per cent of it, so why does the car industry only quote recharging times to 'not quite full'?

Sadly, it all gets a bit technical at this point, but we'll try and keep things simple. Batteries are brilliant, but they also need looking after. If you overfill the tank of a petrol or diesel car, you get nothing more than wet feet. Do the same with an electric car battery, and you'll wreck it. Fortunately, we, as drivers, aren't able to overcharge batteries because electric cars come with all manner of management systems and fail-safes to stop it happening.

When batteries reach the point where they are nearly full, heat builds up in the cells. To keep temperatures down, the car reduces the amount of incoming charge significantly with the last few kWh being added at very low speeds. It's a bit like pouring yourself a very full glass of wine. You start slowly, speed up to fill the bulk of the glass and then dribble in the last few drops to prevent any overflowing.

Key to the whole process is what's called a charge map, which is a bit of code that your car uses when it detects that a rapid charger is plugged in. As you can see from this BMW i3 charge map, the speed at which charge can be accepted drops quickly after the battery pack reaches 80% capacity. As most cars charge at the same fast rate up to 80%, this is used as an unofficial 'industry standard' to measure the time taken to rapid charge.



When rapid charging at a unit like the one above, your car will take full power until the battery reaches around 80% capacity. As you can see from the graph 'map', your electric car will limit the amount of power it can accept as the battery reaches a full charge



Why you don't need to (and shouldn't) charge your car to full after every drive

It might sound odd, but electric car batteries don't like being full to capacity. Thankfully, the management systems tucked away behind the dashboard ensure that this can't happen. However, if you want to really treat your battery to the automotive equivalent of a spa retreat, try to resist the urge to charge up after EVERY drive.

Car batteries are at their happiest at around 60% charged. If your commute uses, say, 25% of your charge, try and run the battery down and then charge every third day. This will be much kinder to your battery than repeating the charge cycle every 24hrs. If you have a smart home charger you can set the amount of charge that is sent to your car, which means your charger can perfectly tailor your battery levels.



Resist the temptation to plug in after every journey. Your battery will stay healthier if you allow it to discharge every so often

Why you should never leave your battery with very little charge in it

Okay, we've established that electric car batteries don't like being too full or too empty. One key reason why leaving them empty is a really bad idea is because hot or cold weather can potentially damage the chemistry within the cells of your battery. Ever been in a really cold climate and found that your smartphone stops working? Well, it's all to do with the fact that the chemical reactions in a lithium-ion battery become much slower as the temperature drops.

To prevent damage to your battery pack, most electric cars are equipped with battery management systems that can heat or cool a pack if the system thinks that damage may occur. To do this, it needs to have charge in the battery. So if you've got home with zero miles of range left, 2% showing on the battery and you haven't plugged in, the management system won't have the juice to keep your battery at a healthy temperature.



Electric car batteries hate the cold. Make sure you have enough charge in your battery so the car can keep the pack warm when the temps drop

RANGE ANXIETY AND OTHER STRANGE TERMS YOU NEED TO KNOW

When it comes to electric cars there's a host of new jargon to get your head around and we're here to help you do exactly that.

1. Range Anxiety

This is the fear that you will run out of battery power before reaching your destination or a charger. It's an often unfounded state of mind and whilst understandable there's no need to panic. In most electric cars (EV) the range is pretty accurate and achievable and most electric cars have built-in sat nav or an app, which will direct you to the nearest charge point before you get in trouble. You'll soon get to know your electric car's capabilities, stop staring at the range meter and start to relax into EV ownership.

2. AFV

No we're not talking about an Armoured Fighting Vehicle, which we promise is a real thing! This AFV stands for Alternatively Fuelled Vehicle. An AFV is a vehicle that runs on substances other than the conventional petrol and diesel. That includes fuels like electricity, solar, biodiesel, ethanol, propane, compressed air, hydrogen, liquid natural gas... even algae could be a potential alternative fuel source of the future. The benefits of using AFVs include spending less on fuel and reducing carbon emissions.

3. BEV

Otherwise known as a Battery Electric Vehicle, a BEV is a car that gets its power solely from a battery, which is charged by plugging it in. When the battery runs out it won't go any more and it doesn't emit any CO₂. The UK Government has said it will impose a ban on selling new petrol or diesel cars by 2030 (hybrids by 2035), which means the only cars you'll be able to buy will be those powered by electricity.

4. Hybrid

One way of making a petrol or diesel engine more efficient is to add a battery and electric motor to help it out. This can capture the energy which is usually wasted when you slow down or push the brake pedal by putting the motor in reverse, so it becomes a generator. That can then be used to power the car, usually when you first start off from a stop or when you want a bit more acceleration. To help the engine even more (and improve fuel consumption), you can choose a plug-in hybrid. This means you can use mains electricity to charge a larger battery, allowing the electric motor to be used more. You can even choose to turn off the petrol engine completely and use electric only for shorter distances.

5. Degradation

All batteries get old and lose some of their capacity to hold power as they get older. This is degradation and it's accelerated by extreme heat or cold. We're all used to it happening with our phones and laptops, but it's more of a worry in a car where the battery will cost thousands of pounds to replace. It's worth learning how to protect your battery in everyday use.

The good news is that the power packs in a modern electric car are designed to be harder than the batteries in a phone, and should be able to provide a useful range for the lifetime of the car. You can check the condition of your battery by looking at the State Of Health (SOH) either in the car's menu, via a special app (such as LeafSpy) or by asking the dealer at a service. Once the car is getting old, the packs can be reused for home or industrial power storage and still have a value.

An electric car that runs solely on batteries is often referred to as a BEV, or Battery Electric Vehicle



6. ICEd

When talking about an ICE in the context of electric cars, it has nothing to do with what goes in a drink. It's an acronym for Internal Combustion Engine and us EV drivers get rather upset when an ICE vehicle parks in an electric car charging spot rendering it incapable of charging an electric car. This is known as being ICEd.

Occasionally, electric car and hybrid owners may even park in a charging bay without actually plugging in to the charger or will overstay in the spot after they're fully charged. This is known as 'selfish', rather than ICEd.

7. Rapid Charging

There are various ways you can get power into your electric car's battery, ranging from Trickle Charging using a common-or-garden three-pin socket, up to Rapid Charging, which requires some very expensive kit and is usually found at service stations or some other public charging points. These are usually comparatively expensive to use (but still cheaper than petrol) so are commonly reserved for topping up the range when on a long journey.

Rapid charging works by supplying the power in a way the battery likes (Direct Current) rather than the car's on-board inverter having to convert it from Alternating Current, which comes out of a mains electric supply from the power station. As a result of bypassing the inverter, a top up to 80% capacity usually takes 20-40 minutes.

8. Regenerative braking

In a petrol car, you're burning fuel to move forward. When you want to stop moving you press the brakes and pads squeeze against discs to slow the car down. It creates heat and wears away the brake parts. In an electric car, as soon as you lift off the accelerator pedal the motor automatically reverses itself to become a generator and starts harnessing the energy to top up the battery. This is called regenerative braking.

In many modern electric cars you can tailor the amount of regen braking to suit your driving style and preference. In a Nissan LEAF with an E-Pedal for example, you can drive without having to touch the brakes at all, except for an emergency stop.

9. WLTP Range

This is the official figure which should give you an indication of how far an electric car will travel between charges. In theory it should be an accurate indicator of the sort of mileage you'll be able to get, but in reality there are so many different factors which influence the range that you won't really know until you try it yourself. City driving is better for electric cars, whereas motorways, hills, cold weather and driving enthusiastically all eat up power.

The WLTP part stands for 'Worldwide harmonized Light vehicles Test Procedure' and was introduced after a few car makers were found to be 'creatively' finding ways of getting better fuel consumption and emissions figures in official tests. The law makers decided to introduce a tougher assessment which is closer to real world conditions. As a rule of thumb, we'd knock about 20% off these figures to give you a good idea of the distance you can comfortably cover.

10. kW and kWh

A kilowatt is a unit of electricity which is used in all sorts of measurements for electric car owners; from battery size and energy efficiency to charging speeds and energy costs. A kilowatt (or 1,000 watts) is roughly the amount of power needed to run a small electric heater. So, if you switched on that heater for an hour, you'd use 1kWh of energy.

An average electric car, such as the Renault Zoe, has a 52kWh battery, so would be capable (in theory) of powering the heater for 52 hours. Instead it is used to power a motor which will take the Zoe for 242 miles. That means it uses 0.21kWh per mile – which is its measure of efficiency, in a similar way to miles per gallon in a petrol car. The kW can also indicate how fast a car will charge and how much it will cost. In its simplest terms, compare a 2kW 'granny charger' to a 150kW rapid charger and you can guess how long it will take to fill a 100kWh battery. If you are paying 14p per kWh for your electricity at home, a full charge of 50kWh on your Zoe will cost you $£0.14 \times 50 = £7$.



A Hyundai Kona Electric is a popular choice for first-time electric car buyers. It comes with a great battery range and is very simple to drive

MYTH BUSTING

The world of electric cars can be confusing. We'll help you sort the fact from the fiction.

The myth

"The National Grid won't be able to cope if we all switch to electric cars."

"You can't charge an electric car in the rain."

"You can't put an electric car through the car wash."

"An electric car can't take you as far as a petrol or diesel car."

"I don't have off-street parking. An electric car is completely unsuitable for me."

"The batteries are full of nasty stuff and they won't last."



The fact

The truth is that there will be enough energy to meet future demand and the grid will be fine. Growth in renewable energy will help and smart metering will make our use of power more efficient.

Preparations have been underway for a while and electric cars even have the potential to smooth out the peaks, by storing electricity when demand is low and feeding it back when we all make a cuppa in the ad break of our favourite programme.

We know that electricity and water don't mix. But no current flows between the car and the charging station until they have talked to each other and decided that everything is tickety-boo, while the car and cables are shrouded in layers of protection that prevent them getting wet or dirty.

You can drive through car washes because electric cars are fully waterproof. Unless you leave the windows open, obviously. Which is never a good idea.

There's no hiding from the fact that, right now, a petrol or a diesel car will usually go further without needing a top up. However, if you take regular breaks (drivers are advised to take short stops every two hours) and use that time to plug in, the distance you can travel is as long as you want it to be. The rapid charging network is growing all the time while battery ranges are improving with every new model that arrives.

The ability to charge at home with domestic rate electricity is great, but that doesn't mean that an electric car isn't suitable for those who don't have access to this. Many urban electric car owners have small commutes and only need to charge once a week. This can be done at a supermarket or at the gym - wherever there's a charger.

Electric car batteries contain a complex mix of elements and chemicals. However, almost all the materials found in an electric car battery are recyclable and the batteries are expected to have a life of 20 years or more in various guises. They are too valuable to simply be thrown away like a worn out engine.



This is Tom. He's one of our [Electrifying.com](https://www.electrifying.com) experts and spends his time sorting the fact from the fiction when it comes to the world of electric cars



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