The EVA Cymru guide to Electric Vehicles

Welcome to the wonderful World of Electric Vehicles (EV's). This is intended as a guide to help the reader understand that there is no real difference in the basics of the use of an EV but that there are a few fundamentals that are worth explaining to help with the transition.

Note: *during the discussion in this document; "petrol" is meant to mean either petrol or diesel vehicle, also referred to in the media sometimes as fossil fuel (oil is formed from fossils), or by the phrase ICE meaning Internal Combustion Engine.*
"Today" is used throughout and refers to the current information as of June 2026.

1. Terminology

How the EV phrases relate to the ICE terms.

	Petrol	EV	Notes
Engine size/capacity	Cubic Centimetres (cc)	*n/a*	Nothing equivalent
Engine power	Brake Horse Power (bhp)	kiloWatts (kW)	kW x 1.34 = bhp
Fuel capacity	Litres / gallon	kiloWatthours (kWh)	Cars have 45 – 120kWh. Buses/lorries have 500+kWh
Fuel consumption	Miles per gallon, mpg	kWh per 100 miles or miles per kWh	(kWh p 100) ÷ 100 = mpkWh
Maximum Charge rate	*n/a*	AC kW DC kW	AC is usually at home, with faster DC away

Note: *MpkWh is the more recognisable metric for most people, who are used to mpg, so the "average" value would be 2.5 to 3.5 while the newest, most efficient vehicles are achieving 5 to 6.*

Using the current UK Car of the Year as an example:
Renault 5 E-Tech electric, "Evolution" (Entry level car, data taken from Renault website)

- Maximum power - hp DIN (kw ISO) = 120(90)
- battery capacity (kWh) = 40
- AC standard charge = 11kW
- DC rapid charge = 80kW
- Maximum speed - mph = 93
- 0-62mph = 9.0 Seconds. *(0-62 (instead of 0-60) is because 62mph = 100kph)*
- Rated Consumption = 233 Wh/mi (*authors note: 4.3 miles/kWh*)

2. EV Myths

The only real difference that you will find is the refuelling of your car, so let us look at the myths and truths regarding that.

There is a myth of "range anxiety" which is the fear of running out of fuel before you find the fuel source, it's the same for petrol or electric propulsion, except no one ever mentions it with regard to petrol. The fact is that today there are approximately 4,500 petrol stations in the UK, while there are over 120,000 EV charging points, of varying power size, at 46,000 locations. The motorway services at Exeter hosts 76 chargers, while Rugby has 64. While nearer to home, Swansea West has 25, Cardiff West has 22 and at the end of the M50, Strensham has 11 each on either carriageway. There is no shortage of chargers, unlike 5 to 10 years ago when they were nearly all 50kW and only one or two per services.

Also there have been significant advances in the cars themselves, with the original Nissan Leaf (launched in 2011 and a pioneer) had a 24-kWh battery and a range of 109 miles, whilst today we have the "new" Leaf (totally different design) having a 75-kWh battery and a range of 386 miles. With the new Mercedes CLA having a range of 480 miles and the new BMW iX3, 500 miles and the i3 saloon 560 miles.

The batteries do not fail in the same way the ones in your phone might as they use a different chemistry and are "good" for 150,000 to 200,000 miles. The "good" is usually where manufacturers deem the battery to still have up to 70% of its original capacity, so today's 300-mile range car may only have 210 miles after 200,000 miles.

Also note that the batteries are not then "thrown away", but they are put into a second-life use as part of a much larger storage system, where a 70% capacity does not matter if it is storing excess electricity generated by a wind or solar farm for use at another time.

3. Refuelling

The easy note – is just that, it is easy once you have done it a couple of times you will wonder what you were concerned about. However, there are a few things to know and remember:

Firstly, you can do it at home if you have a wall charger, so there is no hanging around. If you can keep charging your vehicle at home, it is cheaper than charging at a "fast charger" (see later), especially if your electricity provider offers you an EV tariff with cheaper overnight electricity. Some providers also offer to control your charger so that they decided when the charge should start or finish, this is usually when the wholesale price is at its lowest – mainly during windy evenings with excess power being generated.

3.1 Understanding the charging numbers

There are several factors that affect the way and speed at which a vehicle charges, but it is down to three numbers:
The car will have two maximum **charge speeds** quoted, usually 11kW AC and between 100 – 400kW DC depending on model; and obviously the vehicle has a **battery capacity**.
The charger also has a maximum **charge speed.**
The battery will fill its available **capacity** at the **lower** of the car or the charger's **charge speed**.

Note that just as you never run the petrol tank to empty, a battery very rarely gets down to an extremely low percentage (<5%), also the vehicle does not sustain its maximum charge speed for the whole charge, and it decreases as the battery fills, this is called the "charging curve", the fuller it gets, the slower it charges (when on a DC charger).
This is why most vehicle manufacturers quote a charging time as "from 10% to 80%" which the industry sees as the best and most sensible metric for comparisons.
However, the battery capacity is important factor as a 10-80% of 20 minutes on a 50kWh battery is worse than a 10-80% of 25 minutes on a 100kWh battery.

3.2 A Charging Example

A car has a DC charge speed of 150kW and a battery capacity of 75 kWh.
If it is connected to a 50kW charger, then the cars 150kW potential is only being 1/3 used, being limited to the chargers 50kW, with a filling from 0-100% taking one and a half hours (in theory).*
However, if the same car is connected to a 300kW charger then the cars 150kW maximum is the limiting factor and the charger is at ½ its maximum, therefore the same 0-100% would be half an hour.*

* *An example charge curve could be such that starting at 150kW, it will reduce to 100kW by 60% and 50kW by 75%, therefore the time mentioned is going to be slightly less than in reality. Also, beyond 80-85% the battery will slow significantly and it is better to stop then if on a DC charger, see the 10-80% mentioned above.*
An AC home charger does not have the same impact.

4. Away from home charging

Home charging is via a wall box and is AC (alternating current) while most of the away from home faster chargers are DC (direct current). The away from home chargers (DC) are equipped with their own cable connector and uses all of the socket, both halves, whereas the home charger (AC) only uses the circular top half. So, you will need to remove the small cover that obscures the lower two holes for most charger plugs.

Note: *If you have an 'original' Nissan Leaf then your car has a different socket to "standard" and therefore requires a different plug. The Nissan uses the CHAdeMO standard (from Japan) and not the CCS (Combined Charging System) one.*
On a "Rapid Charger" (50kW) there are sometimes 2 different plugs, the Leaf uses the blue one.

4.1 Payment

To pay for the electricity is where there can be some differences and potentially annoyances. As the stations are stand-alone and unstaffed, they are more like the self-service petrol pumps. However, the method of payment can vary dependent on the network provider that you are visiting. There was legislation passed in 2023 requiring the faster chargers to accept contactless card payments, for all those installed after that date. Therefore, there are lots of chargers that require either an app from the network provider, or one of their payment/loyalty cards. There are some apps and cards that cover numerous networks and offer a "one stop shop" for finding chargers and the payments. Some car manufacturers rebadge these as one of theirs.

4.2 Automated Payment (future)

There are two options here:

The first is if you are a Tesla owner and charge at a Tesla charger, then the charger communicates automatically with the vehicle connected, if it's a Tesla then the charger will start automatically and will invoice the known owner for the electricity dispensed via their Tesla account.

The second is the new universal implementation of something similar to the Tesla experience, known as Plug and Charge (the technical specification is ISO 15118). This is appearing in more vehicles and charging networks as the implementation of the standard gathers pace.

The principal is the same as the Tesla experience, the compliant charger communicates with the compliant vehicle via a digital certificate, which then confirms the transaction, whereby the charger will automatically fill the battery and submit the invoice to; and deduct the money from; the account associated with the digital certificate. This removes the need for the use of apps and cards in the future, bringing seamless integration between vehicle owner and charger payments.

4.3 Charger Types

Charger	Power	Speed	Connector
Slow AC	3½ kW	Not usually used, except as an emergency solution	UK 3 pin plug
Fast AC	7 kW to 22 kW	Typically found at home, supermarkets or workplaces; and increasingly at hotels. These can charge a car in 1 to 10 hours. In the UK the usual limit is 7kW, while in Europe it is 11kW or 22kW (requires 3 phase supply)	Type 2 (Mennekes).
Rapid DC	50 kW to 99 kW	Typically found in supermarkets, fast-food outlets and some motorway services; adds 80% charge in about 30 to 45 minutes.	CCS and CHAdeMO.
Ultra-Rapid DC	100 kW to 350 kW+	Extremely fast; found in motorway services and dedicated EV charging "hubs"; can charge a modern EV to 80% in 15 to 20 minutes.	CCS
Announced, not yet installed		No current UK car available to take this either, yet.	
"Flash" Charger DC	1,500 kW	5 minutes	CCS

5. Efficiency

As mentioned in the example above, the charging curve is such that the Pareto Principle (80-20 rule) is definitely in play, with the time to charge is such that the most sensible approach is to stop at 80% or so, depending on vehicle. The charge from 10% to 80% may take half an hour, while the charge from 80% to 100% could take another half an hour, so it is quicker in time to stop earlier and potentially charge an hour or two later when you will put more in, in a shorter amount of time.

6. Etiquette

We are all used to visiting a petrol station, where there is one way in to a specific area and vehicles normally form an orderly queue, whereas for EV chargers, they may be spread across

a car park with many ways/directions of approaching the area. Therefore if all of the chargers in use, sometimes there may be an obvious queue formed at small areas, but previously in other situations there has been an informal way of queuing etiquette established. Look for other potential queuers nearby, usually someone sat in a car with a green-flash numberplate. If there is one, then you could be second in the queue when you then park nearby, obviously there could be more. With larger EV charging areas these days, then there is less likelihood of a queue, however with more EV's on the road (2m+ currently) then this situation may arise.

6.1 Tips

- Have a home electricity tariff that provides discounted overnight pricing.
- Have a multi-network app / card for away from home charging
- Plan your route if its a long journey, and through remote countryside
- Always stop charging at a suitable high percentage (80%-90%) to save time

6.2 Suggestions

If want to check the locations of chargers en-route to, or at the destination you are going to, then the most widely used App is Zapmap, available free on Apple and Android – as well as within some car environments which require a subscription.

Your vehicle's satellite navigation (sat-nav) may have its own charging points added along your route. These are very useful if you are in an unfamiliar area and need charging, but should NOT be used while you are driving.

If your vehicle comes with a manufacturers' charging card and/or app, then look at using that, but compare the prices for some charger networks with other offerings as they can vary. For example, if you have Octopus as your home electricity provider, then you get a discount on their charging card/app (Electroverse), however the price for a given charger could be significantly cheaper on the vehicle card than on Octopus, or vice versa. Therefore, having a choice of card/app can save you money if you do a lot of charging away from your home. Similarly, a charger may appear on one of the apps, but not on the other.
That is because not all of the available chargers may be accessible by these cards/apps as they will have relationships/deals with some networks, but not all of them.