GUIDE TO ELECTRIC VEHICLES (EVs)

HELPING YOU DRIVE MORE SAFELY AND EFFICIENTLY

ARVAL
BNP PARIBAS GROUP

For the many journeys in life

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DRIVING

01 TO MAXIMISE SAFETY IN AN EV

Be aware of the **safety features** of your vehicle and how best to configure it to **maximise safety and economy**.

EVs are much quieter than combustion engine vehicles. Be more aware of vulnerable road users who may not hear you. However EVs do generate a sound when moving at slow speeds, enabling pedestrians to hear them. **Remain aware of your surroundings, especially in areas with pedestrians or cyclists**.

EVs offer greater acceleration, especially from a standstill. Practice gentle acceleration to avoid sudden jolts and familiarise yourself with the sensitivity of the accelerator pedal.

Accelerate slowly. Careful acceleration will help ensure a smooth, **safe drive**.

Most EVs feature regenerative braking. This makes braking feel different compared to traditional vehicles. Familiarise yourself with this and allow for longer braking distances.

Don't brake harshly or leave it too late to brake.

Regenerative breaking allows the vehicle to recover energy during deceleration and replenish the battery instead of wasting it as heat. The best way to fully benefit from its advantages is to maintain steady speeds and anticipate traffic and braking distances.

DRIVING

02 MAXIMISE THE BATTERY RANGE

The increased weight of EVs can affect handling, braking and stopping distances.

Drive at a **moderate speed**.

Maintain a **steady pace**, minimising sudden acceleration and harsh braking.

Where available, **use the speed limiter** and/or **cruise control** on the motorway.

Switch on regenerative braking, ideal for urban environments, traffic jams and hilly areas.

Remove unnecessary items from your vehicle, especially heavy loads and those affecting aerodynamics like roof bars and boxes

Use eco mode where possible.

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DRIVING

03 PLAN FOR LONGER JOURNEYS

TAKE REGULAR BREAKS

Make the most of recharging your own battery as well as your vehicle's

Allow at least a 20% margin when planning your journey.

Plan your route and charging stops in advance to avoid any charging problems and unnecessary detours.

Apps such as Zapmap, Chargemap and Google Maps can suggest the **most economical route**, which often avoids motorways and A roads. These routes can reduce battery usage and provide a more enjoyable driving experience.

Stop wherever possible at a location that has more than one charge point to reduce the chance of a queue and the impact of any broken charge points.

Aim to recharge before your battery reaches 20%.

Depending on the charging set-up and grid capability, energy is shared when different drivers use the same supercharger.

Charging slows down after reaching 80% to protect the battery.

The electric range is calculated under specific testing conditions to provide a guide of what you can expect. Consideration should be given to different factors and conditions when planning your journey.

DRIVING

04 EXTREME TEMPERATURES

PRESERVING THE BATTERY RANGE AND LIFE IN EXTREME TEMPERATURES

Plan for colder days.
Make sure you have **full visibility** before you start your journey by clearing ice or demisting.
Maximise safety by being aware of any available driving modes to suit the weather / road conditions.

EV performance is influenced by **environmental conditions**, such as extreme temperatures.
Energy consumption can be managed and **reduced** with the following proactive measures:

IN COLD WEATHER

Preheat the car while plugged in 10 to 15 minutes before your departure time (it's the energy from the grid that is used, not the battery).

Use energy-efficient heating options like seat and steering wheel warmers to reduce less efficient ordinary heating

IN HOT WEATHER

Park in shaded areas where possible.

To reduce energy consumption, use the recirculation function on the air conditioning system.

CHARGING
05
AT HOME

CHARGING SAFELY AND EFFICIENTLY AT HOME

Charge the EV from a dedicated charge point whenever possible, or use a reinforced socket.

Park close to the charger taking care not to obstruct the path of other vehicles or pedestrians with the charging lead.

Never use a standard extension lead when charging an EV. Using an extension lead overrides any over-heating protection. Without this protection in place, there is an increased risk of electrical fires.

Aim to charge at home when possible. Public charging, specifically fast charging and super charging, is noticeably more expensive than charging at home.

Take advantage of off-peak hours if available from your energy supplier.

Look for **tariffs with energy suppliers** that incentivise timed use of charging to make the most of abundant renewable energy in the grid.

Where possible, utilise **solar capture** (converting sunlight into electrical energy) at home to power your car.

CHARGING
06
ON THE GO

PUBLIC CHARGING GUIDINCE

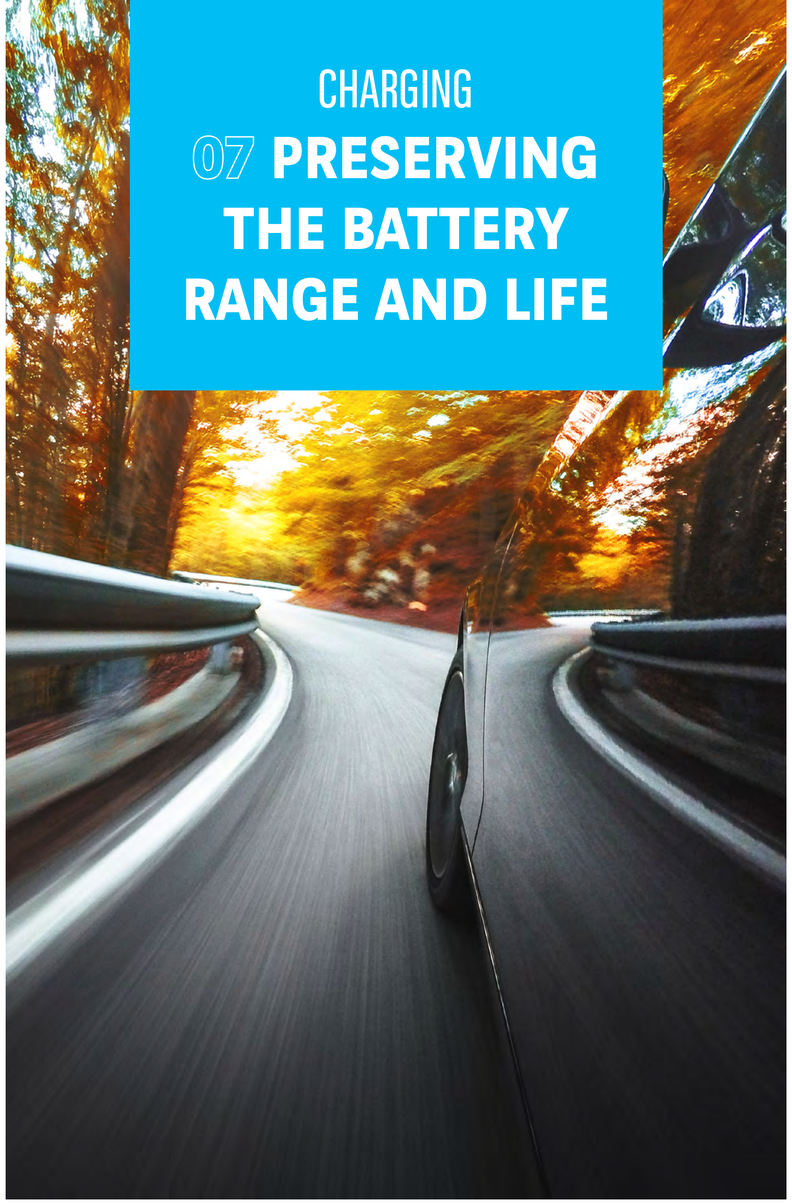
Select the appropriate charging power
If you need to charge quickly on the go, select the highest power charge unit you can. If planning to be parked for a while, such as while shopping or on a day out, select a fast charger (7-11kW) where the vehicle will charge for the duration of your stay – often a much cheaper option.

“Volt ‘n’ Bolt”
During **peak times**, if using rapid charging,, only charge to give yourself enough charge to get you to your destination and vacate the charger for someone else to use.

Once charging is complete, **leave the charging area promptly to avoid additional costs** as most charging stations will bill you for use of the EV charging space.

Ensure you have your Type 2 charging cable. Although rapid and ultra-rapid chargers have their own cables, if you’re planning a charging stop on a fast charger, you may need to use the cable that came with your car.

Only park in **dedicated to EV charging** spaces when you’re **actually charging** – they aren’t EV parking spaces.



CHARGING

07 PRESERVING THE BATTERY RANGE AND LIFE

Optimal Charge
20-80%

80%

Use the intelligent system available in most EVs to automatically stop charging once the battery is 80% charged.

Periodically fully charging the battery helps to balance its internal components.
Reserve these full charges for longer trips.

Opt for shorter, more frequent charging sessions, reserving fast charging for longer trips.

It's a good idea to charge your battery to **at least 50%**, even if the vehicle isn't being used, as some functions can still consume energy whilst the vehicle is idle.

Aim for an **optimal charge level**, which is **between 20% and 80%**. The recharging time increases considerably once your battery is charged to 80% and much more significantly with a fast charger.

CHARGING

08 FACTORS THAT IMPACT CHARGING TIME

The **charging time** for an EV depends on:

A the **capacity of the battery**

B the **state of charge of the battery** (state of charge represents energy levels as a percentage, indicating the available energy in relation to the driving range)

C the **speed of the charging point**

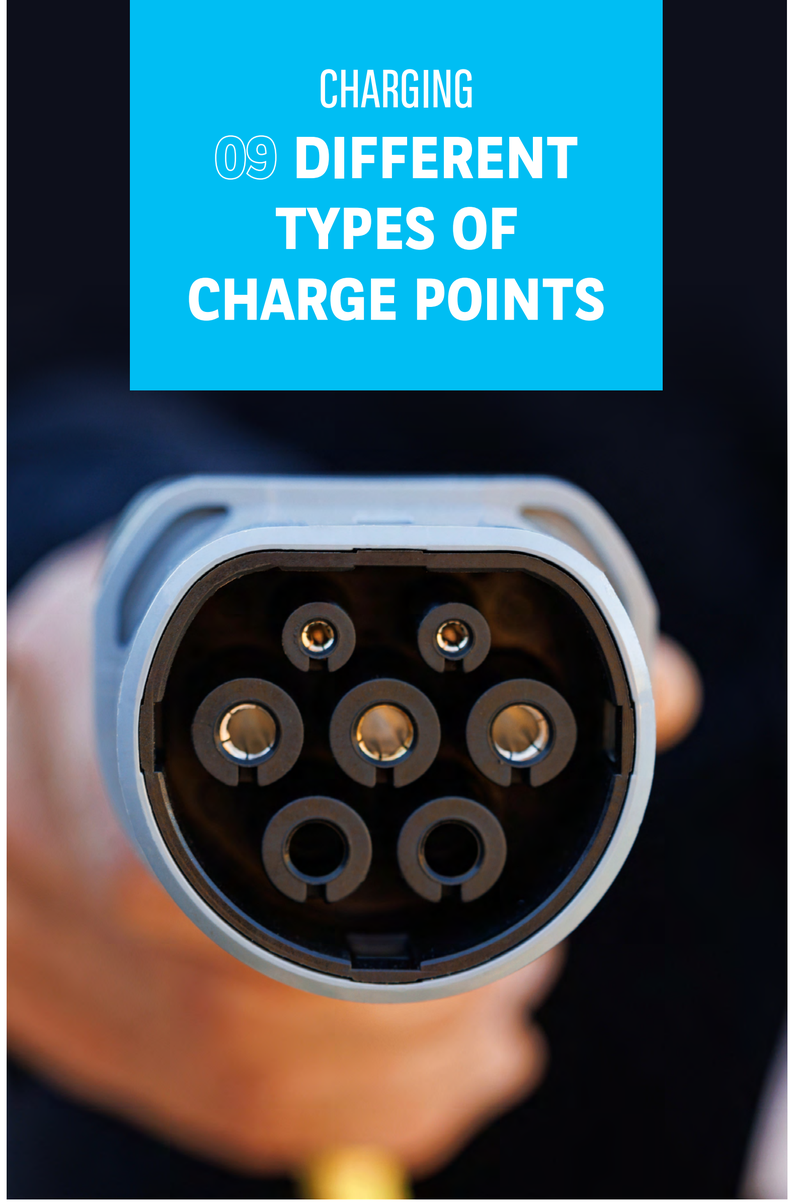
D the capability of the **onboard charger**

E the **ambient temperature**.

You can find the **battery capacity** (how much potential energy is stored in the battery of your EV) **and onboard alternating current (AC)/direct current (DC) charging capabilities** in the vehicle's handbook or the EV Database at ev-database.org/uk.

CHARGING

09 DIFFERENT TYPES OF CHARGE POINTS



ALTERNATING CURRENT (AC) CHARGING: SLOW CHARGING

	Slow Charging (level 1)	Moderate charging (level 2)
Plug Types	Standard household outlets	Type 2 connector
Charging Connector		
Power Rating	**2-2.5kW**	**7kW** is the most common (3.7kW, 11 kW and 22kW also avaiable)
Charging Speed	Adds **2-5 miles** of range per hour of charging	Adds **10-30 miles** of range per hour of charging
20-80% Charging Time	**8-20 hours** depending on battery capacity	**4-8 hours** depending on battery capacity
Availability	At home or any standard electrical outlet. DO NOT use an extension lead.	At home with dedicated charging stations, workplaces and public charging stations.

CHARGING

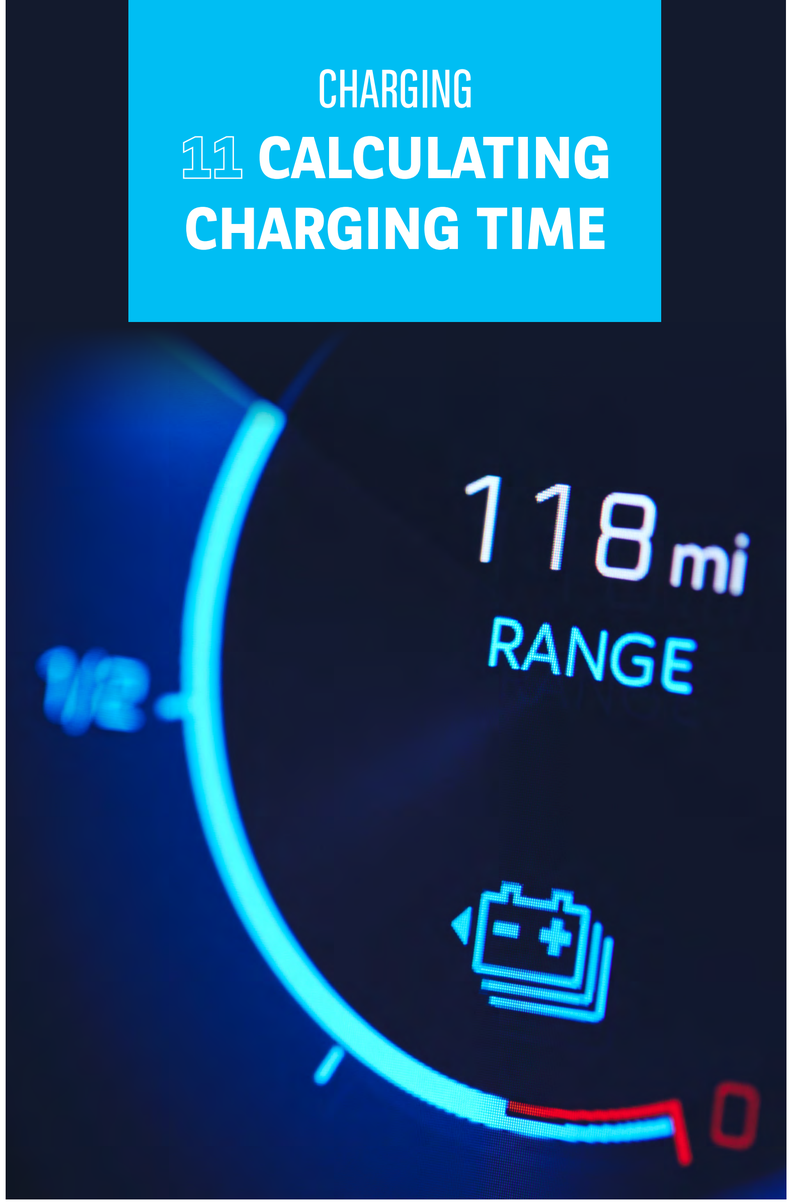
10 DIFFERENT TYPES OF CHARGING POINTS

DIRECT CURRENT (DC) CHARGING: FAST CHARGING

	Fast Charging (level 3)	Ulta-rapid charging
Plug Types	CCS (Combined Charging System)	CCS (Combined Charging System)
Charging Connector		
Power Rating	50kW	150kW to 350kW
Charging Speed	Adds **60-80 miles** of range per hour of charging	Adds **180-250 miles** of range per hour of charging
20-80% Charging Time	**30-60 minutes** depending on battery capacity and charging infrastructure	**20-40 minutes** depending on battery capacity and charging infrastructure
Availability	At public charging stations and some workplaces (tethered connection)	Growing network of high-powered charging stations along motorway service stations and urban areas

CHARGING

11 CALCULATING CHARGING TIME

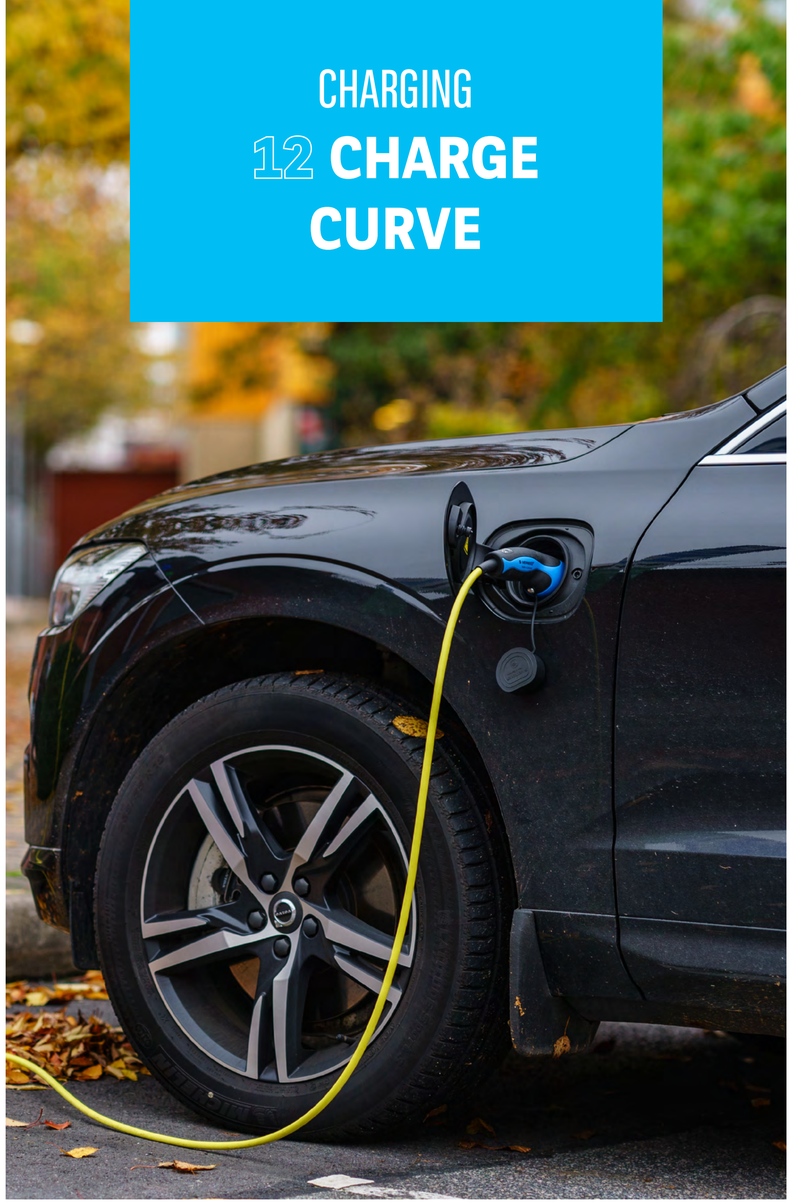


The onboard charger delivers a different maximum power if AC or DC charging.

$$\text{1.Charging time} = \frac{\text{2.Capacity(kWh)}}{\text{3.Power (kWh)}}$$

1. Theoretical times can be influenced by number of simultaneous charges in a charging station.
2. Capacity=vehicle battery capacity.
3. Power=power provided by the charging solution or maximum power of the charger of the vehicle if less than charging solution power.

Example Vehicles	AC: 3.7kW 0-100%	AC: 11kW 0-100%	AC:150kW 10-80%	AC: 350kW 10-80%
MG4 EV Long Range Capacity:61.7 kWh Power: 6.6kW (AC) 142kW (DC) 	61.7/3.7= **18 hours 21 mins**	61.7/11= **6 hours 6 mins**	61.7/150= **25 mins**	61.7/350= **20 mins**
Mercedes-Benz EQA 250+ Capacity: 70.5 kwh Power: 11W (AC) 102kW (DC) 	70.5/3.7= **20 hours 58 mins**	70.5/11= **7 hours 3 mins**	70.5/150= **29 mins**	70.5/350= **22 mins**
Kia EV6 RWD Capacity: 80kWh Power: 11kW (AC) 263kW (DC) 	80/3.7= **23 hours 48 mins**	80/11= **8 hours**	80/150= **32 mins**	80/350= **25 mins**



CHARGING

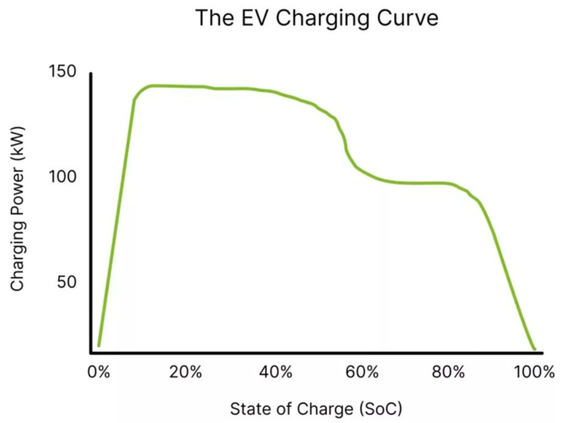
12 CHARGE CURVE

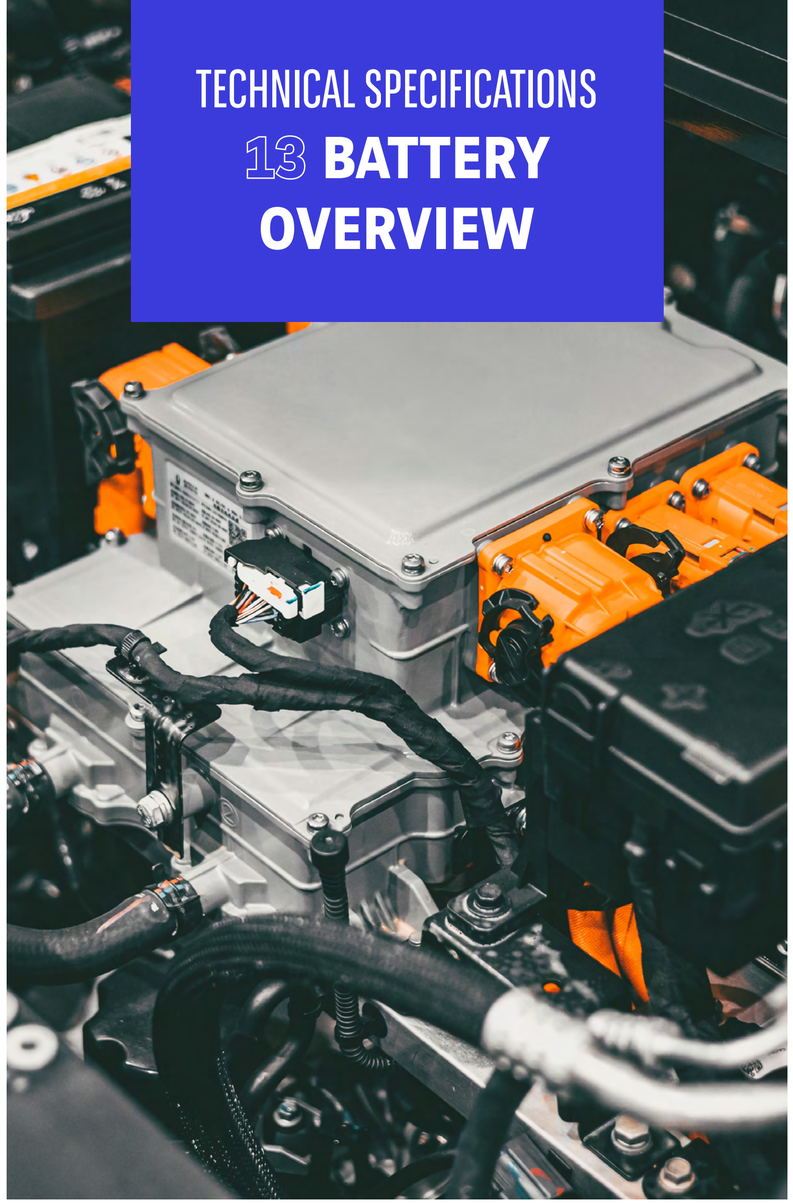
Charging speed
Although a vehicle may state that it has a high charge rate, (typically between 100kW and 350kW), its ability to take that charge is based on many factors.

Factors that affect charging speeds
Firstly, the state of charge (SoC). A battery that's running low will have the ability to charge quicker than one that's three quarters full.

Other factors
Factors such as ambient temperature, number of vehicles charging, and car battery temperature can affect charging rates.

The EV charge curve
This graph illustrates the typical charging curve of an EV. When plugged in, it takes a while to draw electricity at the limit. After an initial slow charge, the battery acts the same way as any other battery powered technology. Note that any charging when the vehicle is over 80% SoC is much slower than the charging at 20%. Not every EV will charge the exact same way though.





TECHNICAL SPECIFICATIONS
13 BATTERY OVERVIEW

Vehicle consumption is typically shown in **kWh/100 miles but can also be displayed as miles/kWh**.

The battery capacity is displayed in **kWh** (kilowatt hours), which represents the energy storage capacity (the total amount of electricity your EV's battery can store) directly related to the vehicle's range, shown in **miles**.

An EV is powered by a rechargeable **high voltage battery**, which needs to be **plugged in** to a power outlet or charge point. Some electricity may be recuperated using energy recovery, also known as regenerative braking, which is technology used in EVs to capture and store energy that would otherwise be lost during braking.

Just like a petrol or diesel vehicle, the range varies by model as well as other factors, such as **driving habits** or **external conditions**.

The EV battery's ability to store electrical energy does degrade **slightly** over time, however not as much as you would think compared to other battery products.

GOOD NEWS!

You have control over many of these variables to extend the battery range

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