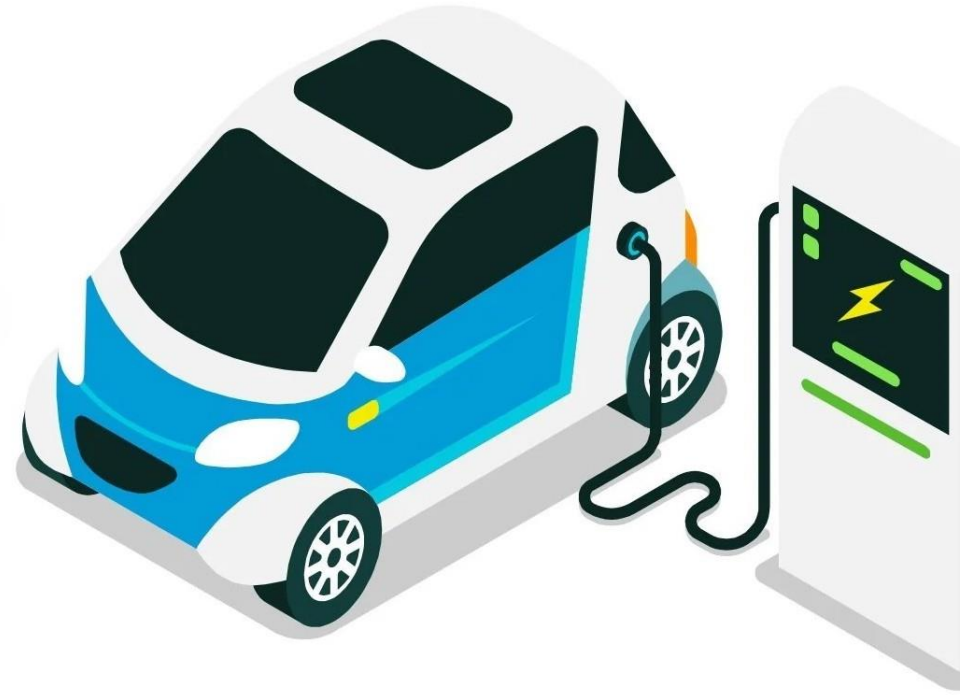
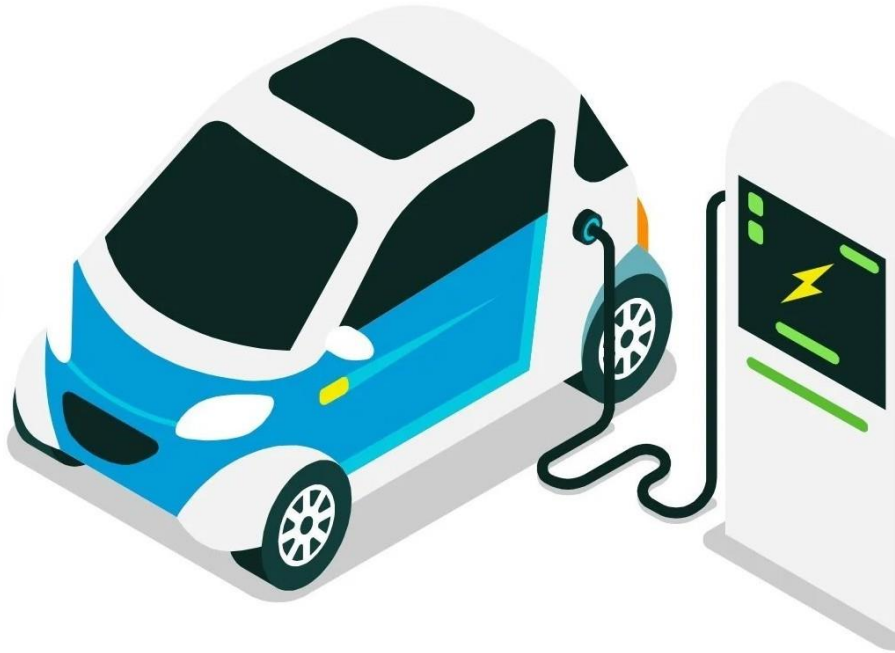


Electric Vehicles - Unplugged



A smooth ride with a few bumps along the way!

Julie Guest



1. Pros and Cons of EVs - perceptions

2. My first EV

3. The key differences – petrol v electric

4. Cost of owning and running an EV

5. The Government's net zero target

6. How green are EVs really? (Part 2)

Pros

- Low emissions
- Affordable to run (with caveats)
- Smooth and quiet driving experience
- Less servicing/maintenance
- Enhanced performance



Cons

- Expensive to buy
- Charging can be time-consuming
- Low range compared to petrol cars
- Range anxiety

2. My first EV - 2021

- Wanted to go green
- Could manage with a runabout
- Petrol was getting very expensive (post Covid)

Renault Zoe

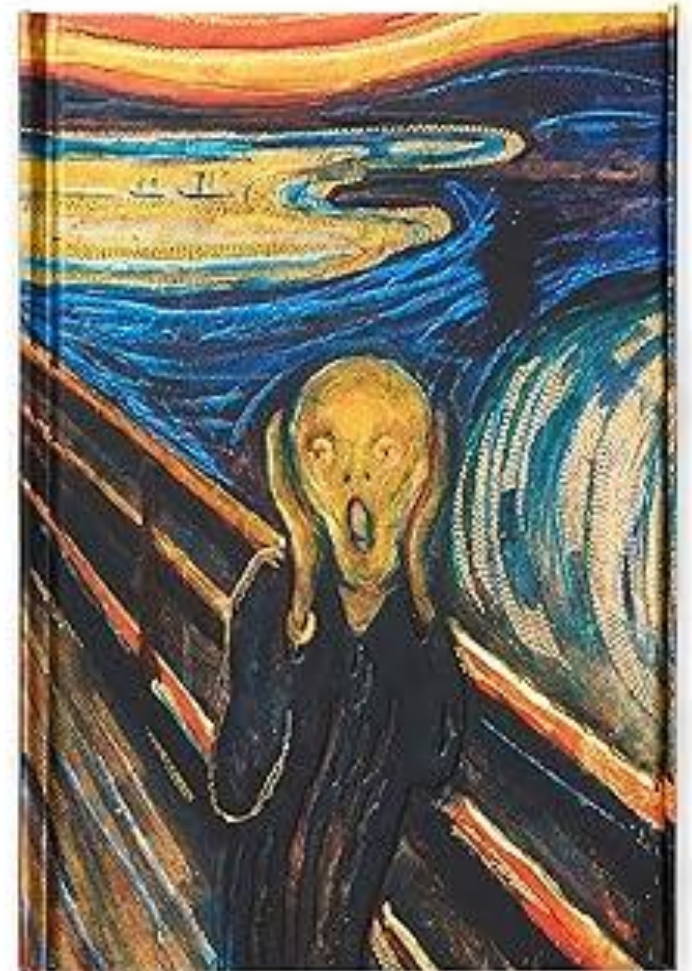
- Range 170 miles
- Full charge in about 45 mins
- Charging was cheap (22p a kw)
(100 miles for £6.30!)
- Government grant towards purchase
- No road tax



2. My first EV

OMG - WHAT HAVE I DONE? !!!

- Home charger not feasible. Had to drive to a charge point
- Not many charge points around and often Out of Service.
- Range Anxiety really is a thing!
- Things the salespeople don't tell you –
 - *cold weather, 80% charging, depreciation*
- Max speed 64 mph (not really!)



2. My first EV

OMG - WHAT HAVE I DONE? !!!

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BUT A LOT HAS CHANGED SINCE 2021

- Batteries – smaller but bigger capacity, charge quicker, last longer
- Ranges are now in excess of 300 miles
- Many more fast charging points, most of which actually work
- I can now charge at home, albeit slowly (but very cheaply)
- Depreciation rates are improving



Now on my second EV !!

3. The Key Differences – Petrol v Electric

- **The Power Source**

- Lack of Engine Noise

- Instant Power Delivery

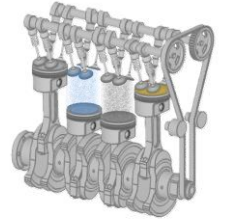
- Emissions

- Regenerative Braking

- Charging

Internal Combustion Engine (ICE)

Burns fuel to generate heat. Mixes with air to create high pressure, which moves the piston which rotates the crankshaft.



Lots of components -

Pistons, cylinders, valves, coolants, timing belt, fuel injector, exhaust system.

Inefficient – 70% of energy released from the fuel is lost as heat/friction etc

versus

Electric Vehicle Motor

Simple – a motor, a controller and a battery pack

Relatively few moving parts.

Only 15% of stored/generated energy is lost



3. The Key Differences – Petrol v Electric

- The Power Source
- **Lack of Engine Noise**
- **Instant Power Delivery**
- **Emissions**
- Regenerative Braking
- Charging

Electric	ICE
Very quiet –almost silent	Noisy – engine and exhaust
Instant torque – smooth and fast acceleration	Torque builds with RPM, slow
Zero exhaust emissions	Produces CO ₂ , Nitrogen Oxides, and other pollutants

Torque: a measurement of how long it takes to get moving.

3. The Key Differences – Petrol v Electric

- The Power Source
- Lack of Engine Noise
- Instant Power Delivery
- Emissions
- **Regenerative Braking**
- Charging

Petrol cars and EVs both have hydraulic brakes.

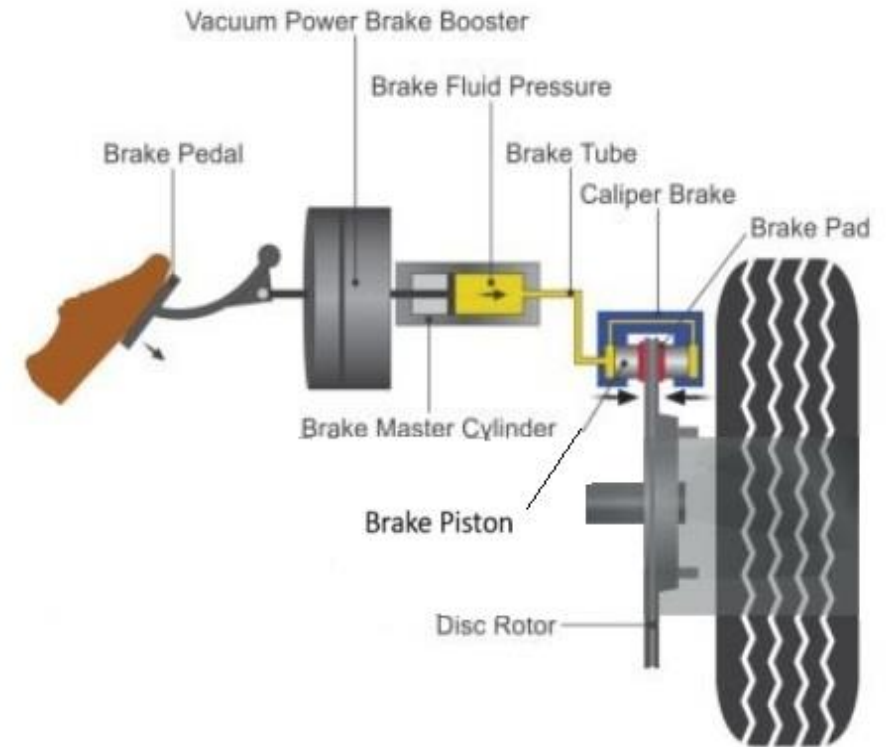
BUT EVs also have **REGENERATIVE BRAKING**

Makes a big difference to running costs.

REGENERATIVE BRAKING (REGEN)

Hydraulic Brakes

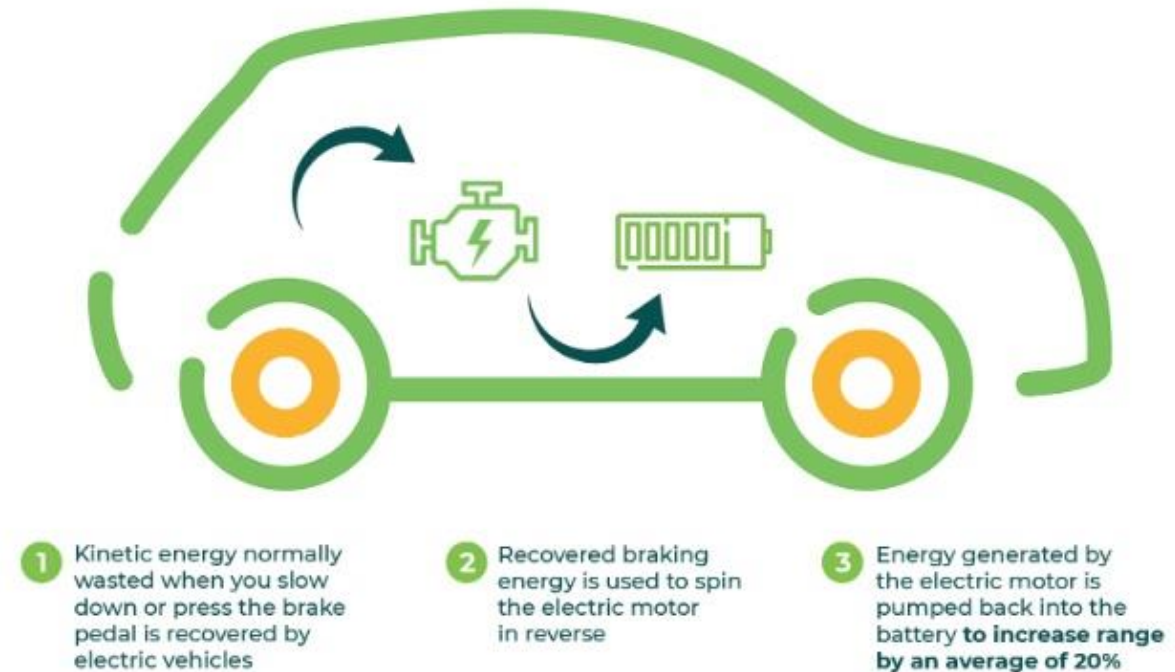
- Used on virtually all Petrol/Diesel/Electric vehicles
- Press brake pedal – creates hydraulic pressure, which pushes brakes on to the discs
- Creates friction and slows the vehicle
- BUT – the energy that was propelling the car is wasted, mostly as heat through the brake pads and discs.
- Friction causes wear on the pads/discs.



REGENERATIVE BRAKING (REGEN)

Electric Vehicles also have Regen Braking

- Some of that energy lost through braking can be recovered in EVs.
- Can be used to recharge the battery, adding miles to the car's range.
- Possible because an electric motor can run either forwards or backwards.
- When take foot off the “gas” the motor reverses direction turning it into a generator.
- Not using brake pads – less wear and tear



REGENERATIVE BRAKING - DRIVER EXPERIENCE

- The sensation of the car braking by itself does seem odd at first!
- Happens when take foot off accelerator – instead of coasting, start to slow.
- Can switch it off on most cars, or you can set the braking strength.
- Higher the setting, the more energy is saved:
but the stronger the braking sensation.
- Most cars have a dashboard readout:
shows how much power is being regenerated.
- One Pedal Driving – some EVs can be driven without using brake pedal
(Can obviously hit the brake pedal if needed!)



ELECTRIC vs PETROL VEHICLES – Key Differences

- The Power Source
- Lack of Engine Noise
- Instant Power Delivery
- Emissions
- Regenerative Braking
- **Charging**

CHARGING – HOW IT WORKS AND COSTS

For reference - My car (Renault Megane):

- **The Basics**
 - Charging speed
 - Home charging
 - Chargepoints/cables
 - Charging Costs £-£££
 - Battery life
- Max range 270 miles on a full charge.
 - Driving style makes a big difference to range.
 - Charging at home - can add 30 – 40 miles a night, 5 hours off-peak.
- this is without a dedicated home charger.
 - At a public chargepoint - can add 150 miles in less than 30 minutes
- average for a new car.
 -



CHARGING – HOW IT WORKS AND COSTS

Charging speed depends on the type of charger

- The Basics
- **Charging speed**
- Chargepoints/cables
- Home charging
- Charging Costs £-£££
- Battery life

Chargers are classified as:

Ultra-rapid (350kw) : can add 20 miles in a min. (100% – 20 mins)

Rapid (50 - 150kw) : 50kw – can add min 3 miles in a minute.

Fast (7 - 22kw) : can add 30 miles in an hour.

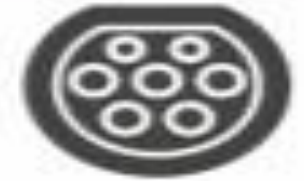
Home (3.6 – 7kw) : full charge in typically 8 – 15 hours.

3-pin (2.3kw) : over 24 hours to full charge

CHARGING – HOW IT WORKS AND COSTS

- The Basics
- Charging speed
- **Chargepoints/ cables**
- Home charging
- Charging Costs £-£££
- Battery life
- Most public chargepoints their have own cable
- Only the slowest (3-7kw) are “untethered”
- Cars have different types of socket
Depends on manufacturer / charging speed.
This governs which chargers can be used.
- In the UK it's mostly
Type 2 (slower charging)
CCS for ultrafast/rapid charging.
- CCS sockets can take both CCS and Type 2 connectors.

Europe



Type 2



CHARGING – HOW IT WORKS AND COSTS

- The Basics
- Charging speed
- Chargepoints/cables
- **Home charging**
- Charging Costs £-£££
- Battery life

HOME CHARGING - two options:

1) **Granny Cable**

2) Dedicated EV/Charger/wall box

- Use it to charge your car when visiting relatives, such as your granny!
- Basically, a cable with 3 pin plug and an EV connector.
- Charging is very slow (35 – 40 miles in 5 hours)
- Limited to draw no more than 10 amps (2.3kw max)
- Otherwise, can overheat.
- Best to buy a high-quality cable. (£200)
- Some have a controller for scheduling start time.

CHARGING – HOW IT WORKS AND COSTS

Two options:

- The Basics
- Charging speed
- Chargepoints/cables
- **Home charging**
- Charging Costs £-£££
- Battery life

1) Granny Cable

2) **Dedicated EV/Charger/wall box**

Safety: In-built features to protect from overheating when charging.
Can withstand the elements.

Costs: About 800 - £1500 incl installation

Can schedule to only charge at off-peak hours

VAT charged at 5% on domestic supply (20% on public charger)

Power: Most are 7kw

May need to upgrade home power supply.

7 kw is 3 x faster than a granny!



CHARGING – HOW IT WORKS AND COSTS

- The Basics
- Charging speed
- Chargepoints/cables
- Home charging
- **Charging Costs £-£££**
- Battery life

CHARGING COSTS – AT HOME

Petrol Prices

Currently 131p per litre at supermarkets (RAC April 25)

Average consumption 40 mpg

100 miles = £14.89



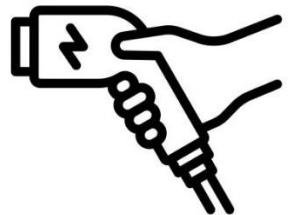
EV – Charge at Home

Off-peak EV tariff with British Gas.

7.9 p per kw/h between midnight and 5 am. (5% VAT)

Average consumption = 3.5 miles/kwh

100 miles = £ 2.25



Note: 25.51 p / kwh at other times

CHARGING COSTS – PUBLIC NETWORK

Petrol Prices

Currently 131p per litre at supermarkets (RAC April 25)

Average consumption = 40 mpg

100 miles = £14.89



Public Charging Points

70 – 90p per kw/h (20% VAT)

Average consumption = 3.5 miles/kw

100 miles = £22.85



Plus cost of a coffee!



- Plan ahead – get a full charge at home before a longer trip
- Motorway chargepoints are the most expensive.
- Hotel chargepoints usually cheaper – can get an overnight charge, at a rate equivalent to petrol.

CHARGING – HOW IT WORKS AND COSTS

- The Basics
 - Typical lifespan of battery is 8 – 15 years.
 - Depends on factors like climate and usage patterns.
- Charging speed
- Chargepoints/cables
 - Most EV manufacturers offer a battery warranty of 8 years or 100,000 miles.
- Home charging
- How much £££?
 - With proper care EV batteries can retain 70-80% of their capacity, even after several hundred thousand miles.
- **Battery life**

CHARGING – HOW IT WORKS AND COSTS

- The Basics
- Charging speed
- Chargepoints/cables
- Home charging
- How much £££?
- **Battery life**

How to extend battery life:

- **Avoid frequent fast charging on public chargers** – they generate more heat and stress the battery more than Home charging.
- **Keep charge levels moderate** – 20 - 80% is optimum. Frequently charging to 100% or letting it drop below 10% will degrade the battery faster – just like a mobile phone!
- **Drive smoothly** – Gentle acceleration and braking will reduce energy strain and heat build up.
- **Update software** - Manufacturers often release updates to improve battery management and efficiency.

4. Cost of Running and Owning an EV

compared with petrol

Upfront Costs

- **Higher:** Mid-range starts around £25,000
- Further the range, the bigger the battery, the higher the cost.

Maintenance Costs

- **Lower:** No oil, spark plugs, fuel filters, water pump etc
- My car – every 2 years or 18,000 miles.

Insurance

- **Higher:** Replacement cost and risks - more expensive parts, faster acceleration.
- Premiums are coming down – more EVs, more garages etc

Road Tax and CAZ

- From 1st April 25: Year 1 - £10. Year 2 onwards £195 (**same**)
- Clean Air Zones – exempt (7 cities incl London, Sheffield, Birm.)

Running Costs – m/kwh versus mpg

- **Lower:** if charge mostly at home **Higher:** if always use public ntwk



5. The Government's Net Zero Target

GOVERNMENT INCENTIVES TO GO ELECTRIC (not really!)

Purchase price	Discounts available, but only for mopeds, vans, trucks, taxis
Chargepoints	Only for renters, flat owners and landlords, with off-street parking 75% off installation up to £350
Disabled:	Wheelchair accessible vehicles – 35% discount, capped at £2,500

Until recently:

- Zero road tax on EVs
- £1500 off purchase price of plug-in car.
- Grants to help local authorities install chargers on residential streets with no private parking.

All cancelled, on premise that Government wants to focus on expanding the charging network.

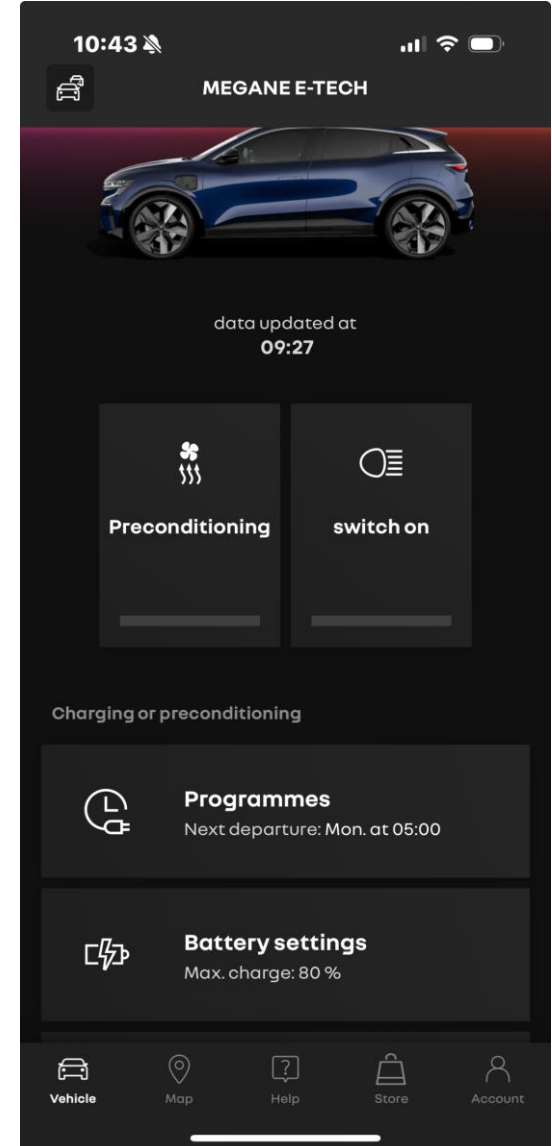
IN SUMMARY

To get the best out of an EV

- Charge at home whenever possible
- Get an off-peak EV tariff
- Maintain battery between 20 – 80% charge as much as possible
- Use regen braking
- Drive sensibly – as we all do anyway!

And, last but not least The Mobile App

- Can set charging programmes
- Set maximum battery charge
- But best of all – warm/cool the cabin up - before getting in the car!
- and de-ice/de-mist the windows
- Can also warm the battery up in winter, prior to home charging.



NEXT TIME – DISCUSSION POINTS

The Big “Green” Picture

- EVs are definitely greener than petrol, once they are being driven
- **BUT**
- Very high carbon emissions during manufacture
- Raw materials – mining/refining/transporting/human rights
- Battery Recycling
- Upstream emissions – the carbon produced in generating the electricity to run EVs
- Need the infrastructure to support thousands more EVs on the road, and meet net zero targets.

THE END

HAPPY MOTORING!

