Presentation by

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Delivering an Electric Vehicle Transition that is both Effective and Inclusive

SERG Seminar, 14 January 2026

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Overview

1. Importance of the Transition
2. Progress to Date
3. Prospects for the UK Transition
4. Was the de facto approach the most sustainable option for transitioning from the ICEV?

Scholarship and Research on the Transition

- 14 interviews approx. 1hr during 2023 Q3/Q4
  - across the EV ecosystem in Western Europe
  - Varying nationalities and country locations
  - Experience from auto manufacture, lithium mining, battery manufacture + academics and policy-influencers
- Engagement in EV/mobility industry events
- Monitoring of specialist media
- Membership of British Parking Association's EV Connect group

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1. Importance of the transition

- 2.1 billion motorized road vehicles globally (1bln cars, 0.6blm motorcycles) and growing
- road system responsible for 69% (6GtCO_2eq) of global transport emissions
- UN IPCC places emphasis on efficiency improvements and powertrain substitution

"Electric vehicles powered by low-GHG [greenhouse gas] emissions electricity have large potential to reduce land-based transport GHG emissions, on a life cycle basis (high confidence)".

International Panel on Climate Change (2022, Para C.8)

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How beneficial is electrification?

International Energy Agency (2024): A BEV sold in **2023** will avoid

- 50% carbon dioxide-equivalent lifecycle emissions of an ICEV (15-year lifespan assumed)
- 40% advantage over HEV
- 30% advantage over PHEV (assuming 40% battery mode)

The ‘other 50%’ towards ‘net zero’ emissions

- Study by Volvo (2020) of XC40 concluded 47,000km before carbon breakeven over ICE equivalent (assuming green electricity)
  - Others have argued 26,000km is more reasonable as ICE emissions under-estimated
    https://www.carbonbrief.org/factcheck-21-misleading-myths-about-electric-vehicles/
  - Payback period expected to fall in future
  - Ironically, payback period longer for a light user
- Large differences in carbon intensity of battery production remain: emissions need to fall
  https://www.carbonbrief.org/factcheck-how-electric-vehicles-help-to-tackle-climate-change/

www.volvocars.com

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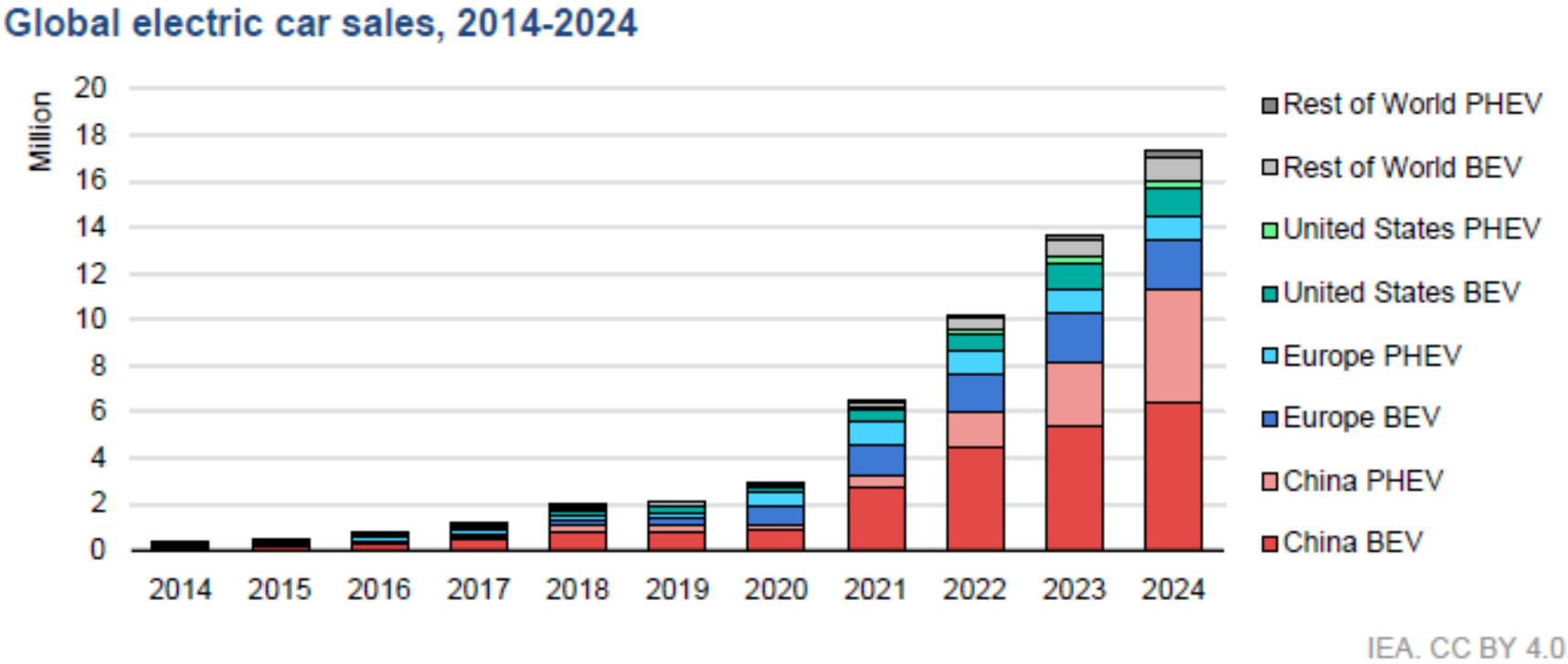
2. Progress to date

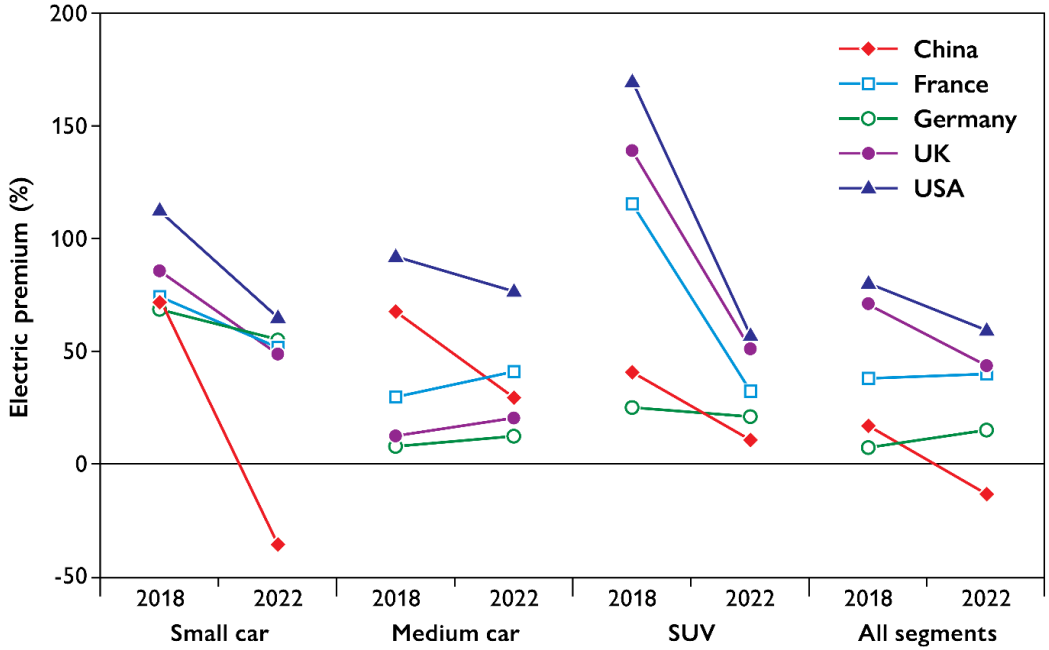
Global plug-in car fleet 58m (4%)



Notes: BEV = battery electric vehicle; PHEV = plug-in hybrid vehicle. Includes new passenger cars only.
Sources: IEA analysis based on country submissions and data from the European Automobile Manufacturers Association (ACEA), European Alternative Fuels Observatory (EAFO), EV Volumes and Marklines.

Chinese production-led transition model

- Industrial strategy since 2001 to 'leapfrog' ICE technology
  - €25 billion subsidies 2009-2022
  - Lower vehicle purchase costs
  - EVs now cheaper than ICEs
  - Wide range of vehicle type
- Some regulatory support
  - E.g. easier vehicle registration procedures (Yang, 2023)



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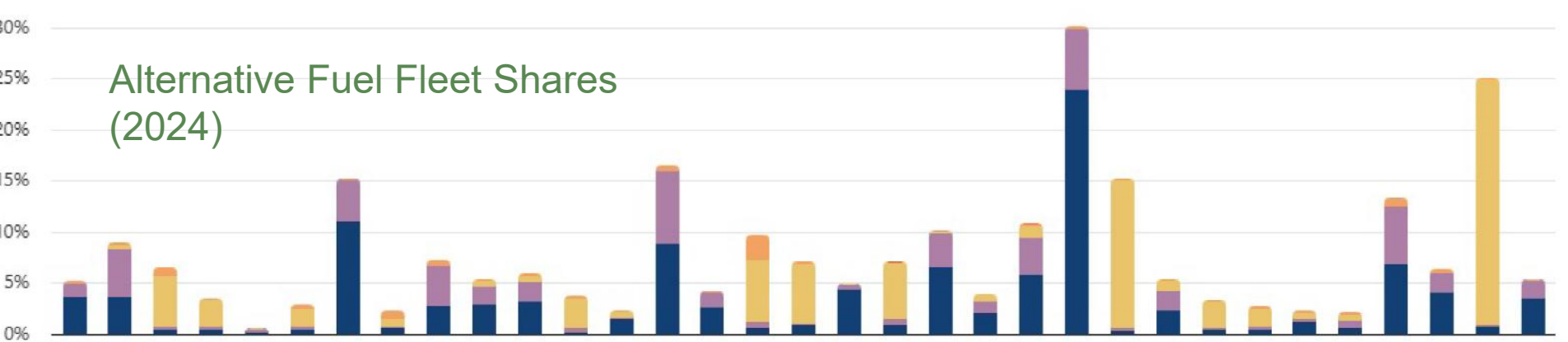
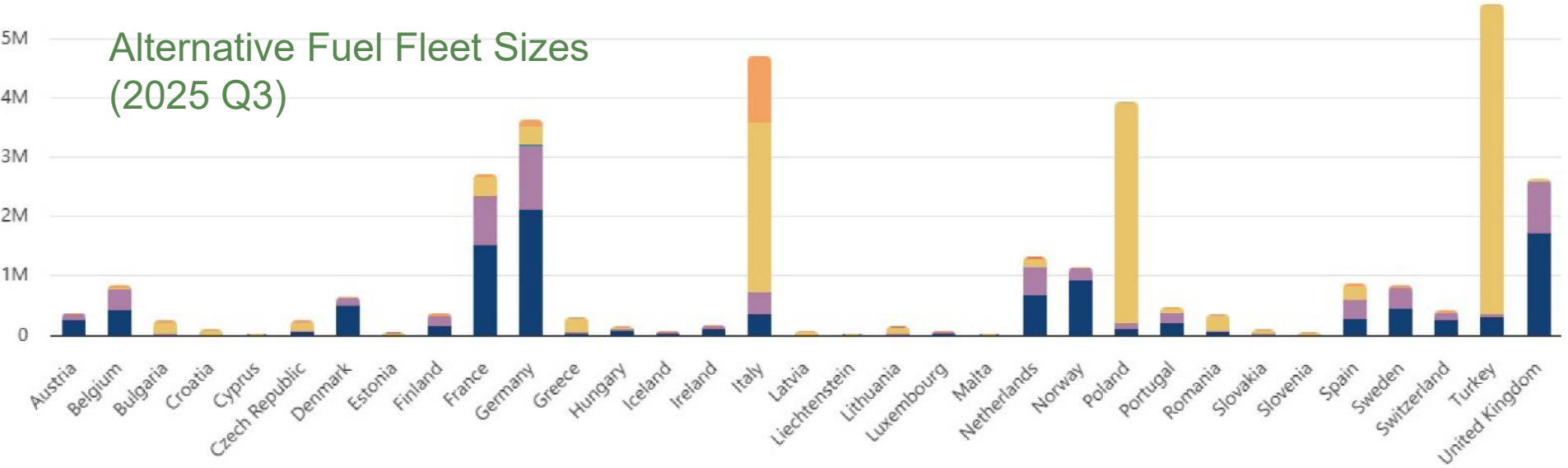
Alternative Fuel Fleet Shares (2024)



Alternative Fuel Fleet Sizes (2025 Q3)



Austria Belgium Bulgaria Croatia Cyprus Czech Republic Denmark Estonia Finland France Germany Greece Hungary Iceland Ireland Italy Latvia Liechtenstein Lithuania Luxembourg Malta Netherlands Norway Poland Portugal Romania Slovakia Slovenia Spain Sweden Switzerland Turkey United Kingdom

https://alternative-fuels-observatory.ec.europa.eu/transport-mode/road/eu27-uk-norway-iceland-switzerland-turkey-liechtenstein

BEV PHEV H2 LPG CNG LNG

Norwegian 'Total Transition' Model

- Fiscal measures from 1990 (preferential tax/fee rates or exemptions)
  - car import tax
  - car purchase tax
  - car use taxes
  - road infrastructure tolls
  - parking charges.
- Regulatory measures
  - use of bus lanes (now ended)
  - right for access charging infrastructure in apartment buildings (from 2017)
  - all public sector car purchases EVs (from 2022)

Helps not to have a domestic car industry
Helps to have a sovereign wealth fund!

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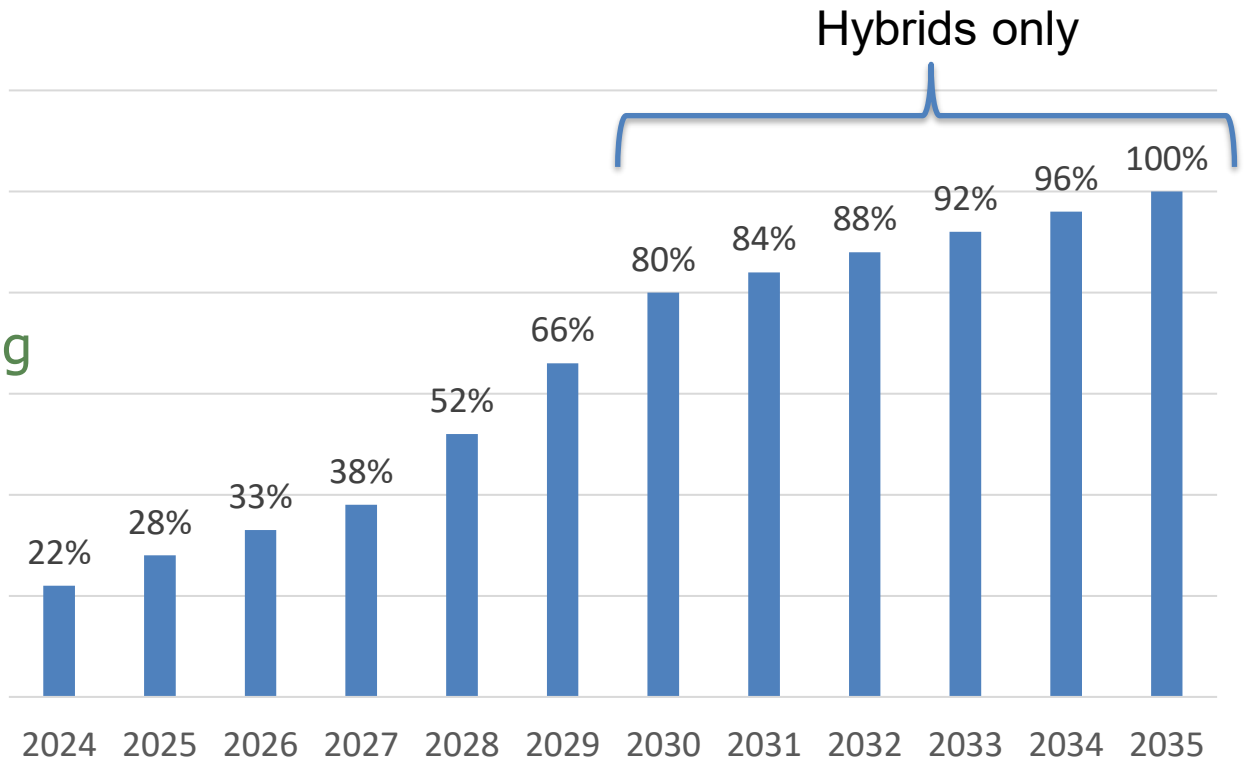
UK Zero Emissions Vehicle Mandate

Flexibilities

- Efficiency credits
- Certificate trading
- Certificate borrowing



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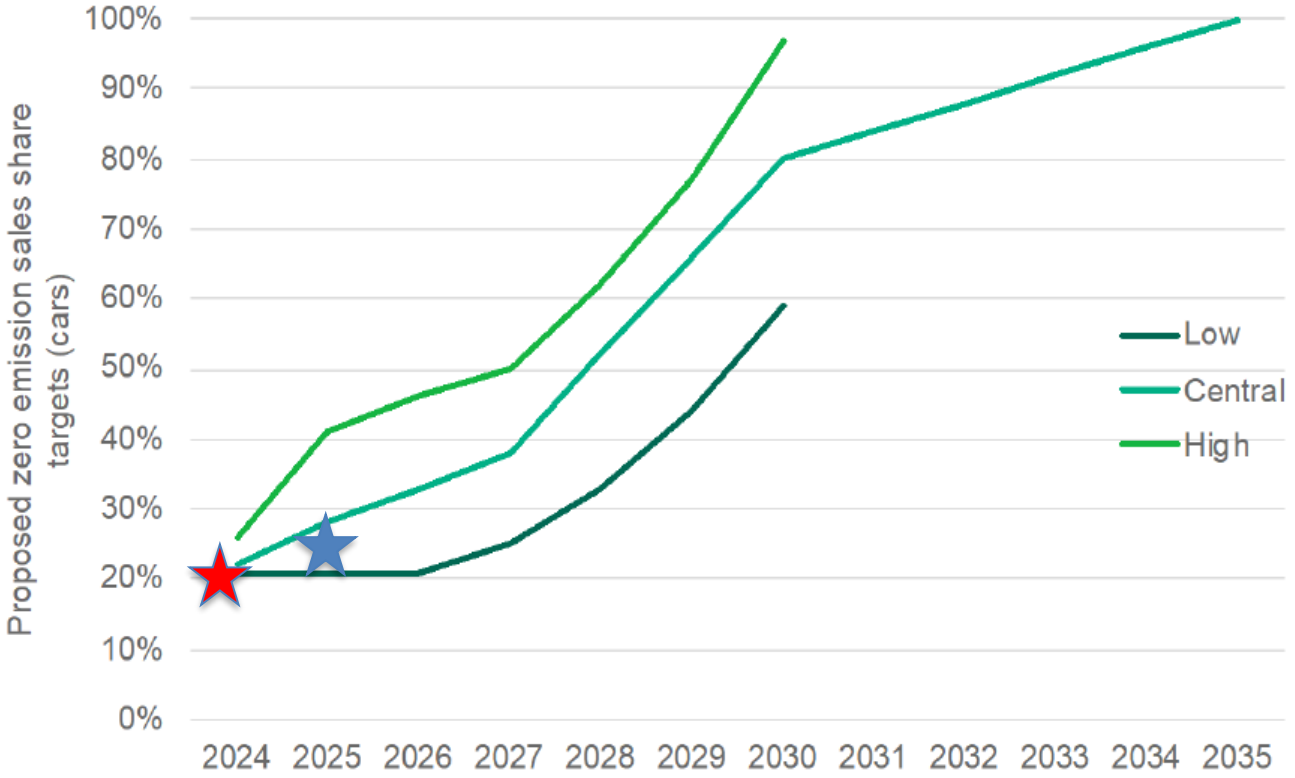
Market share below baseline target

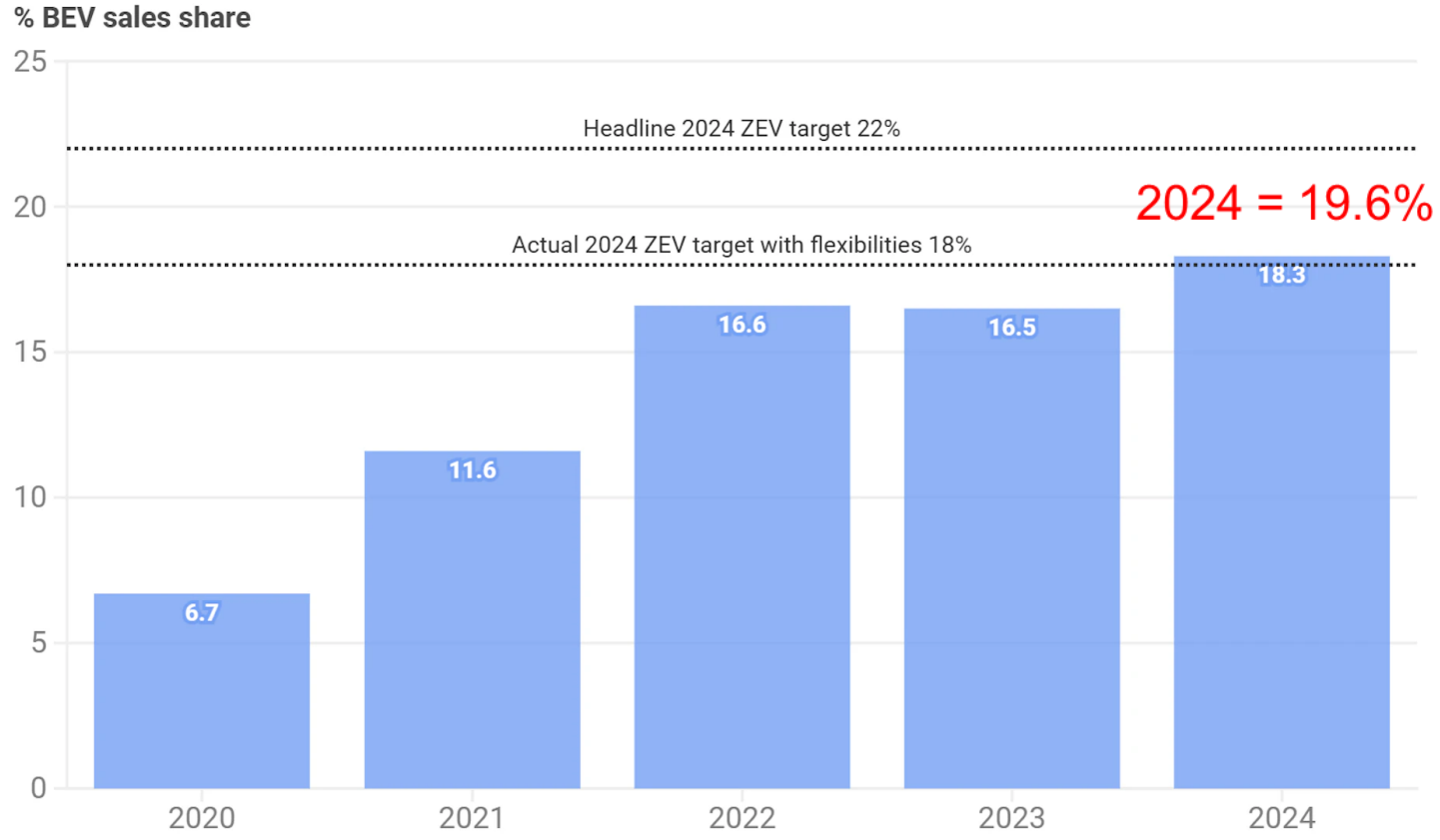
2025 = 23.4%

2024 = 19.6%



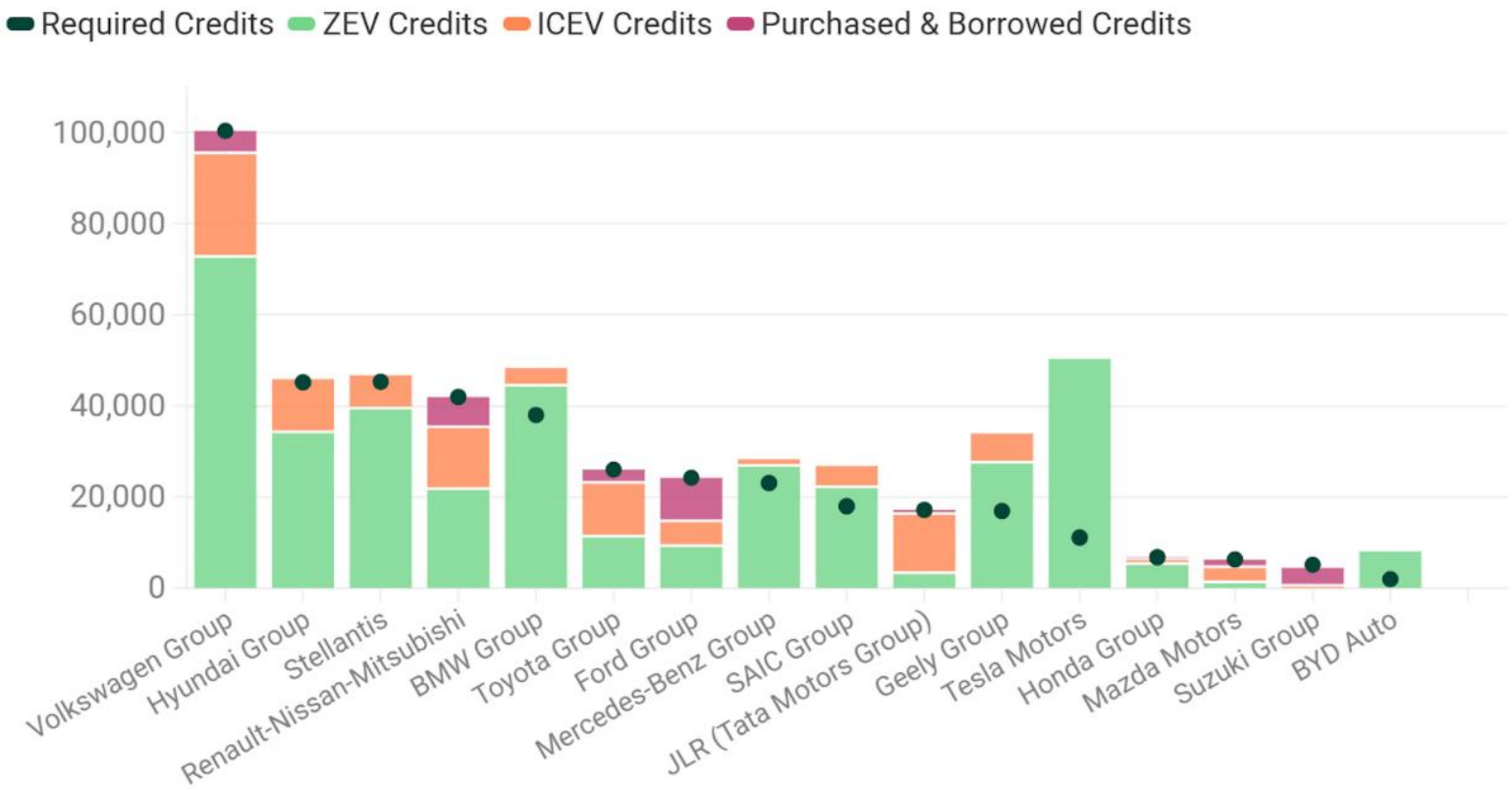
DfT (2023) Consultation on a Zero Emission Vehicle (ZEV) mandate and CO2 emissions regulation for new cars and vans in the UK. Figure 7

But achieved by ‘flexibilities’ e.g. 2024



Source: SMMT new car registrations, New Automotive

The flexibilities…



Source: T&E calculations based on Dataforce 2024 & 2021 • Geely Group includes Volvo, Polestar & Lotus

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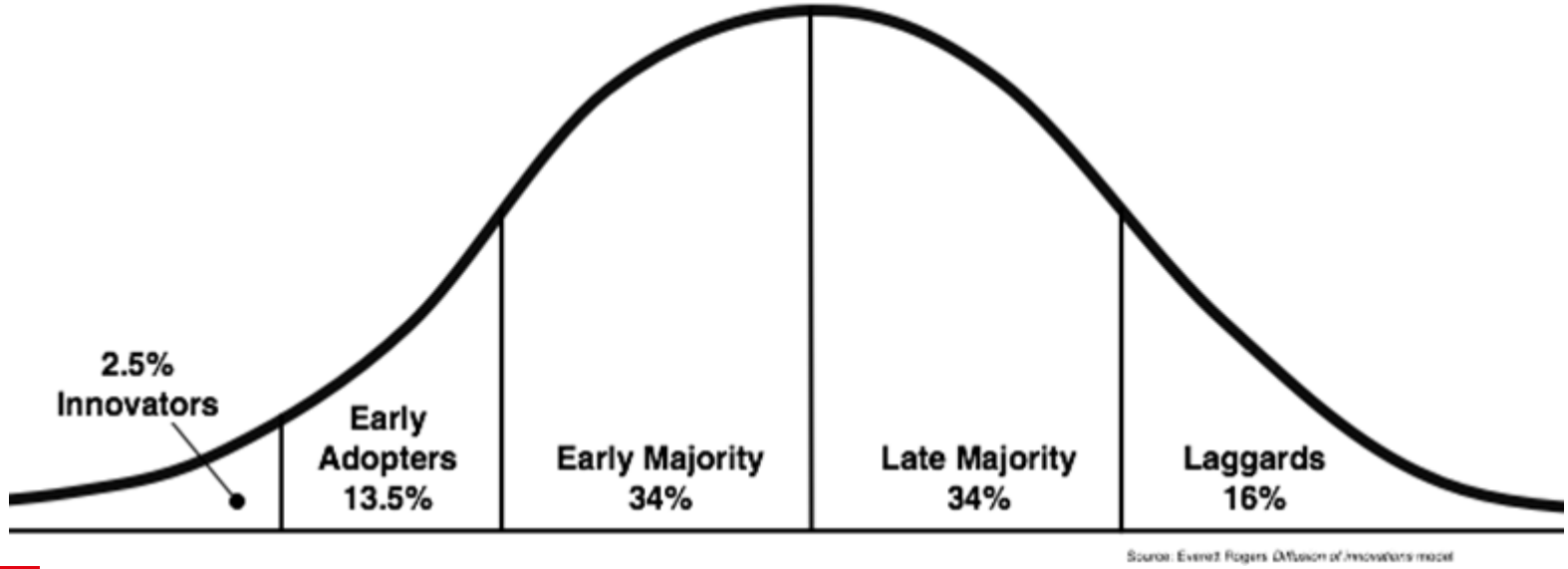
T&E

3. Prospects for the UK Transition

20% new car market resonates with the ‘innovators’ and ‘early adoptors’

Rogers (1962) Diffusion of Innovation Theory



Source: Everett Rogers Diffusion of innovations model

EV adopters to date tended to:

- Be acquirers of new cars
  - until recently limited used car market
- Acquire EVs as part of company cars or through 'salary sacrifice' scheme
  - Tax incentives for companies and employees
  - Incentives for private purchasers only recently reintroduced
- Mainly charge using private facilities (81%)
  - But 32% of households have no private off-street parking

A nexus of issues for the Transition in the UK

- Global issues
  - How far is the BEV a substitute good for the ICEV?
  - Global markets and the auto industry
- Local issues
  - Interactions between the energy and road transport markets
  - Constraints on residential charging
  - Government taxation policy

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The BEV as a substitute good

- For many users, a superior good e.g. driving experience
  - Most owners would not revert
- But range concerns not just an 'anxiety'
  - Reliance on charging network for longer return journeys
  - Constraints on charging beyond 80% (-20%)
  - Cold-weather battery performance loss (-20%)
  - Heating/cooling (-10%)
  - Appetite for risk-taking (-20%)

The '200-mile' range EV still represents a compromise that needs planning and management to use

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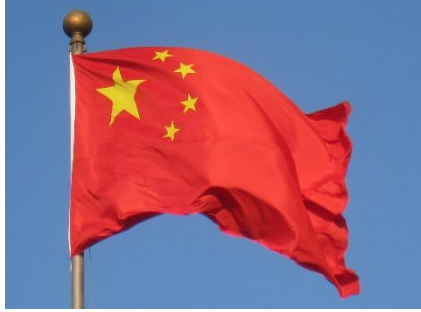
China as a source of cheaper EVs?



- Lower EV costs due to
  - First mover advantage
    - 75% global EV battery capacity
  - Production capacity
    - domestic sales 60% of global
  - State subsidies (land, energy)

- Wider costs of reliance on China
  - High embodied carbon
    - Fossil fuel use in battery production
  - Leaves Europe increasingly as a producer of luxury vehicles
    - Smaller auto-sector workforce

- Our interviewees were unanimous: China has both fair and unfair competitive advantages
- EU has imposed BEV tariffs of 17-38% on top of 10% car tariff
- US has imposed 25-100% tariff!

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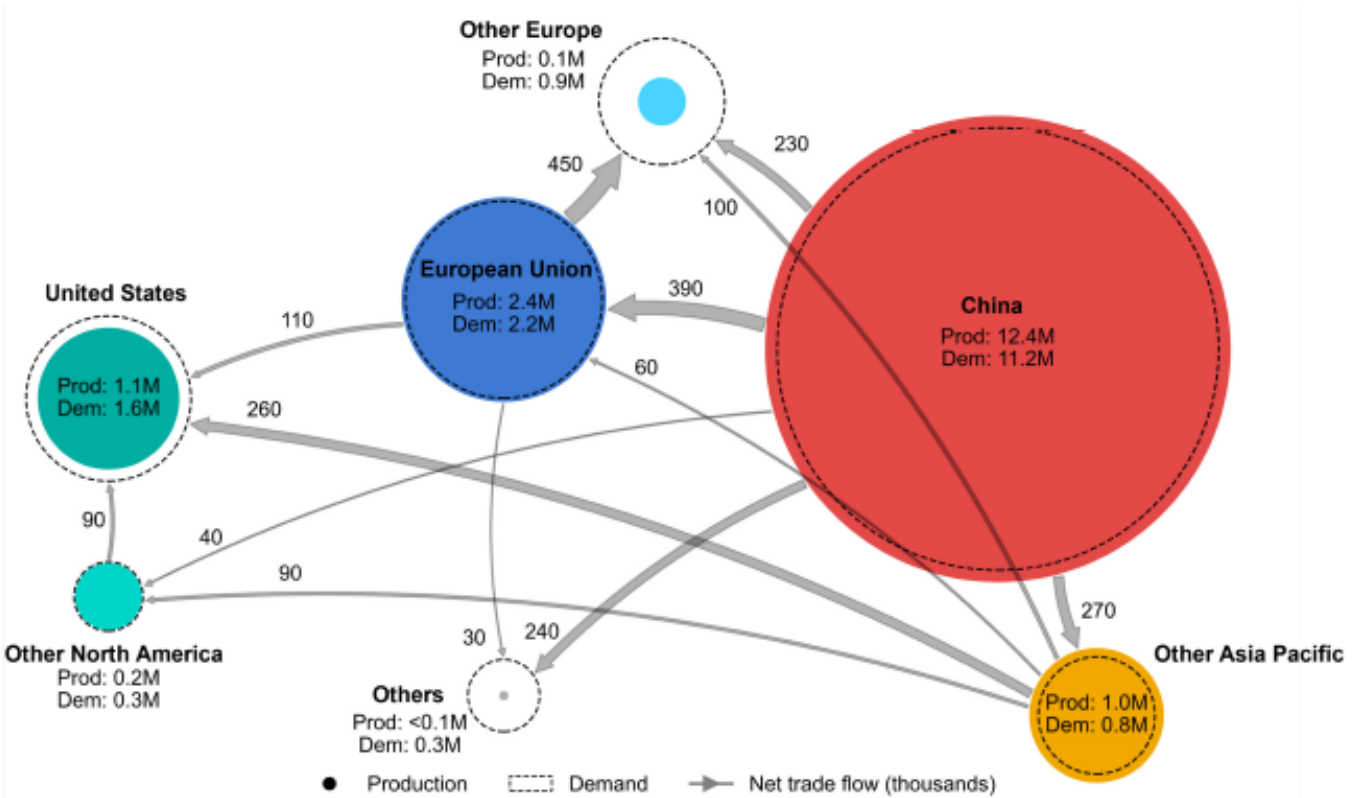
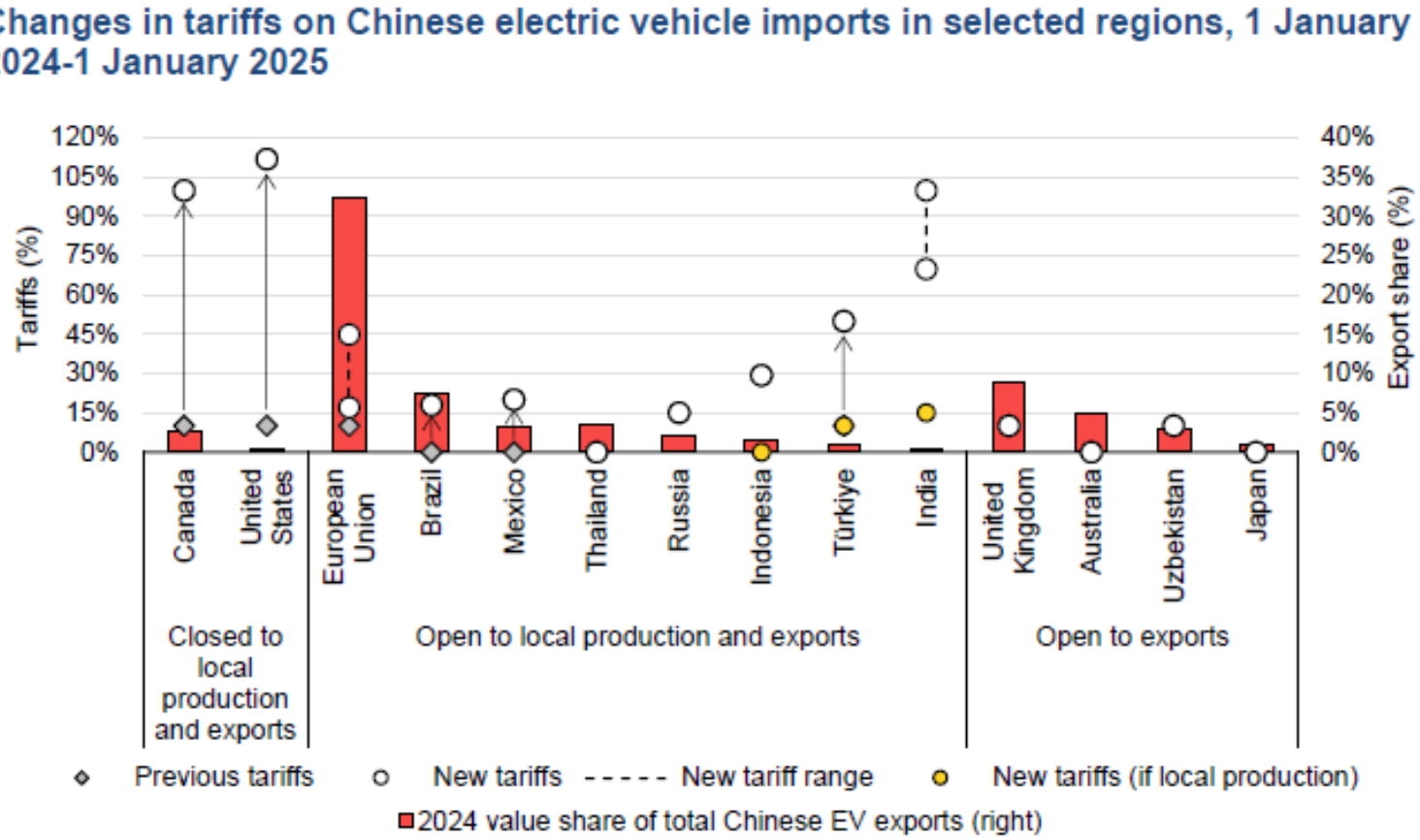
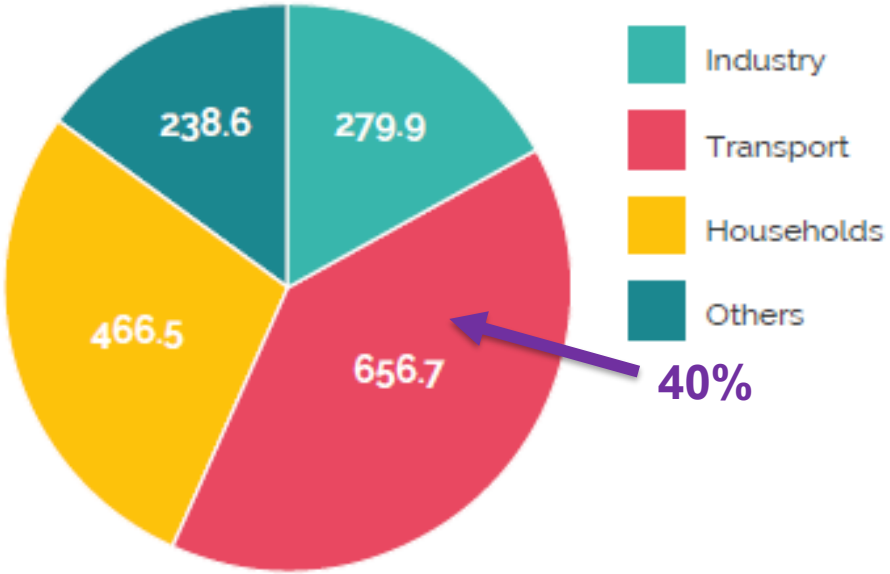
China needs to export 1m EVs per annum



UK Considered ‘Open to Exports’



How to pay for a 40% increase in electricity and delivering it to the road network?



Eyre and Killip (2019) Figure 1: Energy use in the UK by sector in 2017 (TWh) Calculations based on BEIS (2018)

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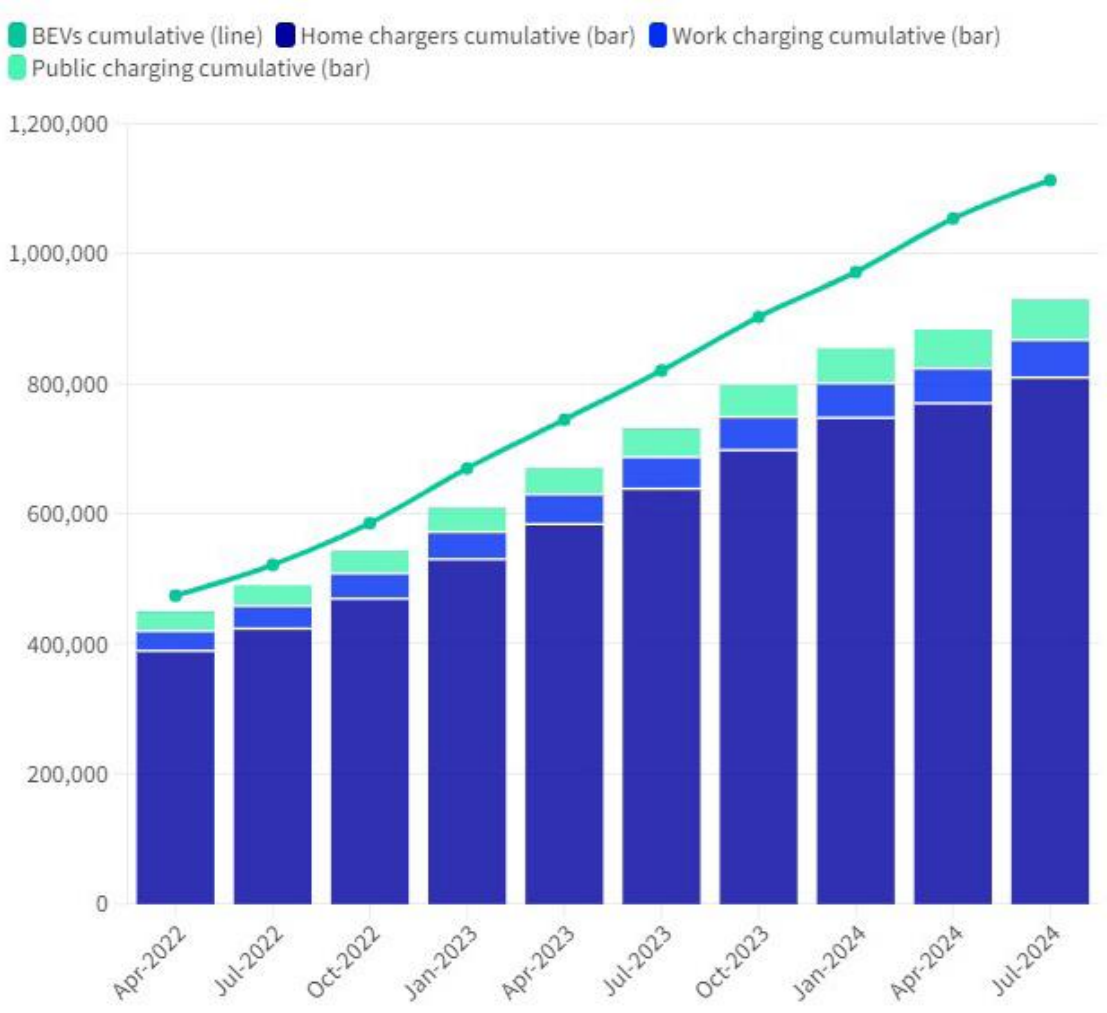
UK charger provision 2024

Charger type	EV Ratio
Public	17:1
Home	1.4:1
Combined	1.2:1



ChargeUK (2024) Powering Ahead to 2030. Fig.

UK needs to be more like Norway than China?

- Norway
  - EV-to-home charger ratio 1:1
  - EV-to-public charger ratio 24:1
  - Right to plug legislation

- China
  - low rates of home charging
  - EV to public charger ratio 7:1
  - ratio is widening, consumers reporting more difficulties

UK EV Association Survey: 75% of owners saw high public charging costs as the biggest deterrent to uptake

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Private home chargers difficult to provide in residential areas without allocated parking near the dwelling

Politics of Home vs Public Charging

Home Charging

- Wealthy households more likely to have off-street parking and investment in solar energy
- Domestic energy tariff with incentives (€0.08/ kWh)
- Photovoltaic panels + battery storage
  - Local car use may be 'free' in summer

Public Charging

- Less wealthy households more likely to be reliant on public chargepoints
- Will people accept queuing/waiting in hubs?
- What will the impact on property prices be?

Cross-pavement solution guidance recently reviewed by OZEV

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Main advantage is that cross-pavement solutions are safer than an ad hoc extension cable

Ongoing uncertainties depending on service model…

- Does the host household need liability insurance? E.g. in case user does not insert cable safely
- Responsibilities for gully cleaning and associated costs?
- Need for neighbourhood cooperation if chargers to be shared peer-to-peer
- Potential for neighbourhood conflict if kerbside cannot be reserved
- Limited installations per street possible e.g. cross-earthing issue

Should there be a ‘right to plug?’

Apartment ‘blockages’: Obstacles to installing chargers in shared buildings

Source: T&E

Member State	France	Germany	Italy	Poland	Spain	UK
Legal provision dedicated to the Right to Plug?	Yes	Yes	Yes	Yes	Yes	No
Can **owners veto** without justification?	No	Yes	Yes	Yes	Yes	Yes
Can the **co-owners' association veto** without justification?	No, only for serious and legitimate reasons	No, only for serious and legitimate reasons	Only if changes in common facilities are required	No, only for serious and legitimate reasons	No, owners simply need to be notified	Yes
Grounds to **reject** the demand	Pre-existence of charging infrastructure or intention to install infrastructure	Unsafe, technically feasible, too costly	No particular rule	Unsafe, unavailability of power connection	Vary locally	No obligation to consent at all
T&E assessment	🙂 Favourable	😐 Favourable but can be improved	😟 Unfavourable	😐 Favourable but can be improved	😐 Needs improvement	😟 Unfavourable

EV charging costs vary by factor of 13 and can be more expensive than petrol

Powertrain	Energy cost (€)	Efficiency	Cost/km
Petrol ICE	1.80/l	19km/l	0.10
EV home tariff	0.09/kWh	7km/kWh	0.01
EV average charger	0.60/kWh	7km/kWh	0.09
EV fast charger	0.90/kWh	7km/kWh	0.13

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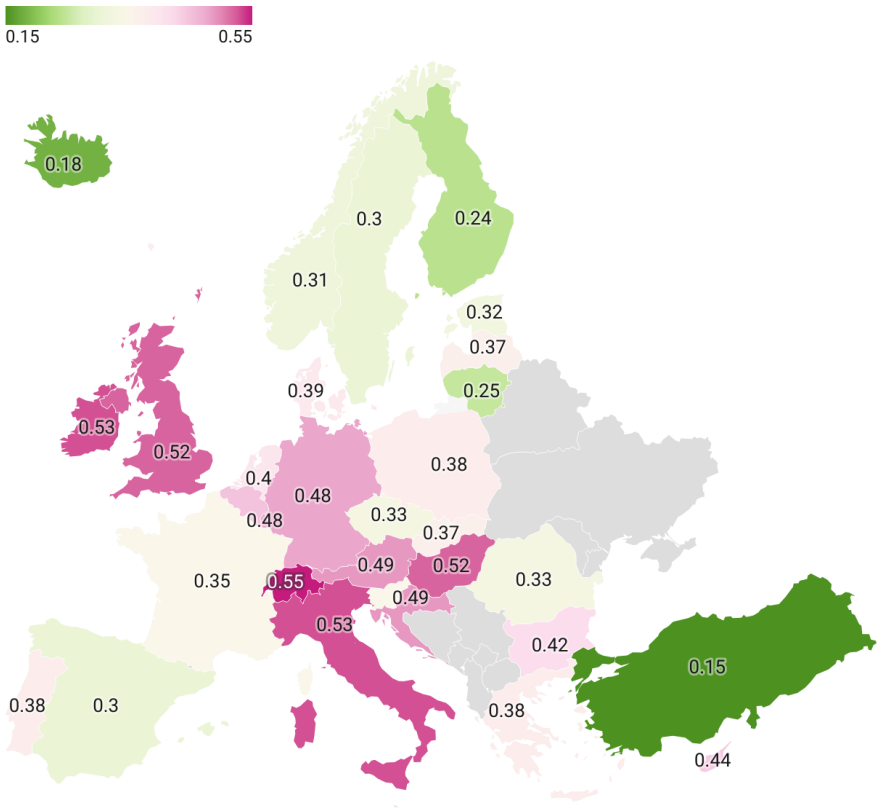
EVA Survey: 75% of owners saw high public charging costs as the biggest deterrent to uptake

Comparative Public Charging Costs

Average AC Adhoc Prices (EUR / kWh) in European Countries



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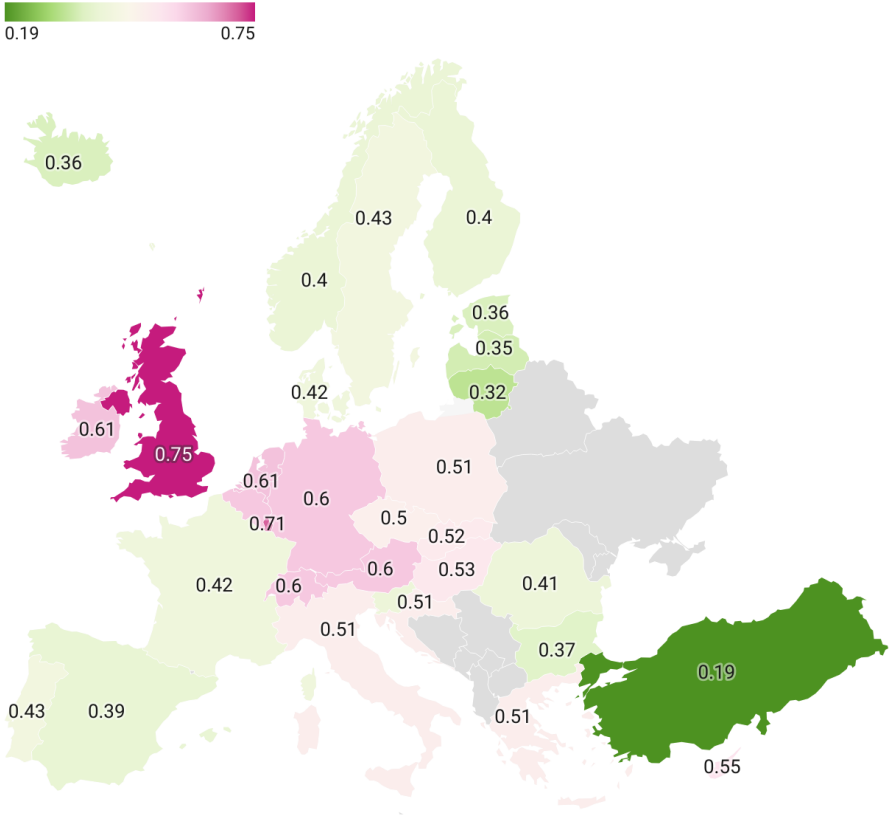
Average DC Adhoc Prices (EUR / kWh) in European Countries



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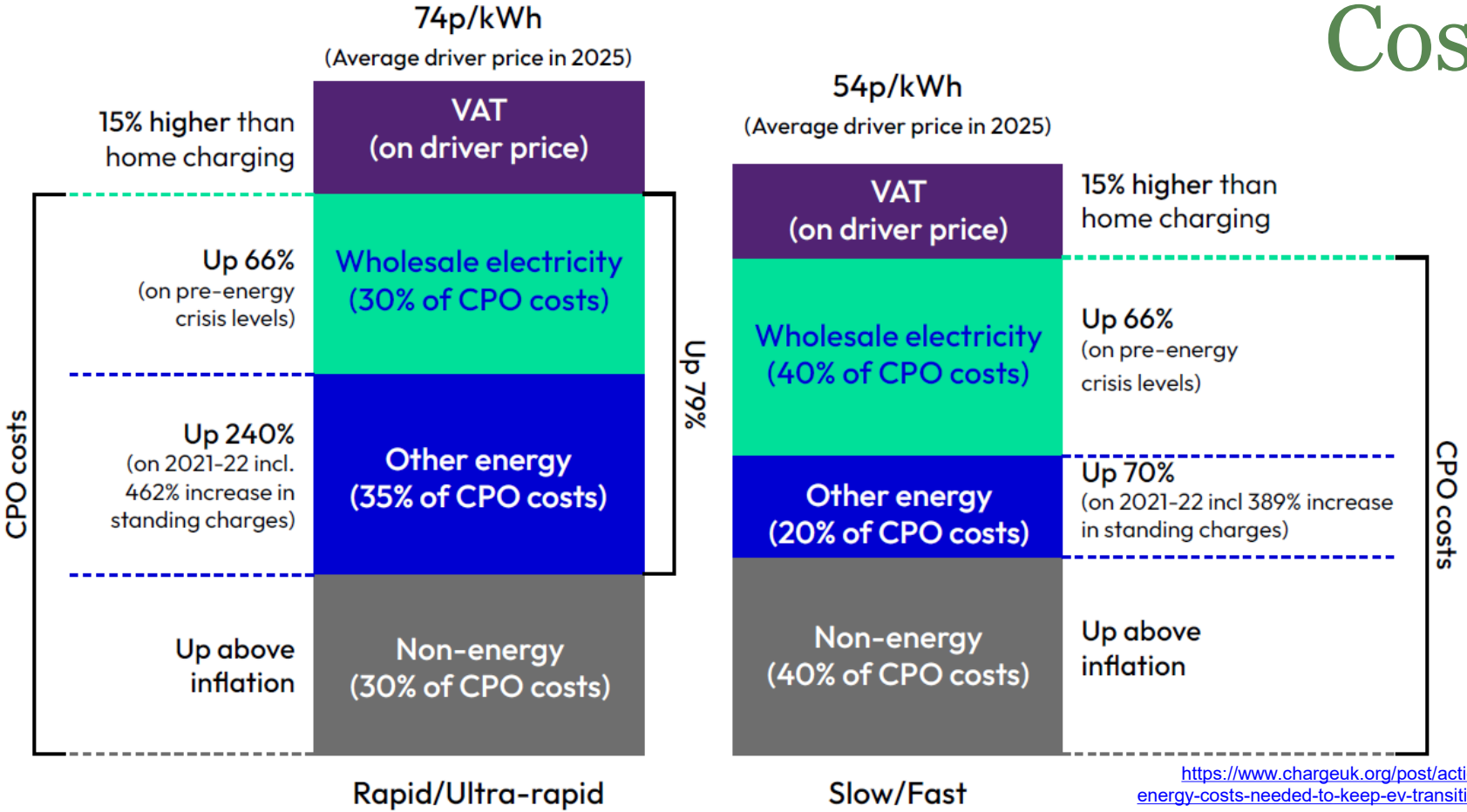
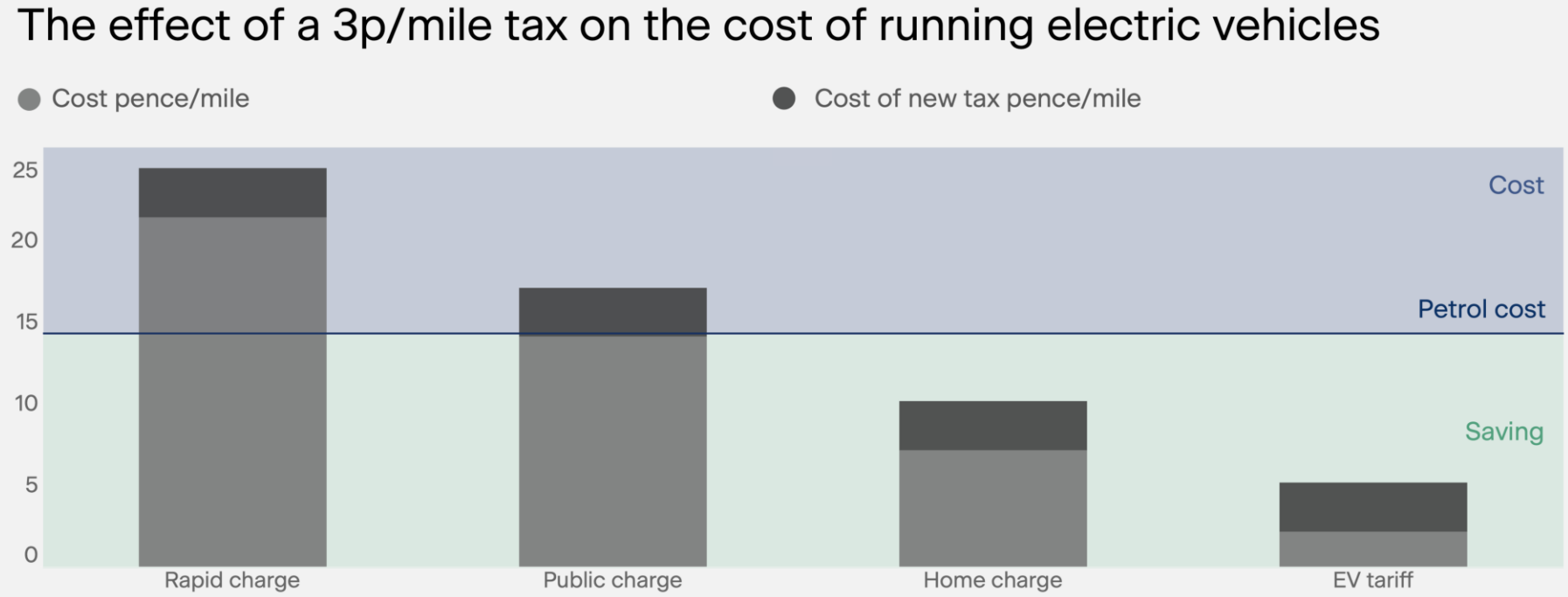
ChargeUK (2025) Analysis of Charging Costs



https://www.chargeuk.org/post/action-on-high-energy-costs-needed-to-keep-ev-transition-on-track

Prospect of the ‘eVED’ road user charge



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Dnes, M (2025)

Fuel Tax Protests 2000

By Hywel Williams, CC BY-SA 2.0; https://commons.wikimedia.org/w/index.php?curid=9125016

Increasingly, EVs will not be a consumer choice, but what is available in the market!

By Malcolm Butler - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=110570524

By Bob Jenkins, CC BY-SA 2.0, https://commons.wikimedia.org/w/index.php?curid=13701720

4. Was the de facto approach the most sustainable option for transitioning from the ICEV?

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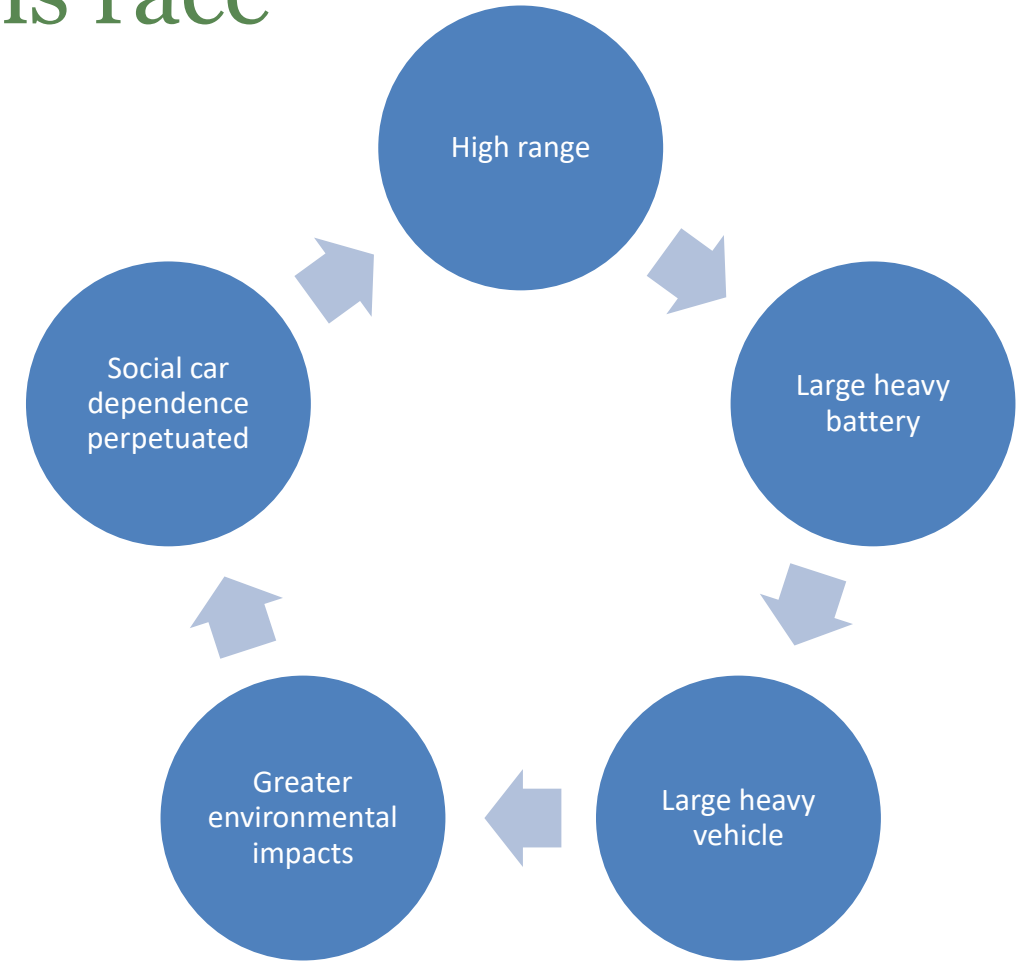
Battery ‘arms race’



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What might Plan B look like?

Road wear charge for EVs (weight-based):

- Part of proceeds used to subsidise public charging infrastructure and/or charge rates

VAT on public charging reduced from 20% to 5%

Correct energy market failures

Greater incentives and targets for shared mobility:

- EV car clubs in neighbourhoods without off-street parking

Further public funds for auto-sector restructuring linked to commitments to produce:

- affordable EVs

- EVs for shared mobility

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Plan C: Revisit Battery Swapping?

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Conclusion

- The EV transition probably has sufficient momentum to be unstoppable
- It is not just a transport transition but part of the industrial and energy transitions
- It will likely have some difficult political moments
- There is good reason to believe that a major cut in GHG and noxious emissions will result
- It is largely a 'technical fix' that will have winners and losers based on ability to buy into the technology
- The opportunity to use the transition to develop a more integrated transport system including cars but not dominated by them has probably been missed

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The presentation draws in large part on a book chapter:

Parkhurst, G. (2025). Challenges to Achieving Net Zero Through Transition to the Electric Car. Chapter 5 in Ison, S., Attard, M., Shaw, J. (Eds) Towards Transport Net Zero. Transport and Sustainability Volume 20. Emerald, Leeds.

https://www.emerald.com/books/edited-volume/17768/chapter-abstract/97269543/Challenges-to-Achieving-Net-Zero-Through?redirectedFrom=fulltext

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http://www.uwe.ac.uk/et/research/cts