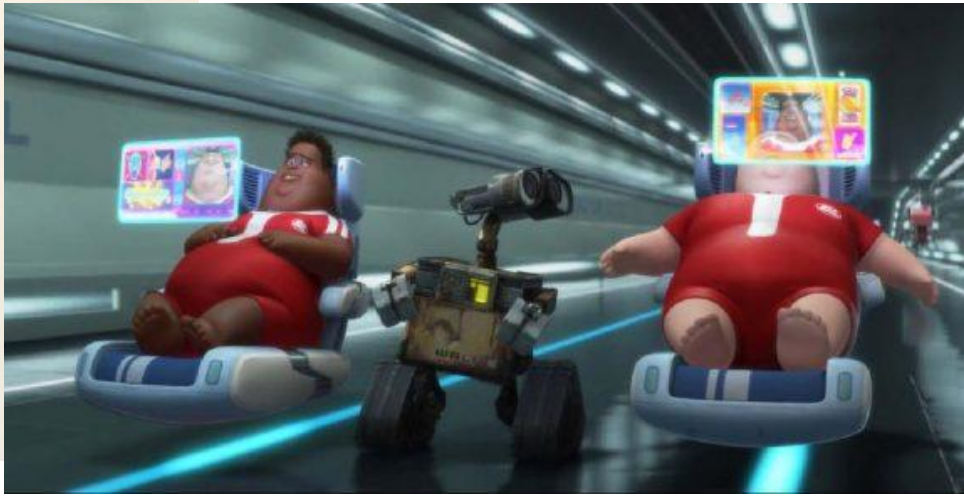
The Future of Energy for Transport

Oxford Energy Network Seminar Series

May 2026

Electricity

Muscle power

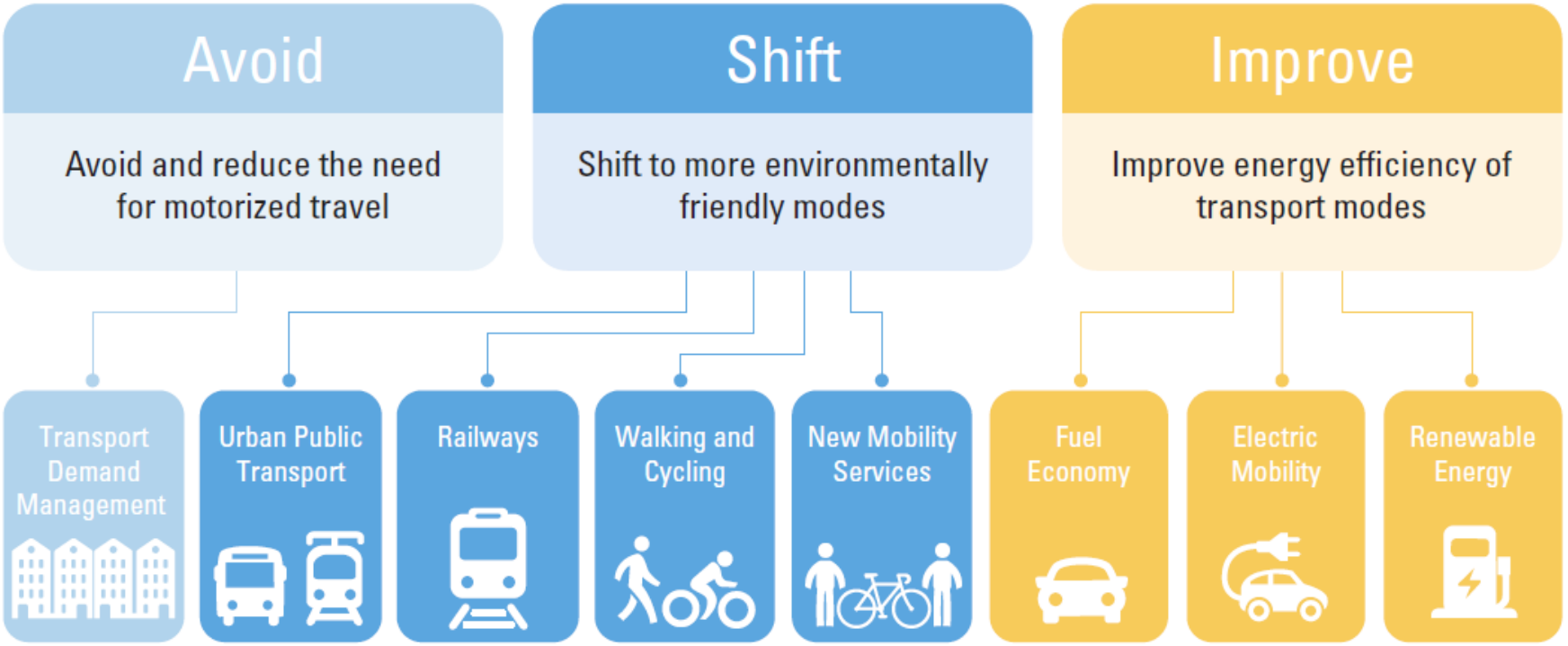


Order of presentation

1. 25 years ago…
2. The acceleration of EVs… an equity issue
3. Electric mobility as…
   - an automobility project or multi-modal?
   - part of an energy systems transition?
4. 25 years from now…

25 years ago…

- https://energysavingtrust.org.uk/a-brief-history-of-the-electric-car/



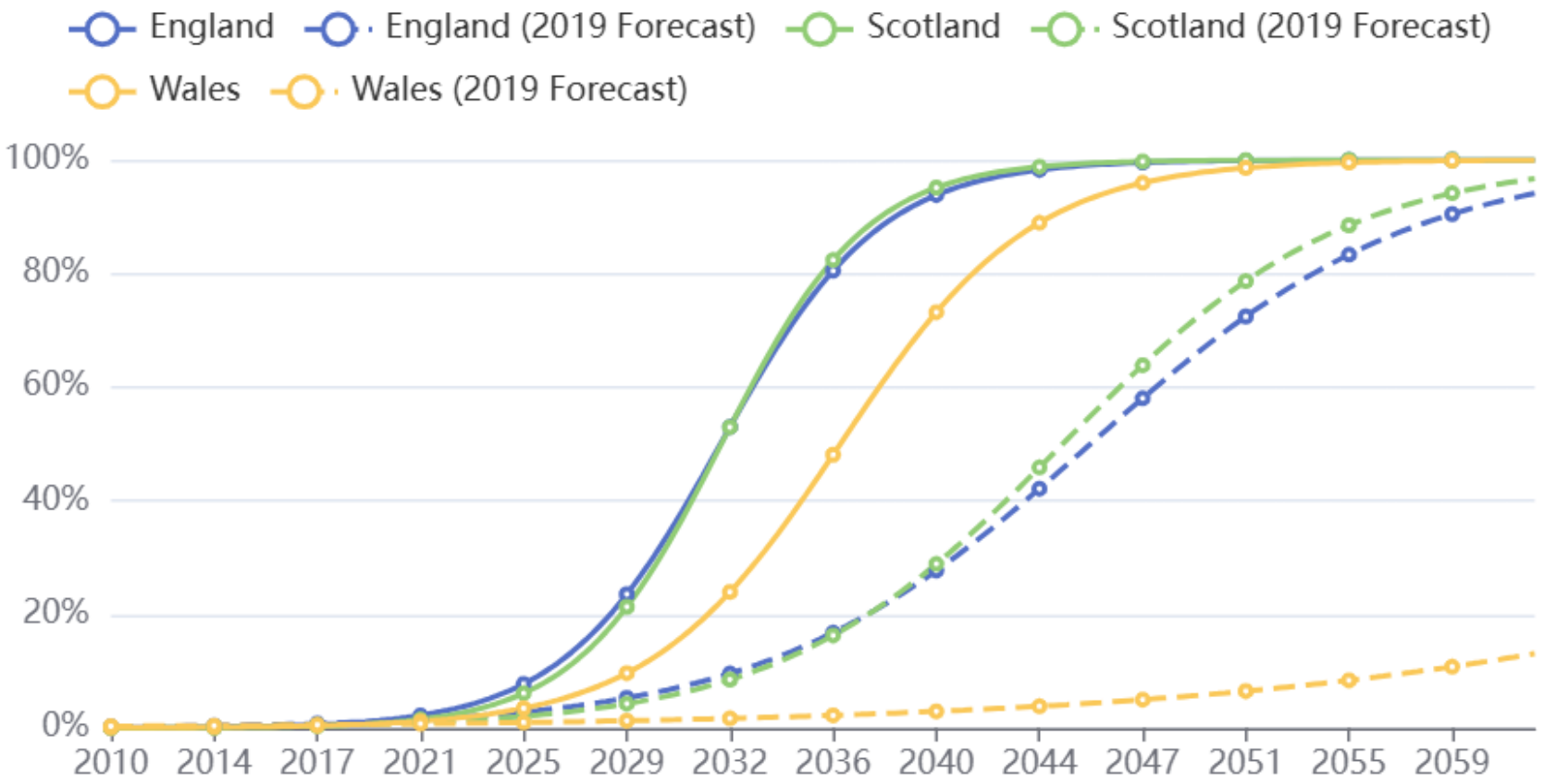
EVs, emissions, industry

https://www.gov.uk/government/publications/cop26-declaration-zero-emission-cars-and-vans/cop26-declaration-on-accelerating-the-transition-to-100-zero-emission-cars-and-vans

Chin

rld PHEV

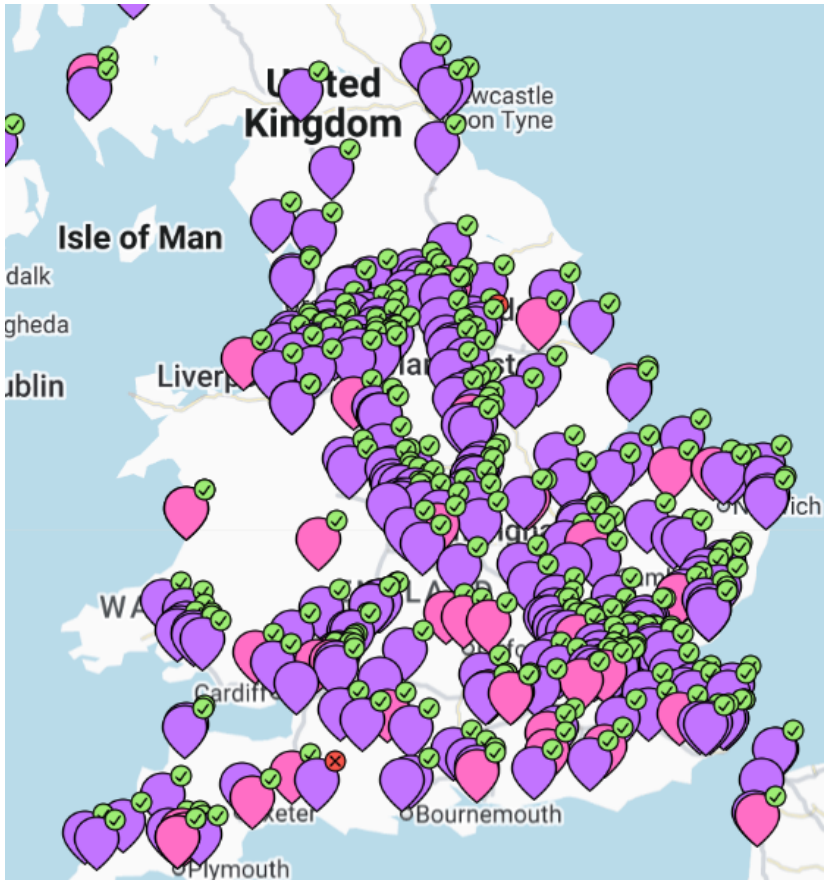
The UK's EV transition



https://data.priyaresearch.com/dashboard/uk-ev-forecast

Uneven public charging infrastructure build out

- https://www.gov.uk/government/statistics/electric-vehicle-charging-infrastructure-statistics-1-april-2026
- https://www.zapmap.com/live/
  (contracted to give DfT information)
- No data on uneven cost of public charging?
- What EV drivers now and in the future want from EV charging in different locations?

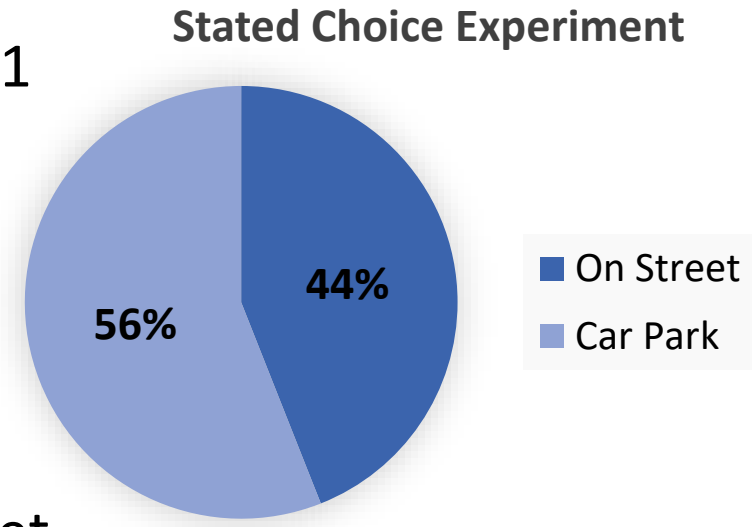


Public EV Charging Needs

- Accent Market Research administered online panel survey:

  22 May -5 June 2020: n = 2001

- ***Car drivers without driveway / garage for all cars in household***
- Gender, age and region representative of car drivers in UK
- Stated Choice Experiment: On-Street or Car Park Public Residential Charging



Public Residential Charging preferences

- Binary logit model showed safe, pleasant walk home most important non-financial attribute
- For cautious users, an attractive, safe, walkable location is non-negotiable
- Varying sensitivity to price related to parking experiences / situation
- Trade-off between cost, certainty and convenience

Value Seekers (n = 628)

- Value reservation, allocated space
- More likely to have experienced parking congestion

Prefer car park charging

- Car park security important
- Value unique, allocated space
- Greater share over 50
- Less likely to have children <16

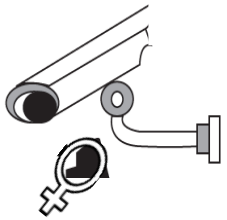
Cautious Users (n = 687)

- Safe and pleasant walk home non-negotiable
- More women, higher income

Convenience Customers (n = 686)

Prefer on-street charging

- Want convenience – no time limits, no subscription, nearby
- Value on-street security only
- More likely to already pay for parking, less willing to change

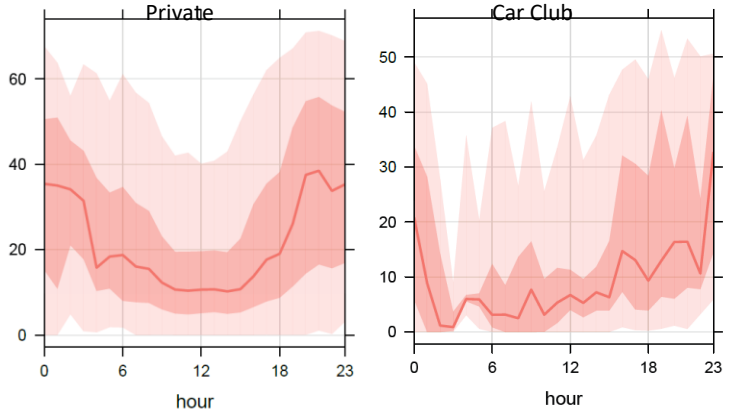


Stated Choice Experiment and Latent Class Model

Public EV Charging policies and Shared Mobility

- Hubs = more reliability and redundancy – easier (and cheaper?) to connect to grid
- Efficient energy use and storage?
- Share charging **&** share vehicles – community assets
- Also future-proof for bi-directional and automation.

Daily Profile



Implications for inclusion

- *"We see that for a lot of people buying an electric car is not an option at the moment… And we believe that shared mobility can remove a barrier to that."*

- *"Utrecht is… making that transition... for example, at neighbourhood hubs... on average eight to 12 people use such a shared car… So you have a four-, five-fold increase in* [its] *use."*

– Utrecht policymakers

User Experience at (large) Public EV Charging Hubs

Azzouz, L. et al. Beyond the Plug: Enhancing the User Experience at Public Electric Vehicle (EV) Charging Hubs. Insights from a Multi-Site UK Study. Journal of Transport Geography.

- n = 360
- +'s and –'s of experiences at charging hubs
- & expectations vs actuality of experience
- MANOVA by hub to explore what influences experiences

	Oxford	Banbury	London
Location	Redbridge, South Oxford; close to highway A34	Strout Park, Northeast Banbury; close to expressway M40	Fulham, Southwest London; close to highway A308
Operators	Wenea, Fastned, Tesla	InstaVolt	Shell
Total number of chargers	45 (20 Wenea, 13 Fastned, 12 Tesla)	32	10
Facilities	Park & Ride bus station, Toilet	Coffee Shop, Restaurant, Toilet	Convenience store, Coffee Shop, Toilet
Charging speed	Normal charging (22kW, Wenea), Ultra-rapid charging (300kW, Fastned; 250kW, Tesla)	Rapid charging (120-150 kW)	Ultra-rapid charging (175 kW)
Price	£0.49/kWh (Wenea) £0.69/kWh (Fastned) £0.48/kWh (Tesla)	£0.85/kWh	£0.89/kWh

* Compiled by the authors from field observations

About a third of UK buses go electric in last 5 years

"The city should first and foremost [invest in] public transport, which is… the most democratic, the most equal.... I can't define electromobility in those terms"

– Poznań policymaker

"We already have electric buses, It just still doesn't get through to us why the Ministry doesn't agree that this law should explicitly mention trams."

– Poznań policymaker

https://fleetdecarbonisationtoolkit.energysavingtrust.org.uk/t/charging-infrastructure/case-study-first-bus-shared-charging/

And there's Micromobility

E-bikes:

• *"So… electrification of cars, yes, that's coming and that's going well. But I feel like the transition to e-bikes and people being done with being in traffic jams, that's much bigger actually"*
– Utrecht policymaker

E-scooters:

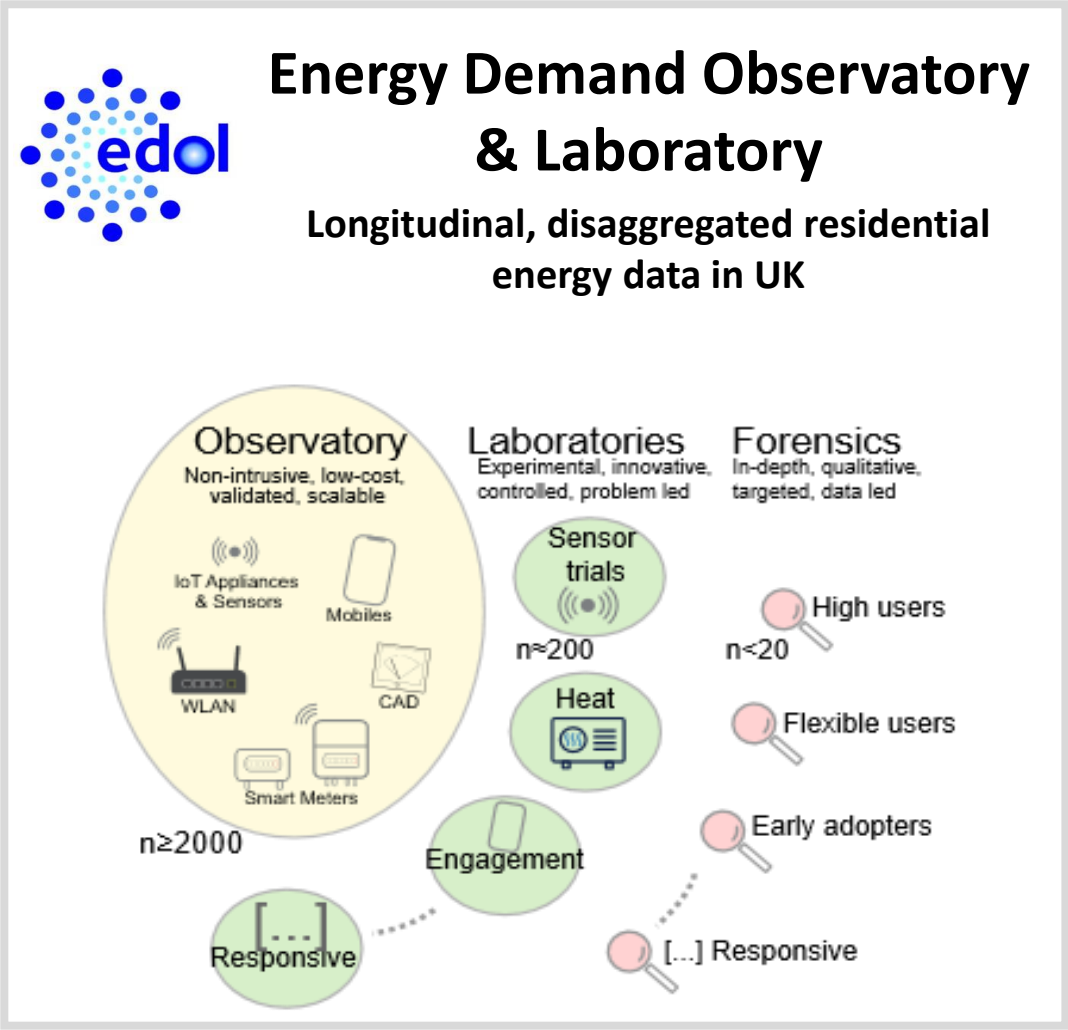
• Users would otherwise *"be riding motorbikes or beaten up old cars…* [are] *prepared to pay a premium for a better transport service"* – Bristol stakeholder

• E-scooters should be made available *"where there is the worst coverage on public transport"* – Oslo policymaker

https://www.pacts.org.uk/wp-content/uploads/PACTS-The-safety-of-private-e-scooters-in-the-UK-Final-Report.pdf

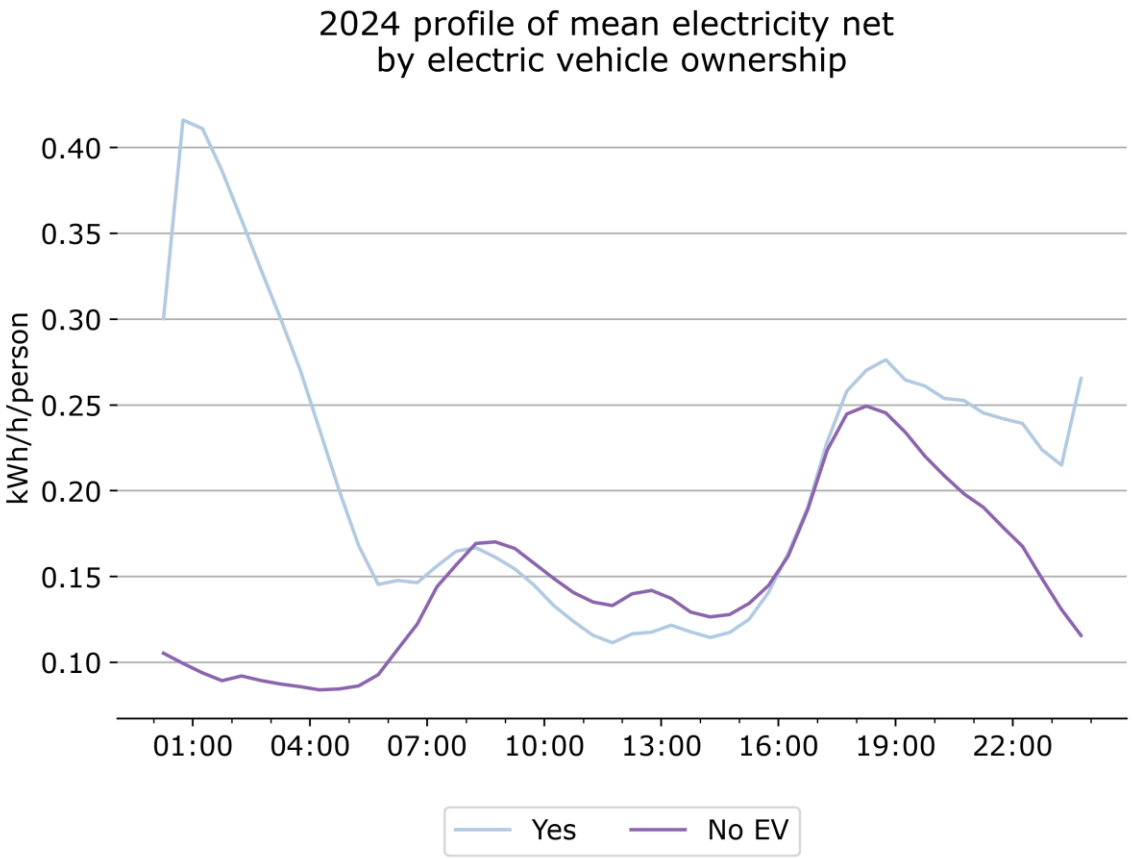
EDOL: Household Energy Demand

- SERL = 11,600 household panel
- Representative by GB region & IMD quintile
- Half-hourly smart meter data
- Survey: Mar-Jun 2025 – 3,806 households

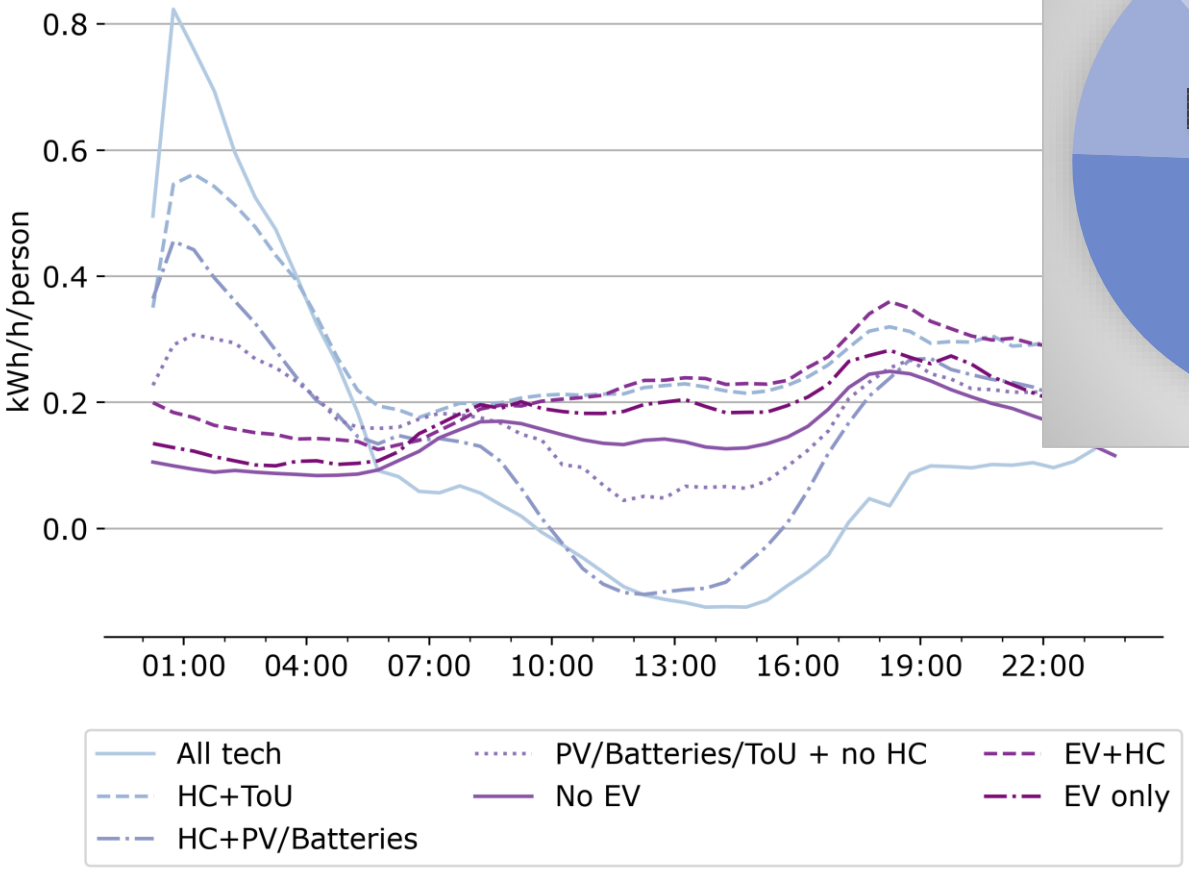


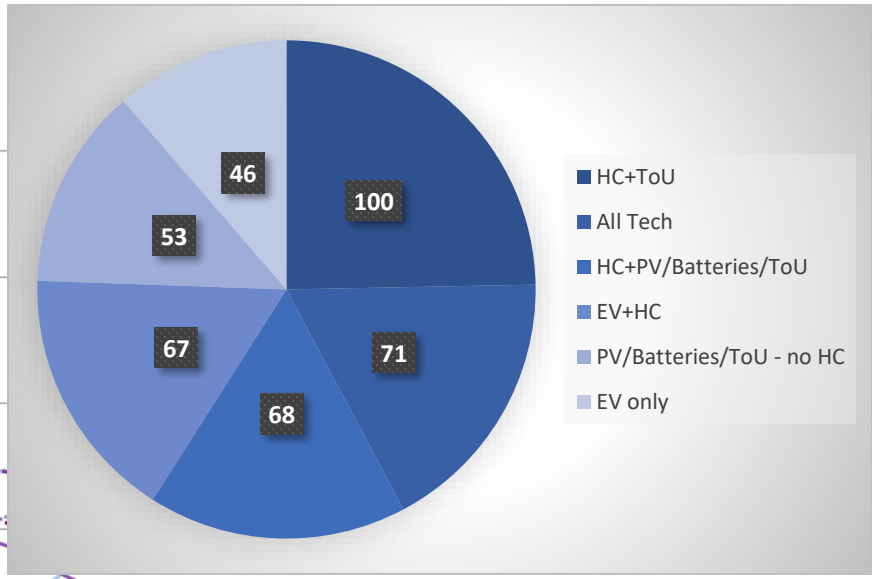
EVs as a home appliance

- EV charging within domestic electricity use profile.
- EV owners use more electricity overall than non-EV owners.
- EV owners' electricity use is concentrated 'off-peak' and has larger fluctuations.



EV & low-carbon tech co-adoption





- energy use flexibility
- pro-sumerism and future V2G integration

The Electrification Transition

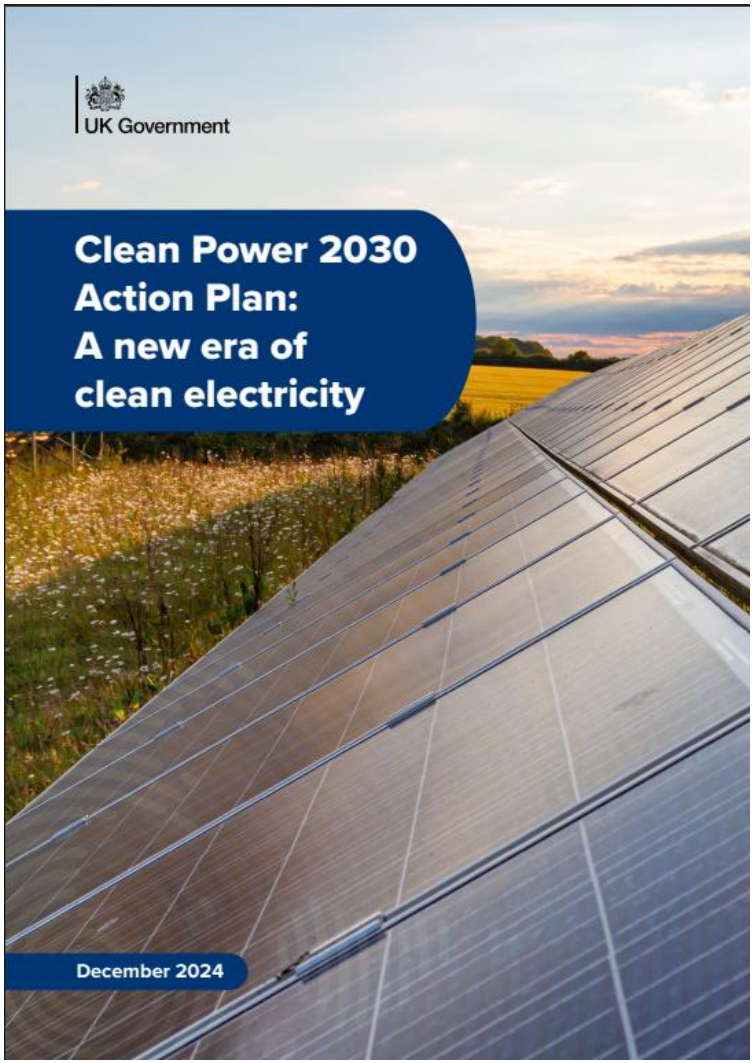
- Maximising self-consumption
- Reducing household bills
- ‘Mapping the path to a clean, flexible, consumer-focused electricity system’

Department for Energy Security & Net Zero

ofgem

NESO National Energy System Operator

- Balance intermittency of renewables
- Peak smoothing to reduce extent of grid reinforcement

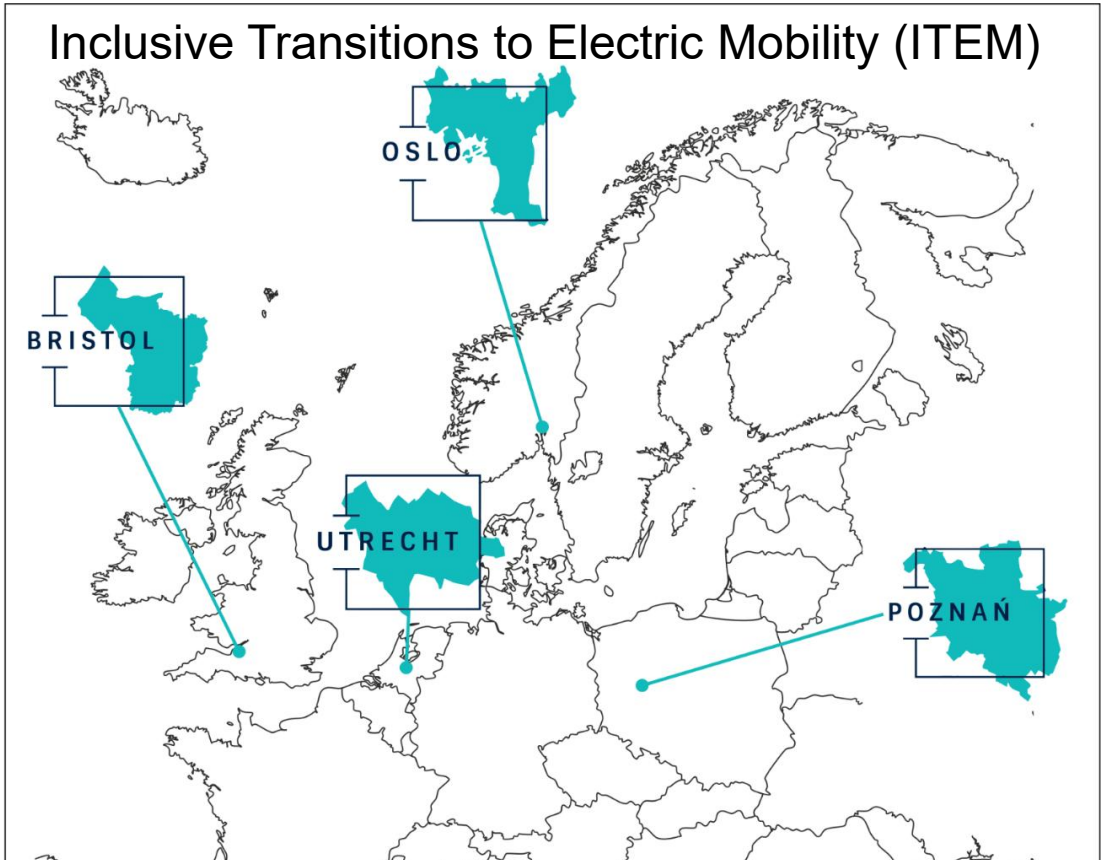


25 years from now…

An equitable, inclusive, fair and electric future?

Assumptions of an EV transition

- "*We get a lot of inquiries* [about EV policy and charging] *from Norwegian cities… but more from other cities internationally and the international press*" – Oslo policymaker
- "*Everyone has to drive electric at some point. Because in 2030 we're not going to allow new combustion engines, cars, on the road anymore. You just can't buy those anymore.*" – Utrecht policymaker
- The "*electrification of private vehicles, it's the, probably the quickest and easiest route to meet our climate targets*" – Bristol policymaker
- "*Electromobility… is an inevitable part of preventing a climate catastrophe*" – Poznań policymaker



Partners:TØI (Norway), Utrecht University (NL), Heksagon & Adam Mickiewicz University (Poland)

ERANET - Urban Accessibility and Connectivity

But more to transition than EM

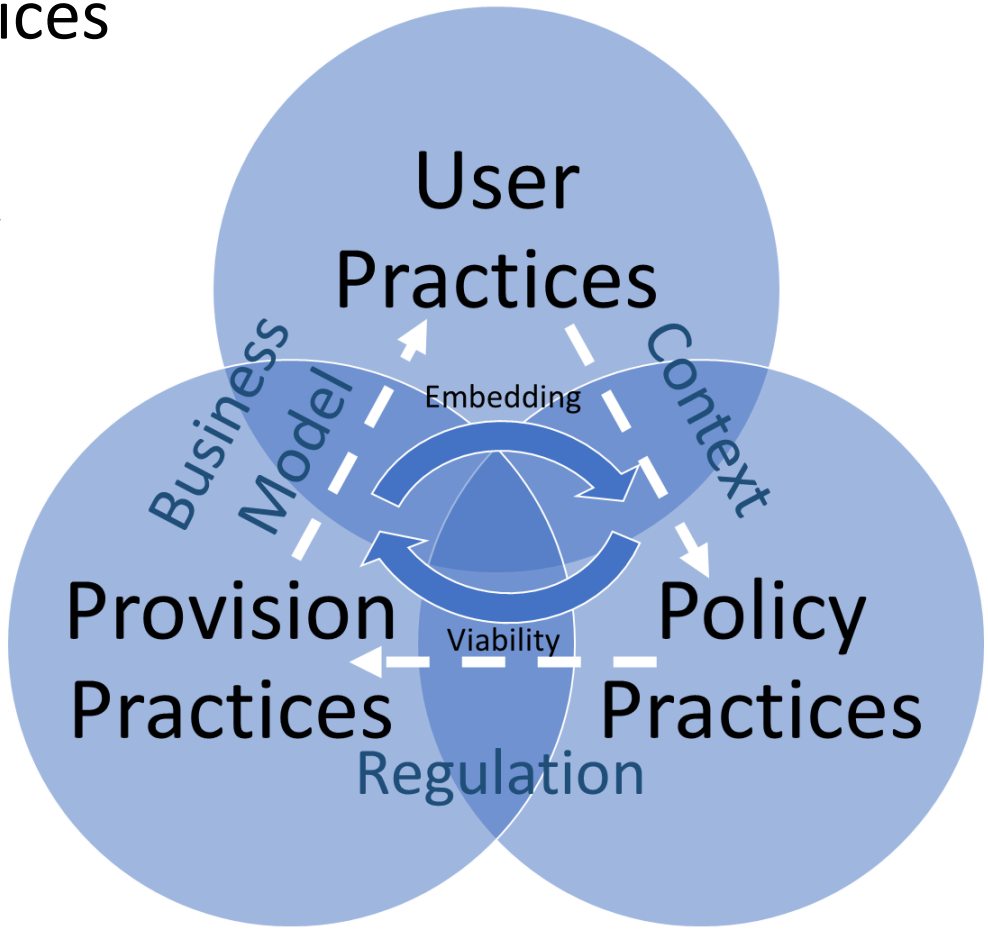
- *"We don't just need to electrify, we… need to organize our society differently… to other forms of transport than passenger car traffic"* – Norwegian stakeholder
- *"…how much resource and time and effort* [we] *should put into promoting electromobility alongside other policy priorities."* – Bristol policymaker
- *It's "still a car. It doesn't matter how it's driven"* – Poznań transport operator
- "*The pedestrian is number one… priority one. And then wider cycle paths, better cycle paths. And car... that's really only afterwards in the priorities.*" – Utrecht policymaker

EV-sharing outside cities

- Higher car ownership and limited public transport
- More affordable way to access EVs
- Reduce car dependency, increase EV uptake
- More certain charging and utilisation of community charging hubs
- Integrate with community energy

Transitions in Social Practices

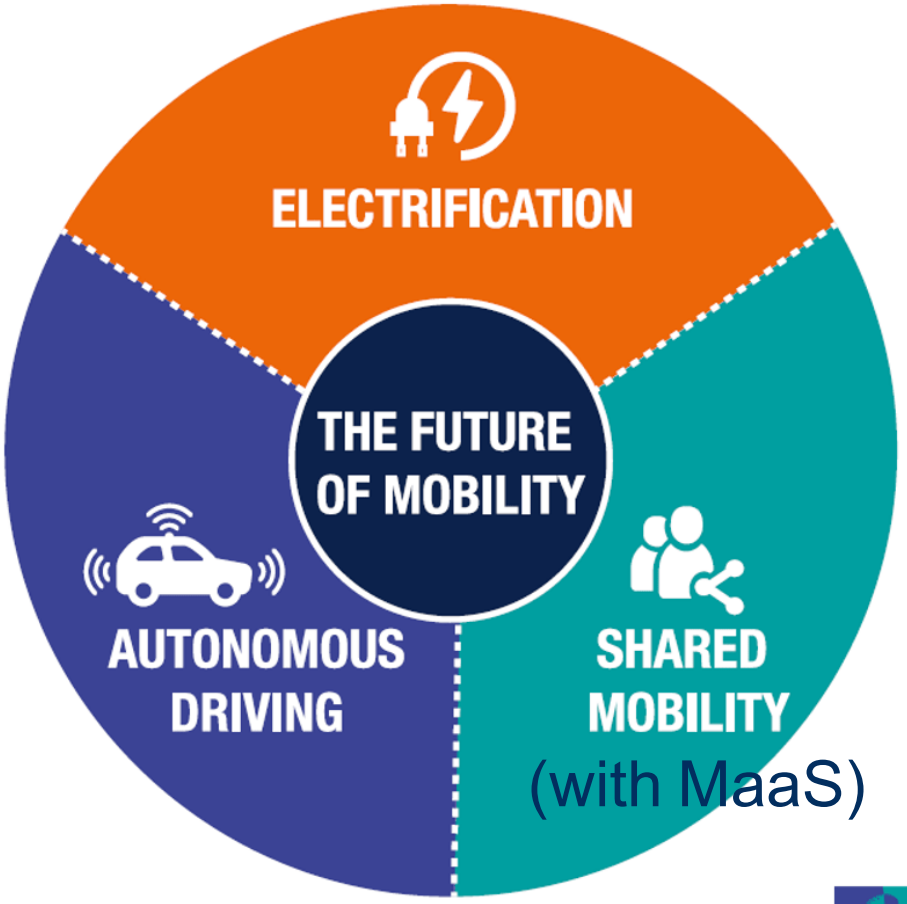
- Configurations of Practices
- Interact, align, evolve
- Embed shared mobility
  - Community named
  - Community promoted
  - Community employee
  - Community volunteers
  - Community owned
  - Community energy ecosystem



Shared, autonomous, electric

- Disruptive technologies
- Systemic, sustainable change if combined
- Electrification, like sharing, not new, but now can be ‘smart’

(Sprei, 2018)



- Changes to socio-technical system.

Sprei, F. (2018). Disrupting mobility. Energy Research & Social Science, 37, 238–242. https://doi.org/10.1016/j.erss.2017.10.029

Thank you!!

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