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The Energy Infrastructure “Roadmap” for Transport

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Light vehicles in the UK

- Light vehicles are expected to remain central to UK mobility in 2050
- Cutting transport carbon emissions is expensive compared to most other sectors
- Light commercial vehicles represent a small but growing share of the light vehicle fleet
- Major strategic challenges of the coming decades around:
  - Congestion – a drag on the UK's economic competitiveness, but there are political barriers to building new infrastructure
  - Decarbonisation – a major shift to lower carbon vehicles is expected to be needed

16%

Light vehicles contribute around 16% of CO_2 emissions

400bn

400 billion person-miles are travelled by car each year – 10x more than rail and 20x more than bus/coach

1/3

Only around a third of UK car mileage is in urban areas. Over two thirds of UK mileage is on motorways and major "A" roads

28m

There is a total park of over 28m cars

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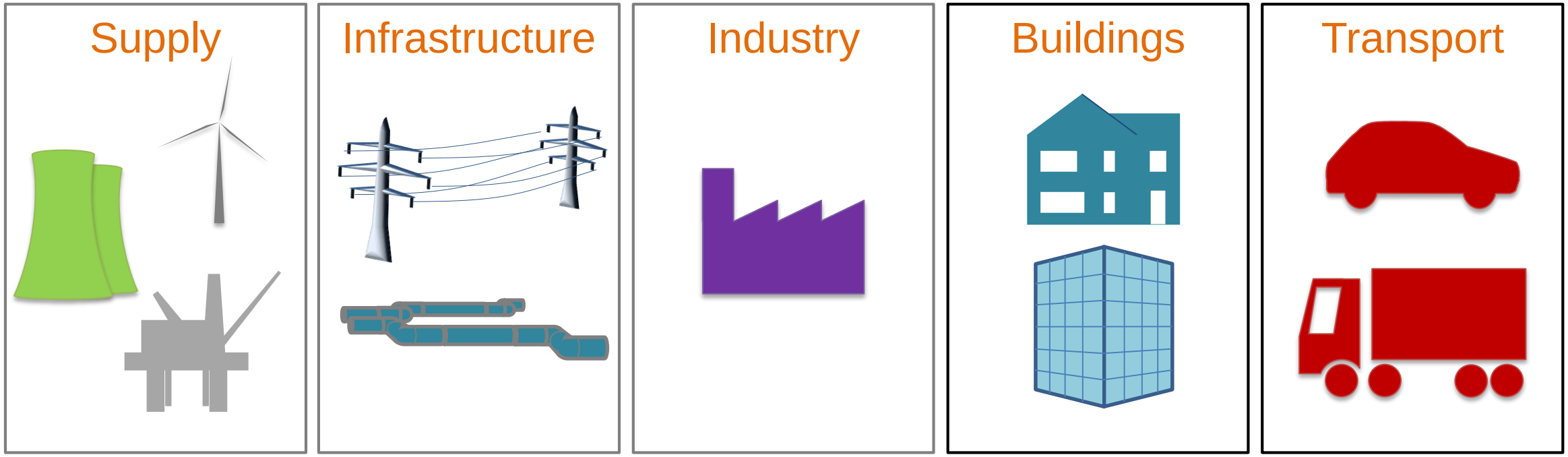
Light vehicles as part of the wider UK energy system

The ETI undertakes analysis of the overall energy system



ESME is used to identify the lowest cost system that meets:

- *End use demands (given available resources)*
- *Overall CO_2 limits*

ESME
Energy System Modelling Environment

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Light vehicle options

Has an established, low cost, mature supply chain.
Is complementary to fuel supply for heavy duty vehicles

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Hybridisation, lightweight structures, improved aerodynamics and powertrain efficiency could deliver a 50% reduction in fuel consumption by 2030 with a 10-15% increase in capital cost

Can contribute to overall CO_2 emission reduction with relatively minor investment
but steps need to be taken to ensure vehicle compatibility soon to enable longer term benefits to be realised

Considering both plug-in hybrids (PHEVs) and pure battery electric vehicles (BEVs).
Hinges on the ability to supply the required electricity

H_2

Continued innovation could enable hydrogen fuelled vehicles to be successful.
Development of a new hydrogen nationwide supply chain would be required for this to be rolled out

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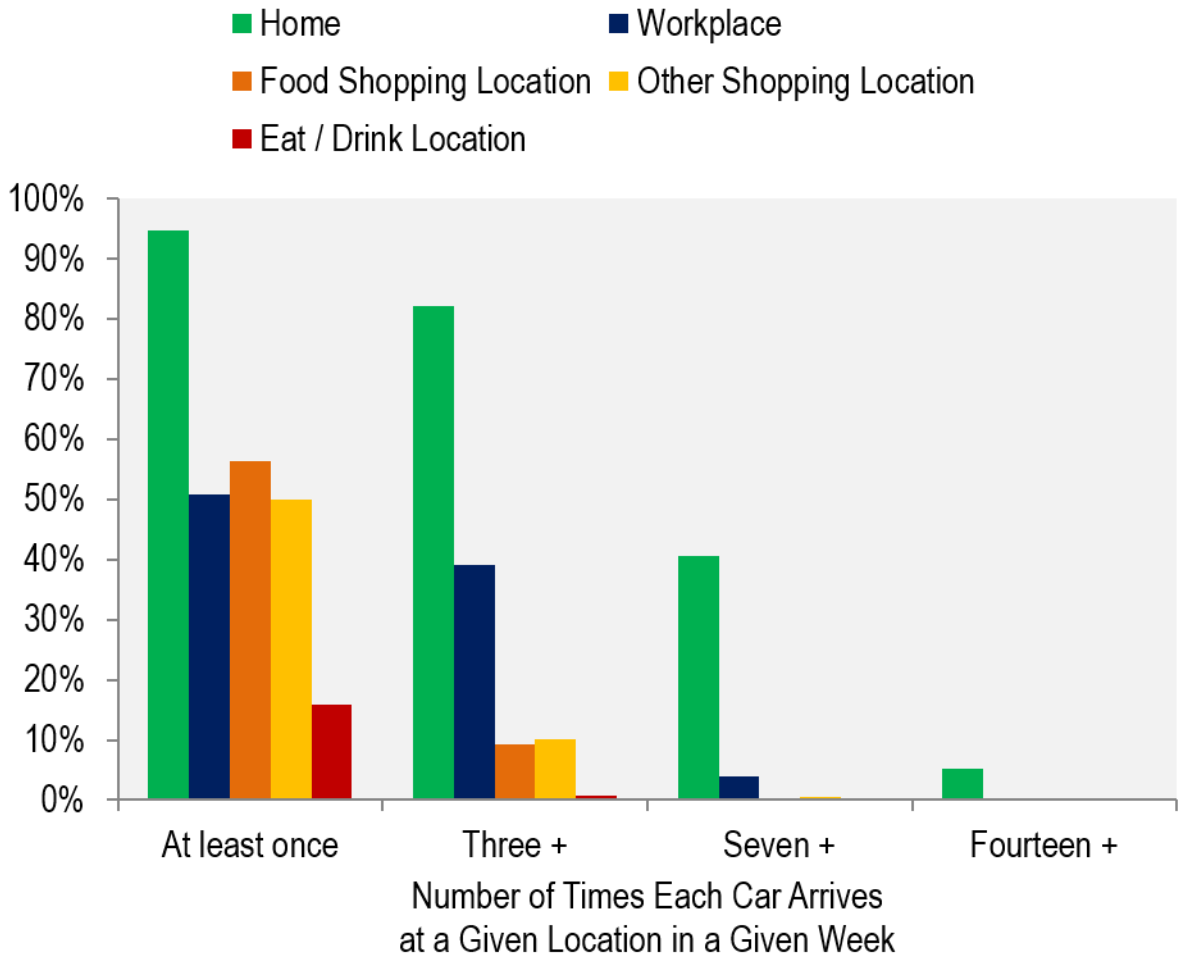
Consumer travel patterns

- Understanding how consumers use vehicles is critical for assessing the energy supply requirements of those vehicles
- The ETI worked with the DfT to develop a model of UK travel patterns, derived from the National Travel Survey

- Homes are by far the most frequently visited location providing the best opportunity for recharging of vehicles
- Less than half of cars regularly visit a workplace (despite this being the second most frequently visited location)



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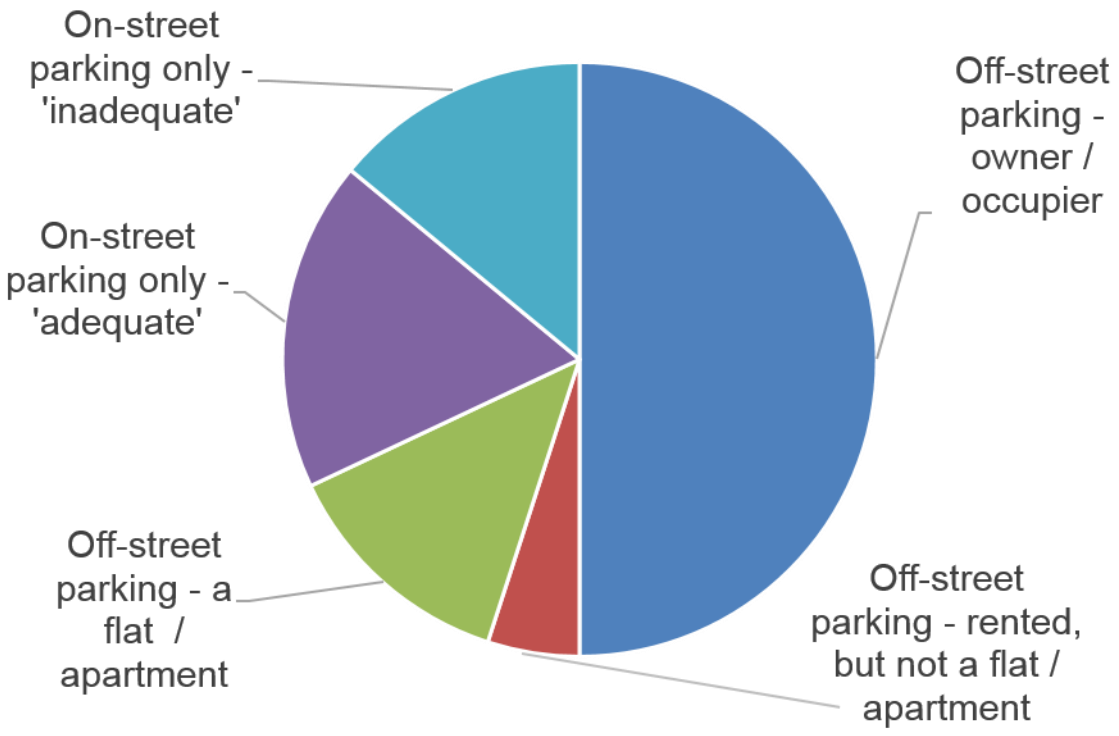
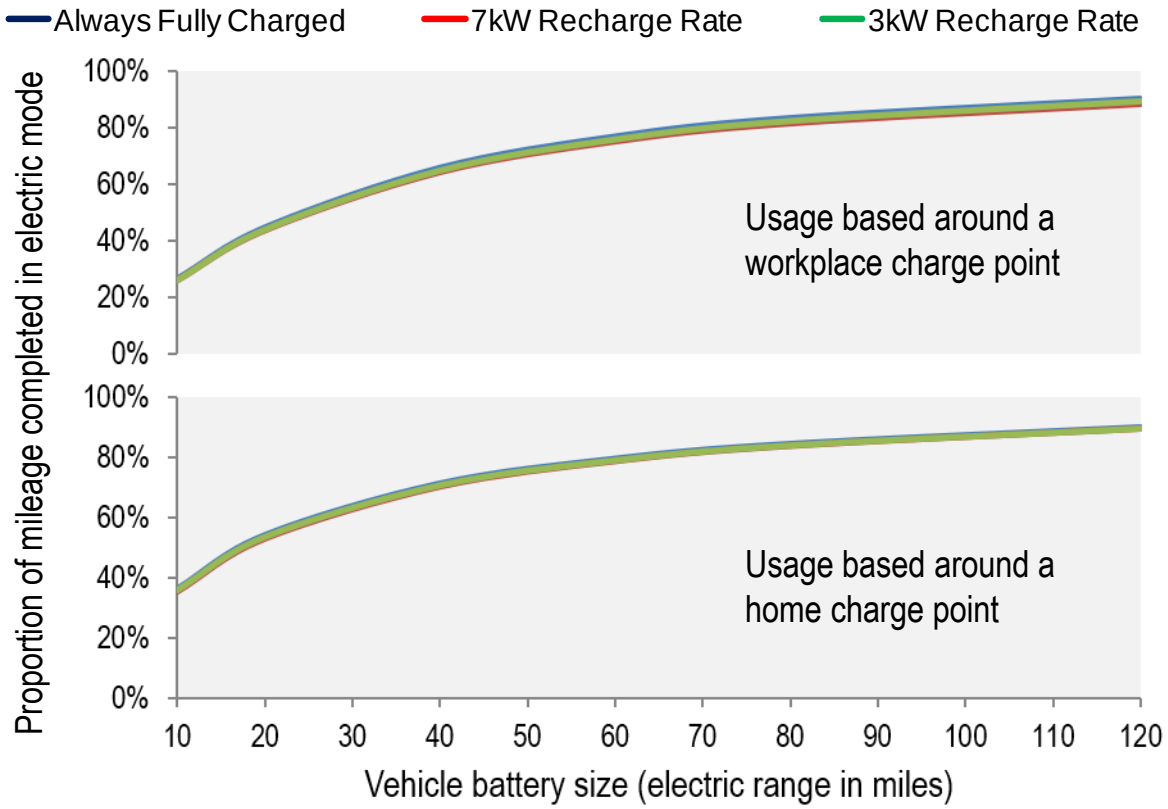
Charging at home

- The majority of homes have suitable parking and access for home charging
- Connections for most homes could support up to two 3kW charge points or a single 7kW charge point



- For 3 or 7kW connections, parking durations at home (or work) generally far exceed required charging times, even looking at a range of battery sizes



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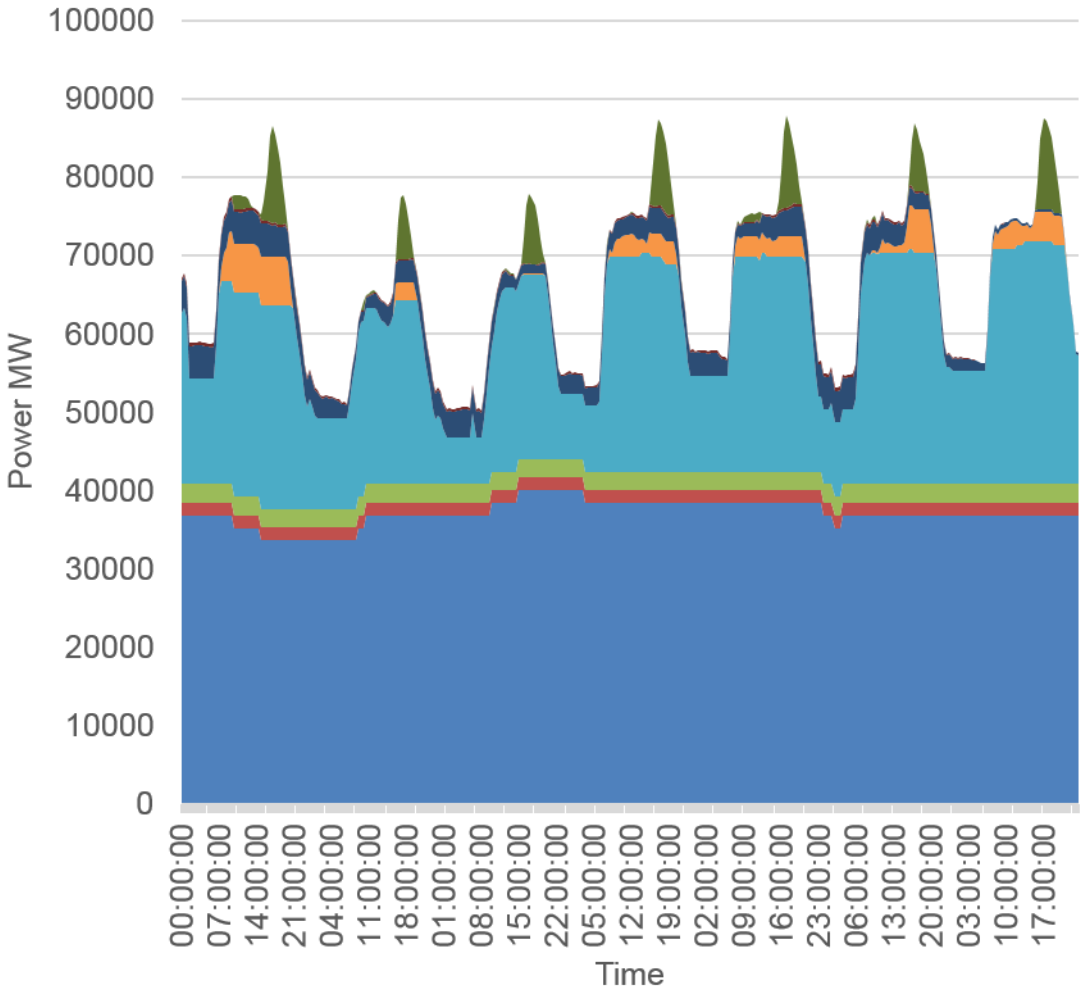
Electricity supply requirements

- Electricity supply must meet demand at any instant in time
- Generation capacity has to be sufficient to meet peak electricity demand
- Any increase in peak electricity demand (even if it only occurs once every few years) will require additional capacity in either storage or generation
- Peak electricity is extremely expensive to make available.
- The implications for vehicle recharging are especially significant for rapid recharge points.
- The decarbonisation of transport through electrification will rely on the decarbonisation of the power sector



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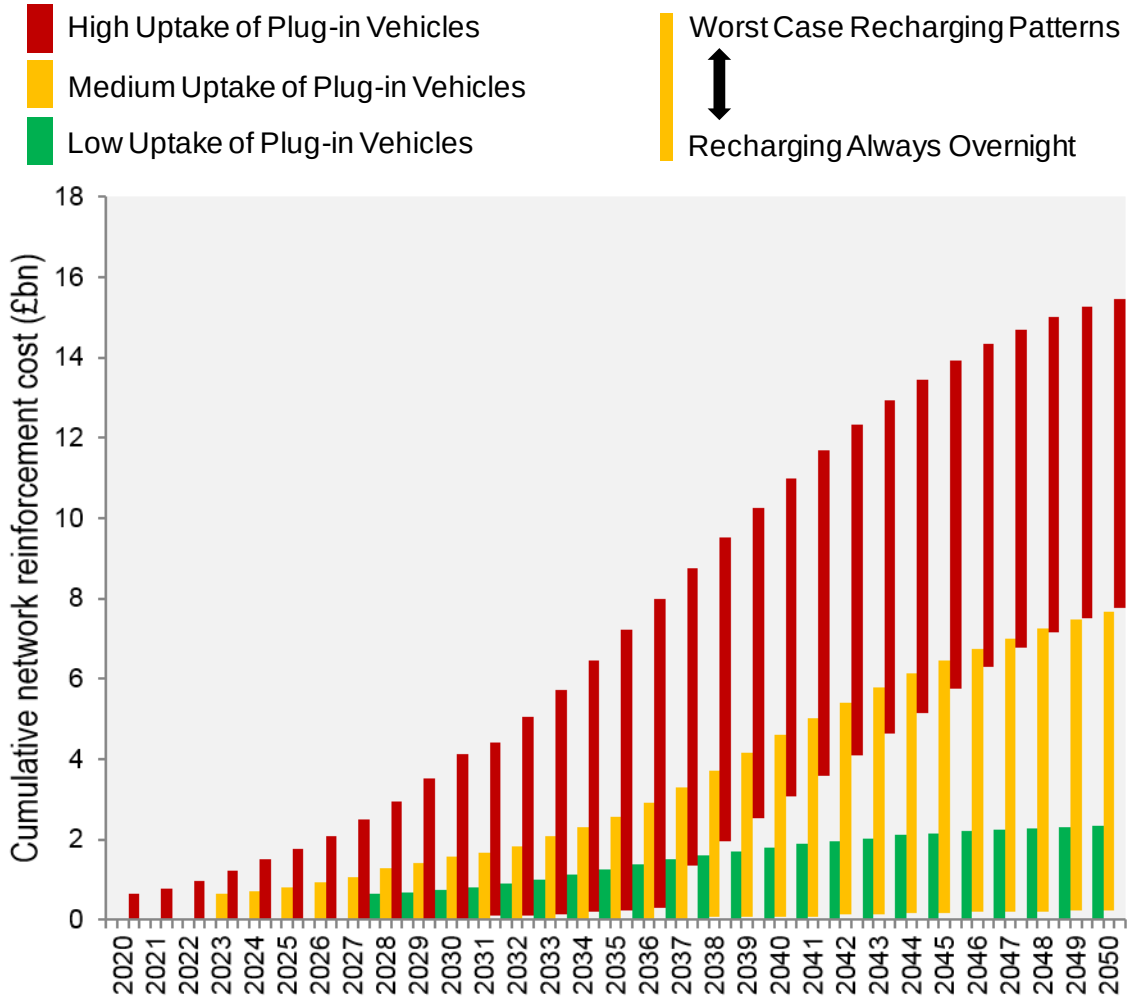
Electricity infrastructure requirements

- Whilst individual properties have sufficient capacity for charge points, the distribution network does not have enough capacity for all dwellings to draw their maximum power demand simultaneously.
- The network is sized assuming everyone has different patterns of behaviour.
- An increase in local peak demand will trigger a need for significant investment in the electricity network or in local storage capacity
- This is likely to be exacerbated by greater electrification of heat supply
- A larger proportion of renewable generation would also impact the availability of electricity for vehicle recharging



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Final thoughts

- The automotive sector is a global industry and economies of scale play a large part in the platform development decisions that are taken
- Other sectors will have an influence over the viability and cost effectiveness of taking different pathways to decarbonising light vehicles. **These sectors will have their own drivers**
- There are critical considerations for the energy supply chain whichever route to decarbonising transport is taken
- Developing strategies to best exploit the different paths that could emerge will be vital to a cost effective and successful transition

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