

Conference: A race against time

Energy innovation for net-zero

Thursday 25 January 2024. Aerospace Integration Research Centre (AIRC)

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WE'LL GET THROUGH
THIS TOGETHER..



Key Challenges in achieving Net-Zero

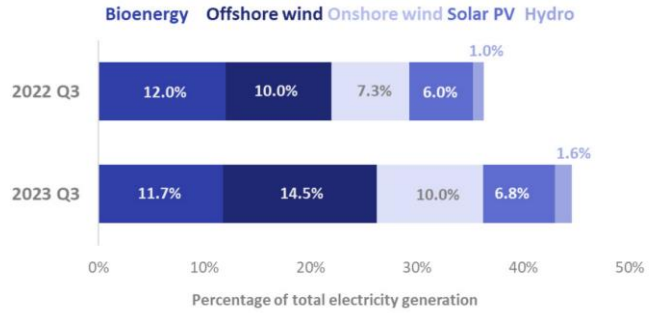
25 January 2024



Key challenges in getting to net zero

Renewable energy investment is a UK success story, significant YoY growth

Chart 6.3 Renewables' share of electricity generation – Q3 2022 and Q3 2023 (Energy Trends Table 6.1)



Now need to focus on:

1. Connecting low carbon assets to the grid quickly and cheaply
1. Operating a renewable system efficiently and securely
1. Helping people decarbonise their homes

Tackling the remaining challenges require focus to shift:

- from producers to consumers
- from building big assets to optimising assets on the system

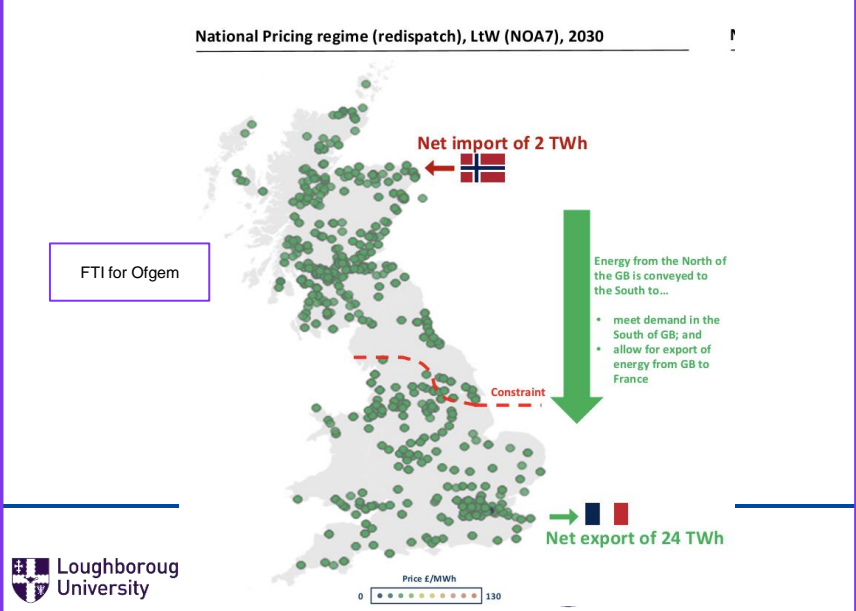
Doing this will allow us to get to net zero quicker and cheaper. But it does require us to challenge traditional thinking and make sure we are not duped by fossil fuel interests.



1. Stop “grid lock” holding up renewable deployment

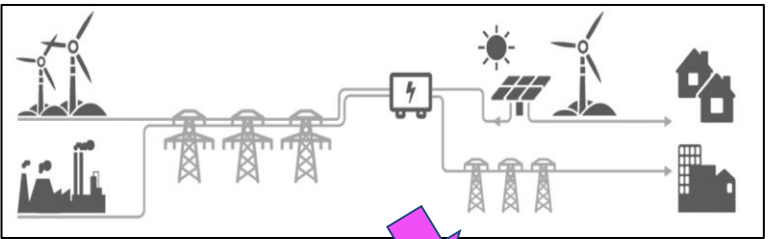
- Some stark facts:
- Most projects have a connection offer AFTER 2030
 - Transmission connection Q over 400GW at the end of 2023 - multiple times the new capacity required
 - It takes 14 years to build a transmission line
 - In the next 6 years need to build 5 x more transmission lines than built over the last 30 years

AND we could massively reduce the need for new transmission and save £12bn if we “just” used the interconnectors properly.

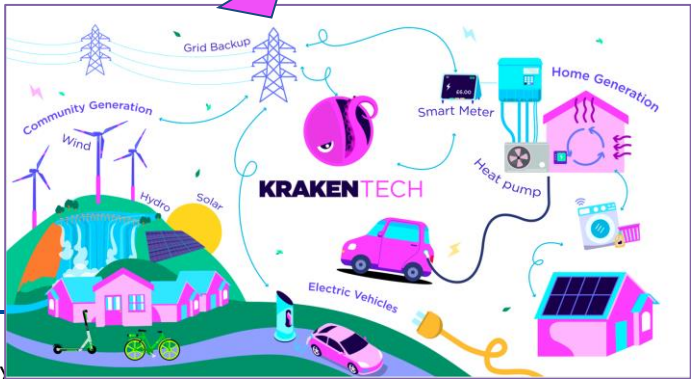


2. Use fresh thinking to operate a renewable system efficiently

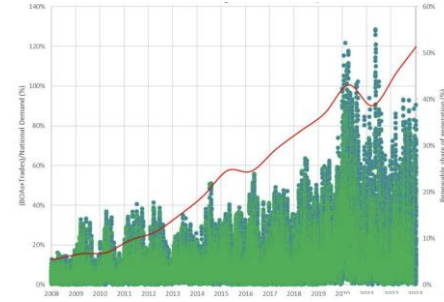
“Reaching net zero isn’t turning a brown caterpillar into a green caterpillar but into a butterfly” RenewX



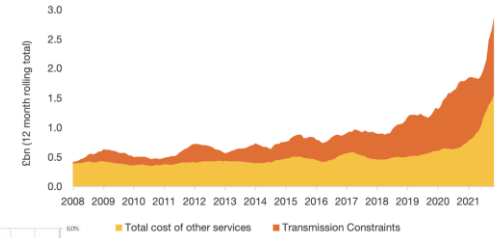
- Decarbonised
- Distributed
- Bi-directional
- Democratic
- Digital



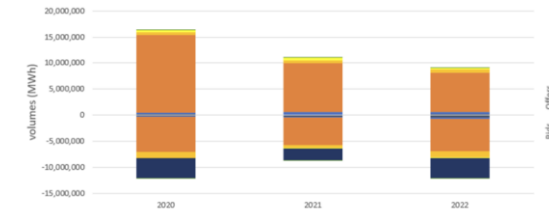
The ESO is having to redispatch an increasing portion of the market



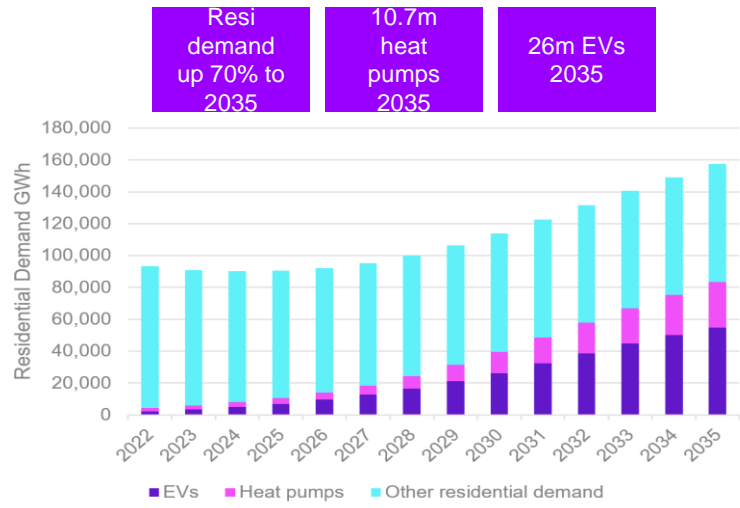
The cost of balancing services is increasing



The Balancing Mechanism is still largely dominated by gas



Massive potential to use flexibility in electrified transport and heat to save £bns for everyone



- Half of residential demand will come from flexible resources by 2035
- By 2050 we could be reducing peak electricity by around 25%/25GW if new household load is managed smartly
- Cornwall Insight estimate by 2040 smart consumer demand could be saving the country over £14bn a year - if optimised to smooth peaks
- Fewer wind farms, fewer networks, less dependence on fossil fuels, cheaper balancing costs

Smart demand management is already a reality - GB is leading the world:

- 1.5m Octopus Energy Customers and growing
- EV customers saving 66%, Heat Pump customers saving £200+ ; 800MW “virtual power plant”
- Free electricity in windy hours for 25k customers in certain postcodes
- 10 year zero bill guarantee for those with PV + batteries + ASHP

3. Help people decarbonise heat (transport is at exponential growth already)

Electrification has to be the answer - “electrify where you can, use hydrogen for the rest”:

- Heat Pumps 3x more efficient than gas fired heating and 6x more efficient than using green hydrogen
- Heat Pump technology is improving and becoming less costly and more suitable for more housing types
- Electrical heating is flexible load - automation helps to flatten system peaks



Technology revolutions are never linear - we need to beware of linear thinking.

Technology S Curve in action:

6kW heat pump installed for between £5k to £8k (less than £500 with grant) - reaching boiler parity with scale.
Purpose built to be fast to install and easier to maintain
Room sensors to automatically control while providing comfort

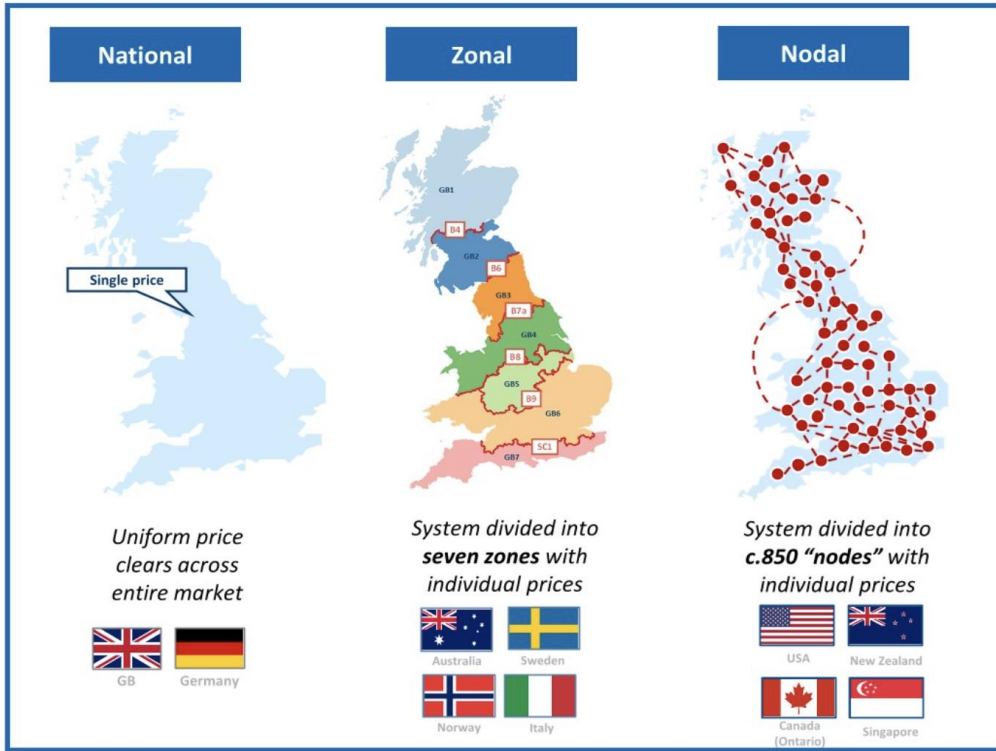
Solutions are more about markets and enablers, **less about** Government funding

- Radical wholesale reform and dynamic DNO charges to solve issues with interconnectors and make better use of consumer flex and other low carbon flex (grid scale batteries etc)
- Short term - routes to market for consumer flex - currently not allowed to participate in the BM and Capacity Market participation is difficult
- Remove remaining barriers to customer heat pump adoption - enduring support for lower income households (£ms a year)
- Focus on consumer protections and retail

Vs

- Building big assets, subsidising CCUS (£20bn), increasing balancing and constraint costs (£2bn+ p/a)
- Continued dependence on fossil fuels to meet system peaks - paying coal to stay on the system (£400m p/a)
- Government subsidy for hydrogen - currently £2bn a year
- Consumers left out of the transition, and asked to pay for it.

Radical wholesale market reform required to optimise the operation of millions of new assets on the system



- With a single GB wholesale price EVs scheduled at the wrong time for the system about 30% of the time - not getting the most from flexible load
- No signal for energy intensive industrial load to locate to where power is plentiful and cheap
- Scotland/NE England has some of cheapest power in Europe, so could help levelling up and reduce the cost of constraining off excess wind through better price signals
- Total social benefits £25bn++ over 16 year period

We have the potential to create a smarter, leaner and lighter energy system... not just a greener one

- We need fresh thinking - caterpillar knowledge doesn't help us understanding butterflies
- We need to innovate for the customer - helping them decarbonise and support and be part of the electricity system
- We need to be digital - to optimise multi-million of assets doing different things at different times and places across the country
- We need to avoid linear thinking and limiting assumptions about technology and how it can help solve today's problems

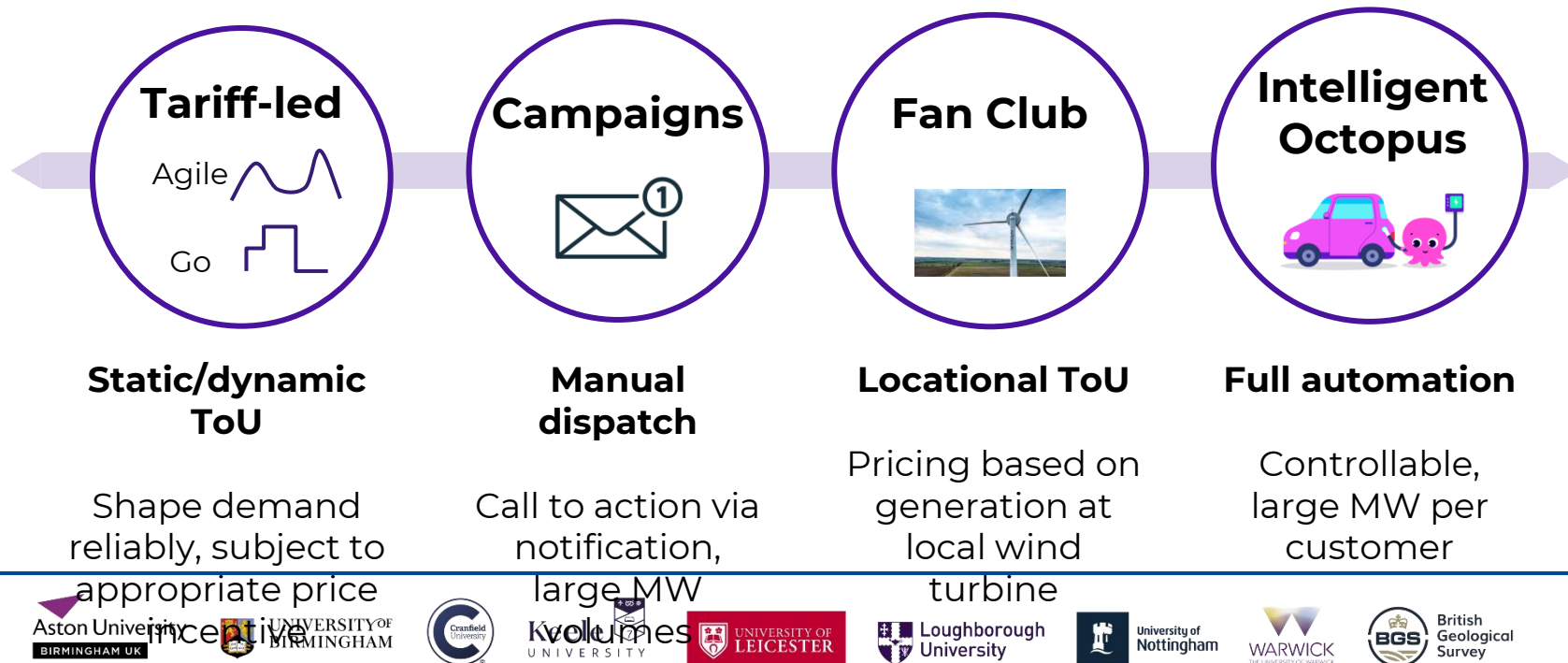
Britain has the potential to lead the world in showing how to integrate renewables onto an electricity system in an innovative way that saves £bns a year, and helps to boost the economy as well as helping the planet. We just need to get on with it.

THANK YOU



Context | Activating consumer flexibility has different flavours that are available today

Examples of consumer flexibility products designed and executed on Kraken within day(s)



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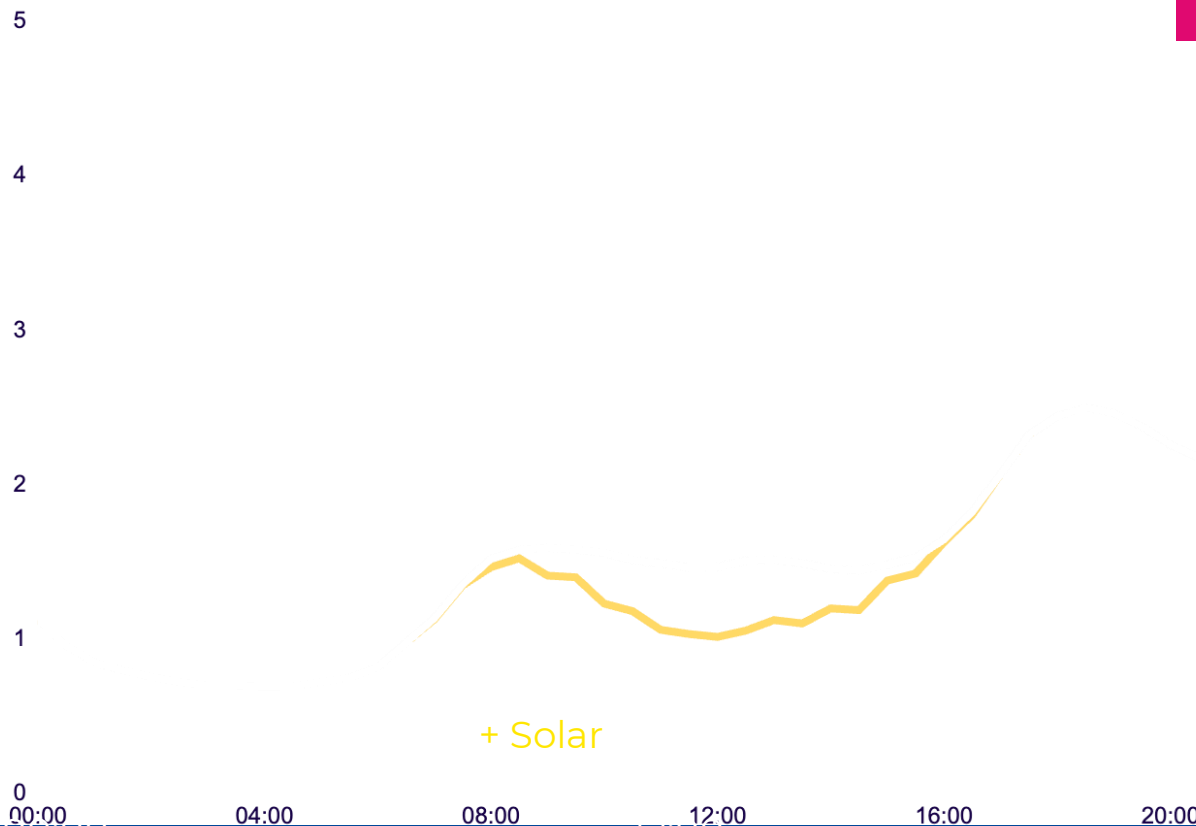
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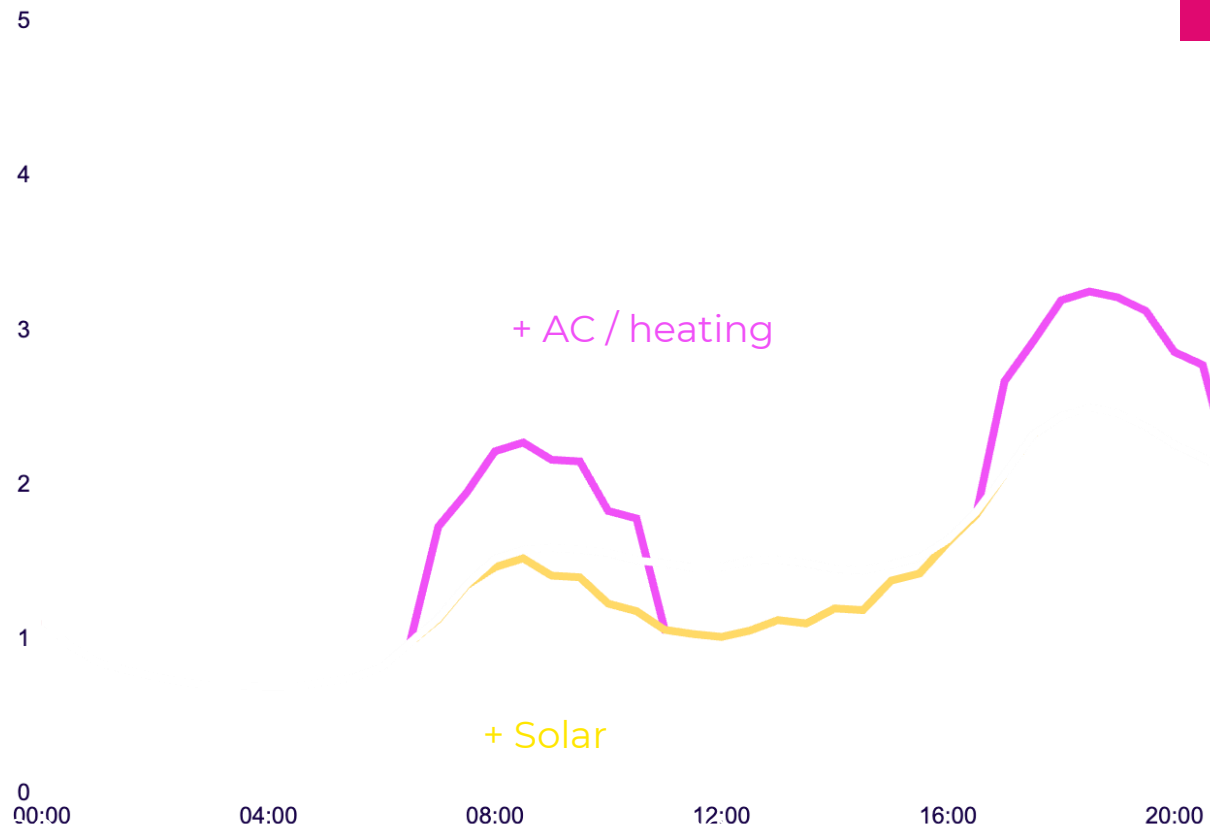
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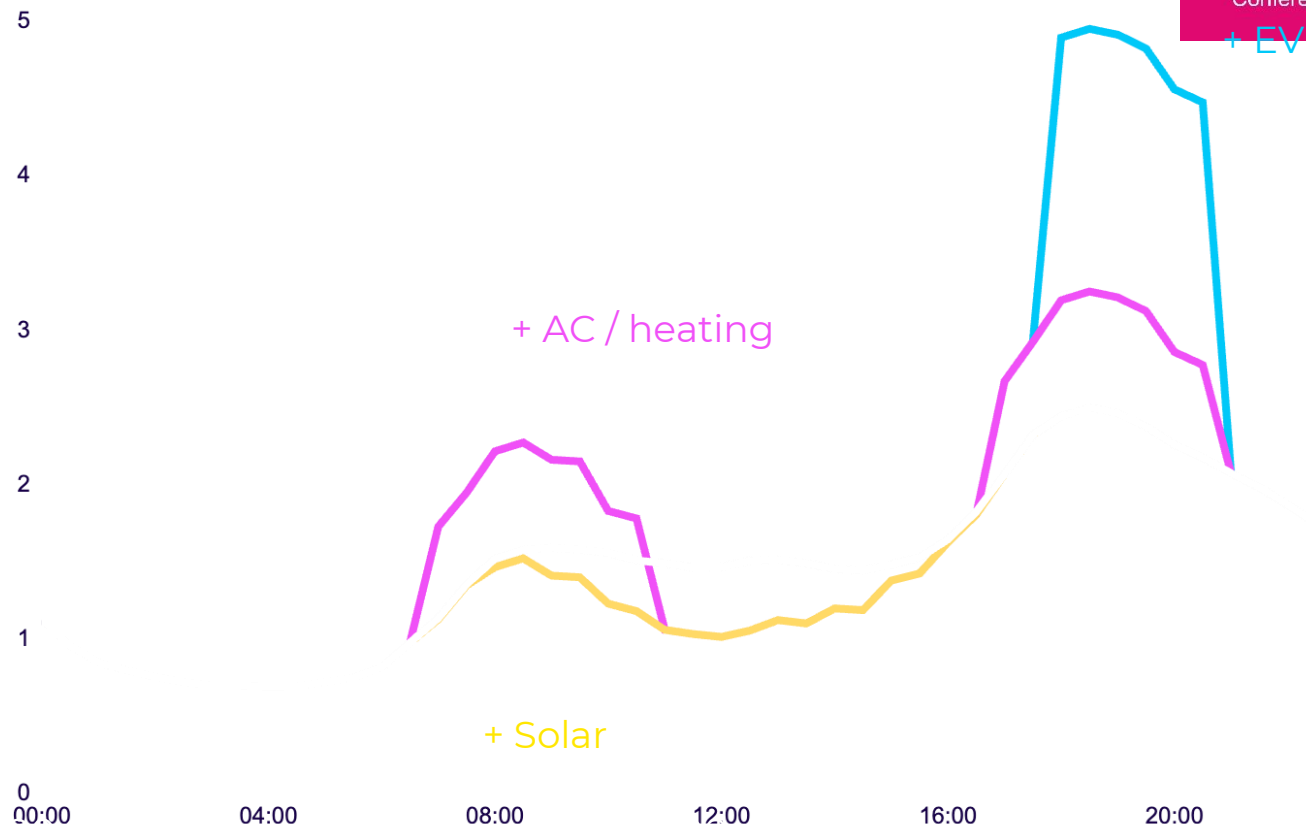
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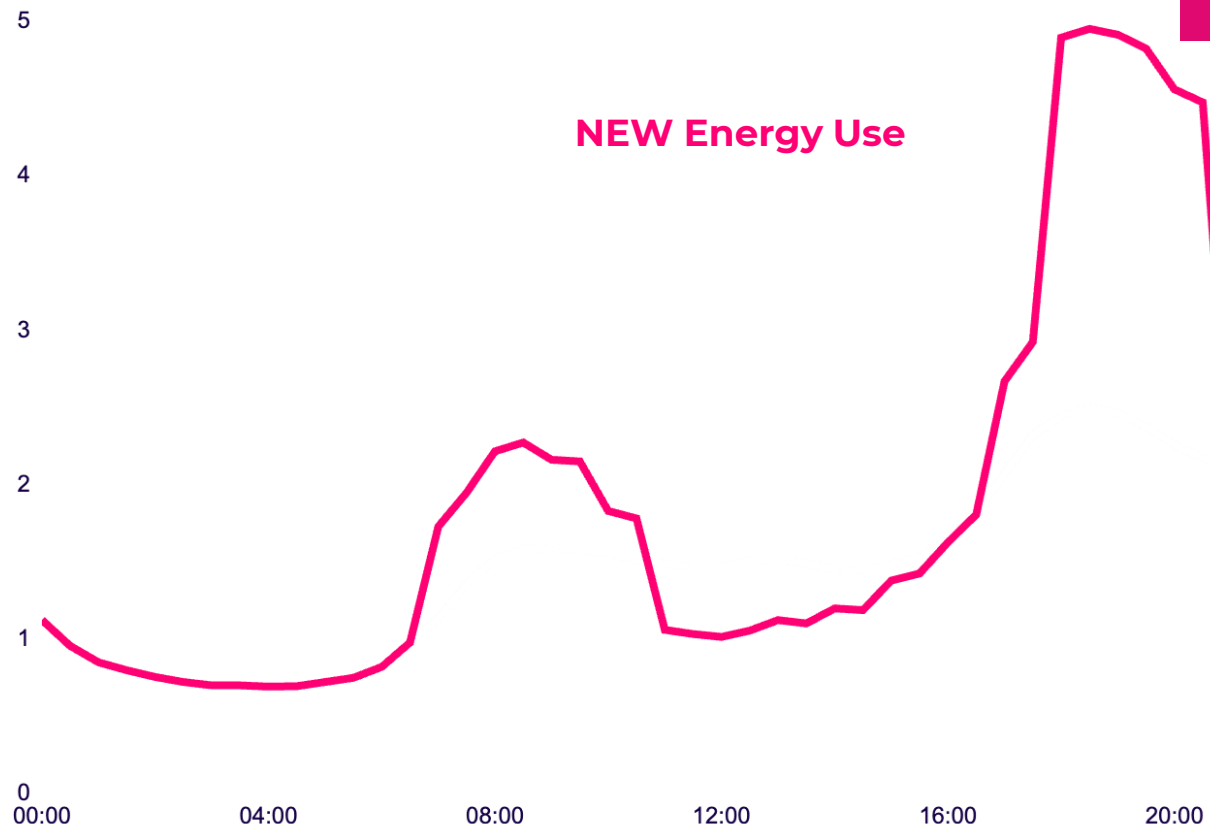
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Managed smartly, consumer products could help reduce total peak system demand

Figure ES.03: ACS Electricity Peak Demand

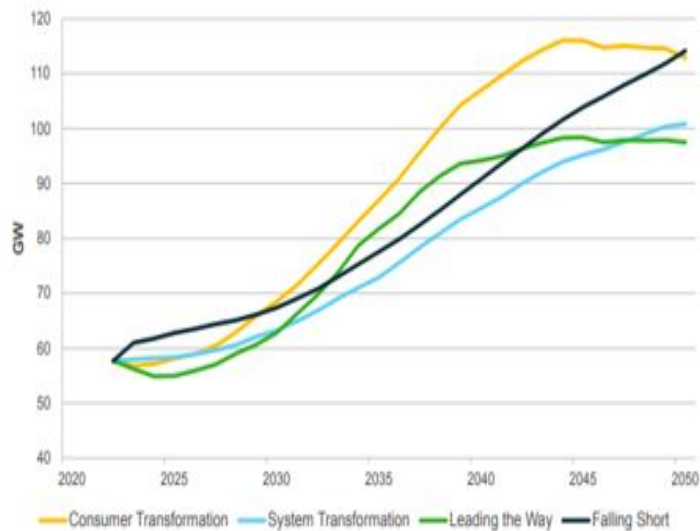


Figure FL.12: Electric vehicle charging behaviour at ACS winter peak system demand
 Consumer Transformation

