3. Energy Consumer

13 July 2023, 10am

ESO

Energy Consumer

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Agenda

10am	Welcome:	Lauren Stuchfield
	Key messages:	Jasmine Desmond
	Key insights & analysis:	Sagar Depala and Archie Corliss
	Guest speakers:	James Whiteford ESO, Sam Homan, CSE and Arna Sigurdardottir, Element Energy
	Guest speaker:	Farhat Raza, Ofgem
	Break	
	Q&A with Sli.do	
	Close	
	Virtual networking follows	

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1 Key Message
Policy and delivery

Measures to reduce uncertainty are needed to ensure the UK delivers a net zero energy system that is affordable and secure.

Net zero policy

Focus on heat

Negative emissions

2 Key Message
Consumer and digitalisation

Consumer behaviour and digitalisation are pivotal to achieving net zero but easy access to information and the right incentives are critical.

Empowering change

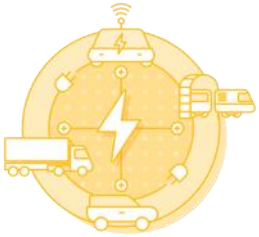
Digitalisation and innovation

Energy efficiency

3 Key Message
Markets and flexibility

Improved market signals and new distributed flexibility solutions are key to managing a secure, net zero energy system at lowest costs to consumer.

Distributed flexibility



Transport flexibility

Locational signals

4 Key Message
Infrastructure and whole energy system

Benefits to the whole energy system must be considered to optimise the cost of delivering net zero technology and infrastructure.

Strategic network investment

Connections reform

Location of large electricity demands

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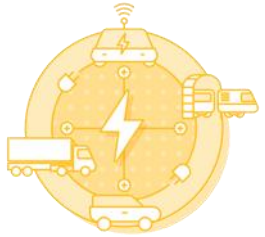

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Benefits to the whole energy system must be considered to optimise the cost of delivering net zero technology and infrastructure.

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Location of large electricity demands

Executive summary

What we've found	The cost of living crisis has suppressed demand, but consumers protect their consumption at peak times
Greatest uncertainty	How we will decarbonise heat and what replaces triad incentives from Industrial flexibility
No regret actions	Improve fabric efficiency, leverage the electrification of transport, enable consumer engagement in demand flexibility
Bottom line	Consumers must be supported through this transition whether that is through better provision of information, financial support, market changes which encourage behaviour change or clear pathways and timings for fuel switching

By 2030, we'll be using less energy than we are today in all scenarios…

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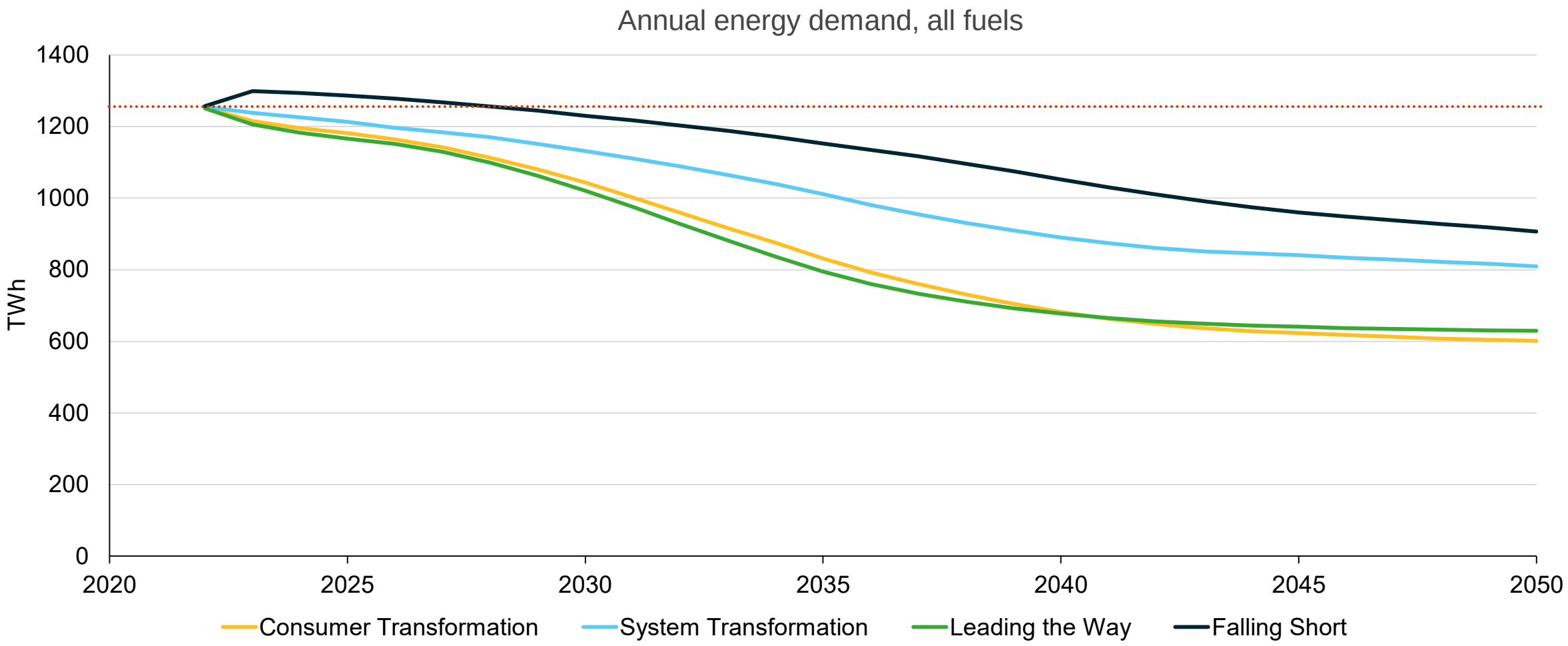
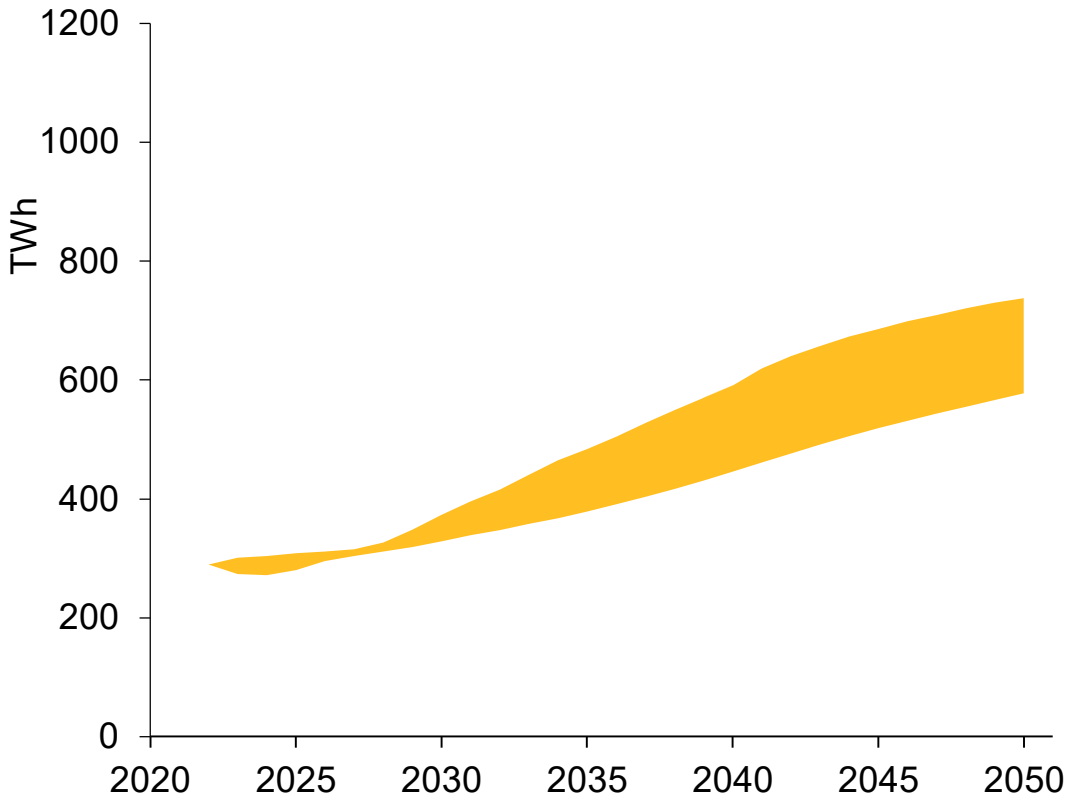
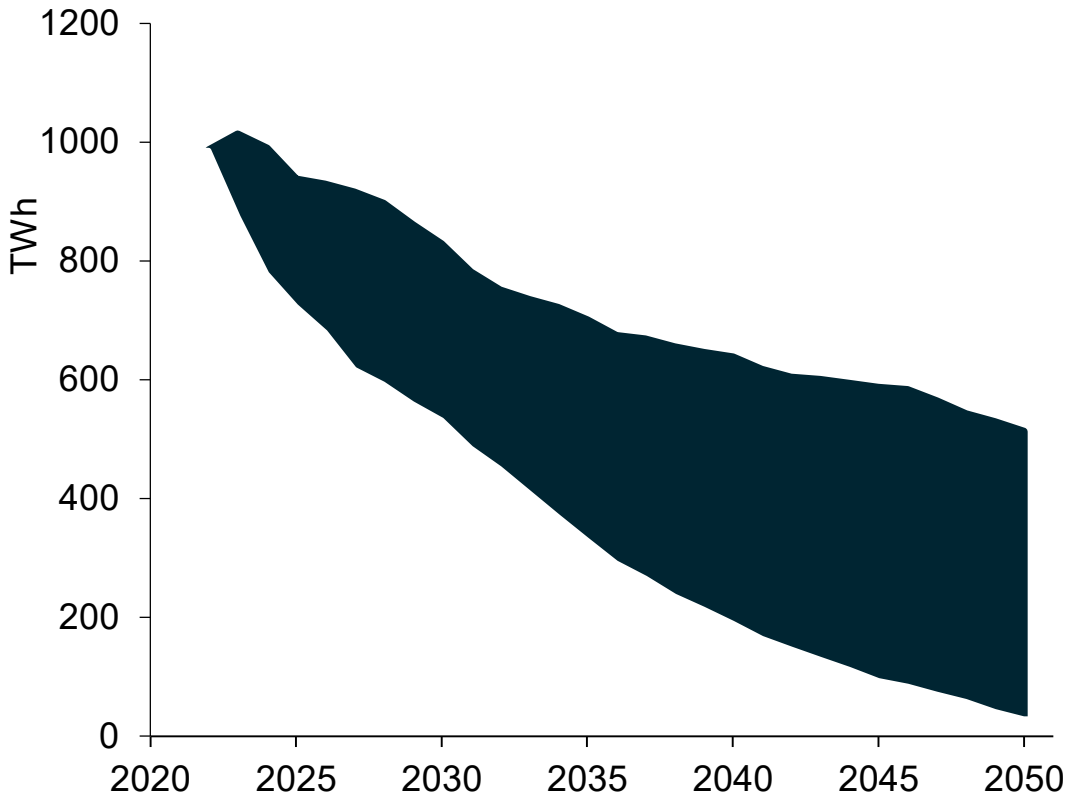


…because of a general shift towards electrification and efficiency

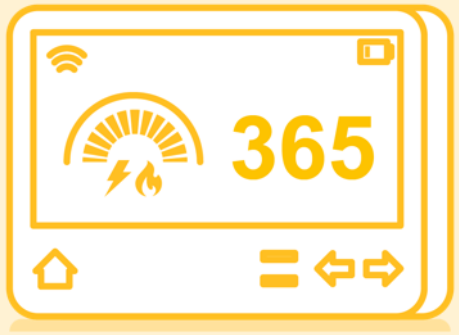
Scenario range: annual electricity supply



Scenario range: annual natural gas supply



The cost of living crisis



Annual demand (TWh)

The total amount of energy used through the year

Peak demand (GW)

The amount of power needed to meet demand when it is at its highest

Consumers are trying to save money, but are protecting the demand which matters most to them

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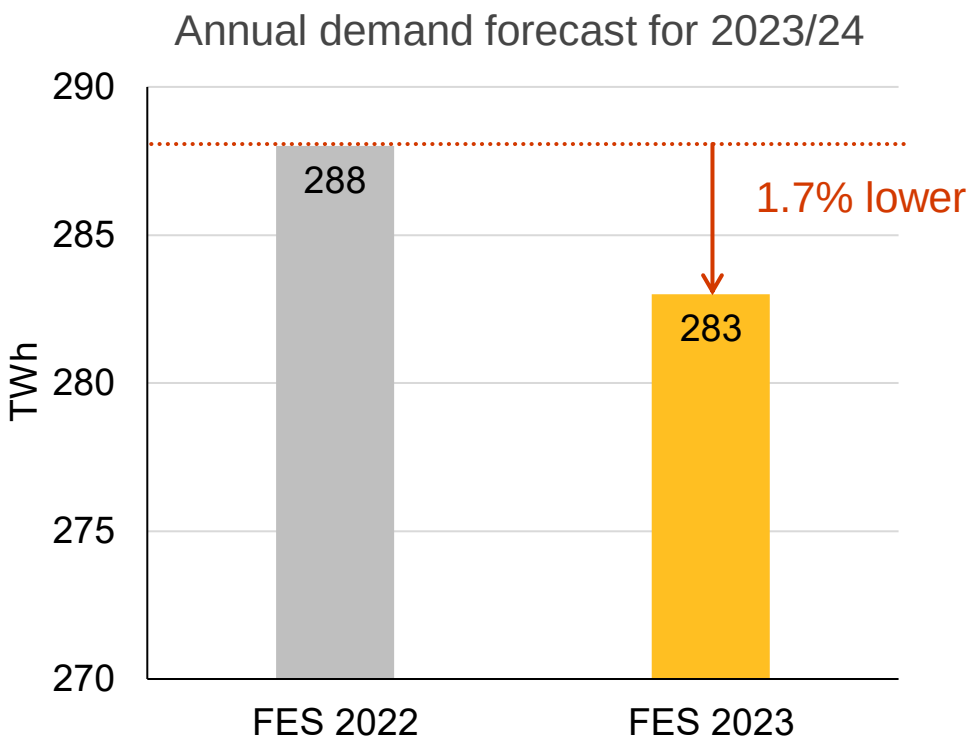

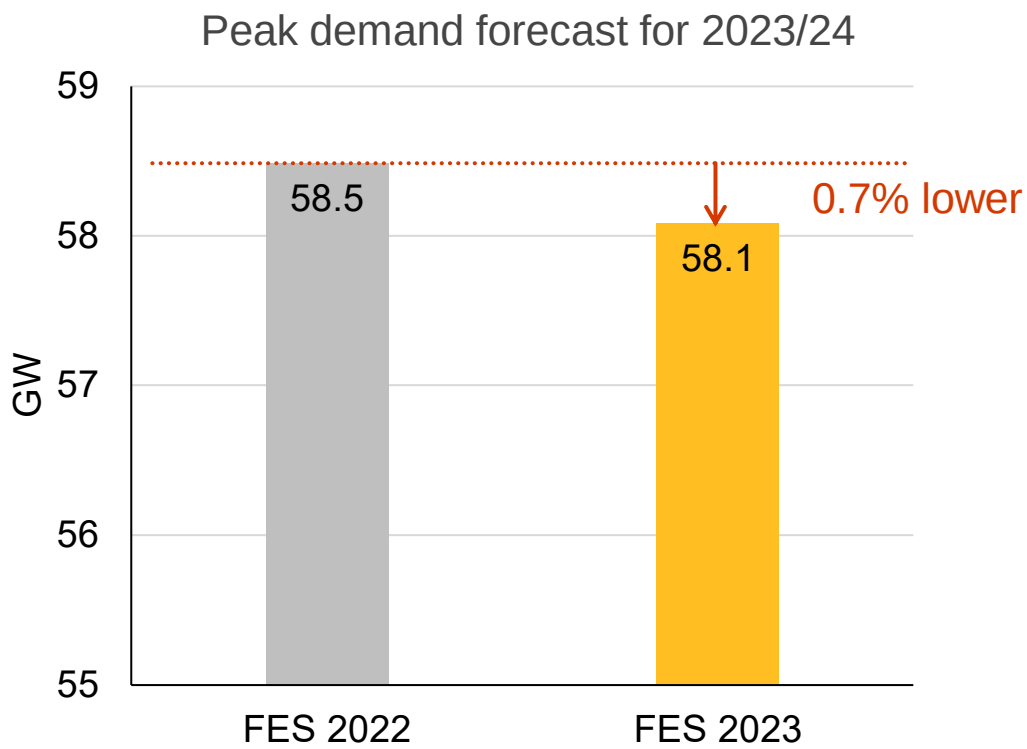

Insight Financial incentives should be combined with efficiency and flexible technology to increase their effectiveness at reducing peak demand

The cost of living crisis suppresses annual electricity demand between now and 2027

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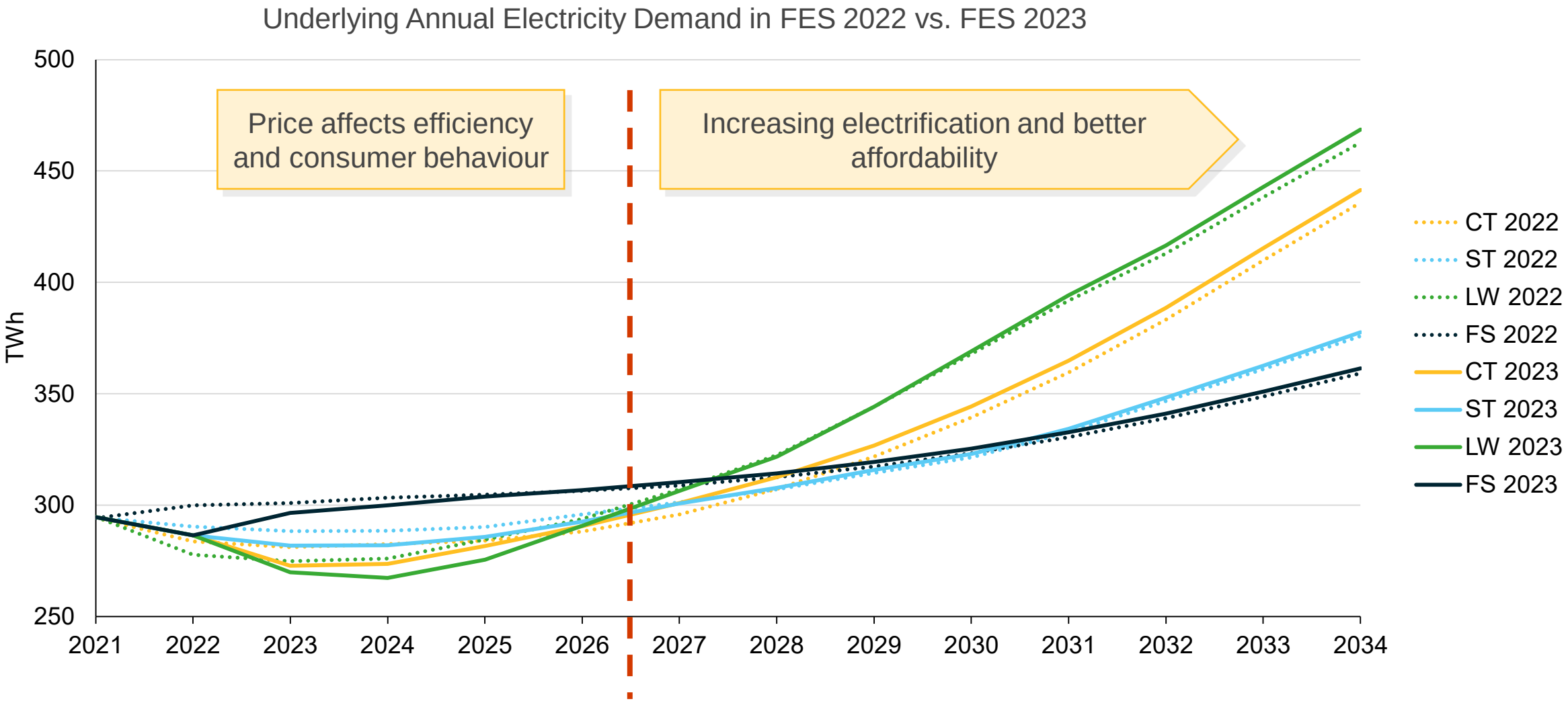

Consumers are less likely to reduce peak demand. Our forecast *increased* in Leading the Way.

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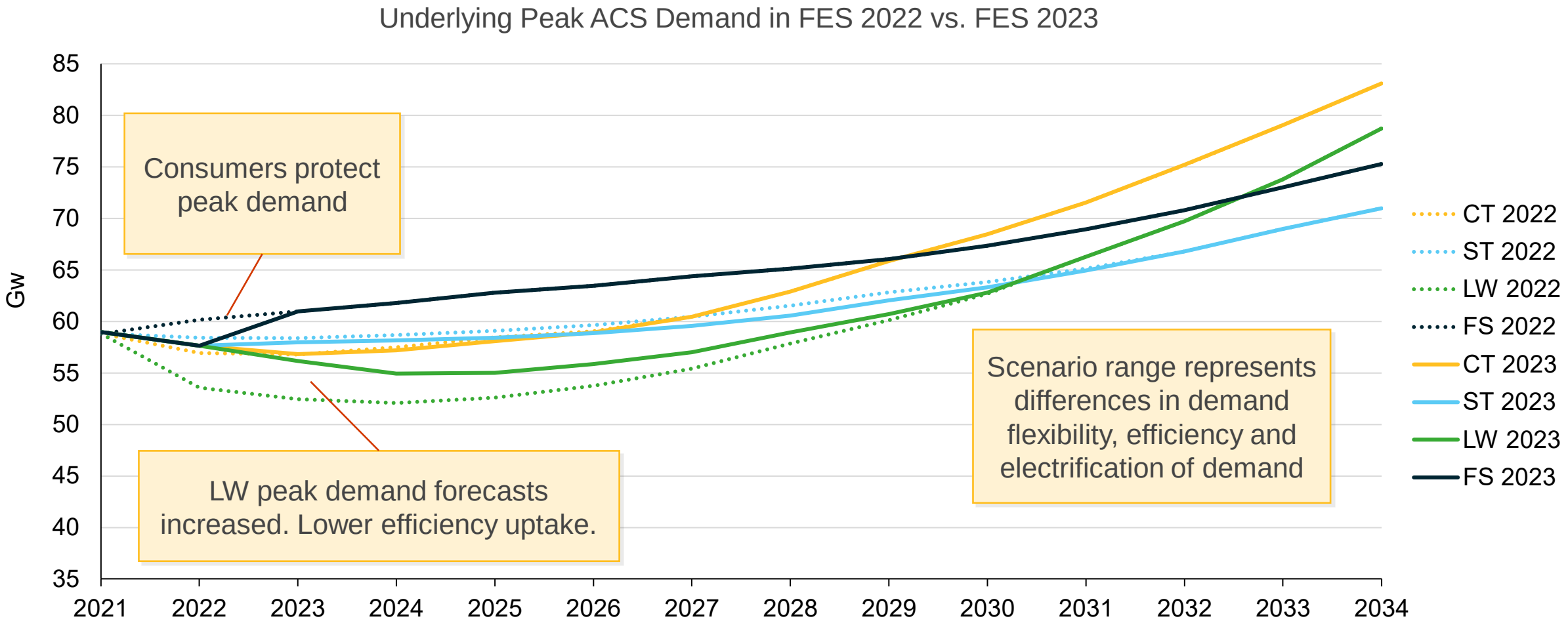

Insight Though peak demand is difficult to reduce, consumers engage in demand flexibility if given the right incentives and an easy way to do so.

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Energy Consumer

What we've found	Cost of living crisis suppresses demand, but consumers protect their consumption at peak times
Greatest uncertainty	How we will decarbonise heat and what replaces triad incentives from Industrial flexibility
No regret actions	Improve fabric efficiency, leverage the electrification of transport, enable consumer engagement in demand flexibility
Bottom line	Consumers must be supported through this transition whether that is through better provision of information, financial support, market changes which encourage behaviour change or clear pathways and timings for fuel switching

Electricity is emerging as the dominant fuel, but the range of uncertainty for domestic heating technology is very wide

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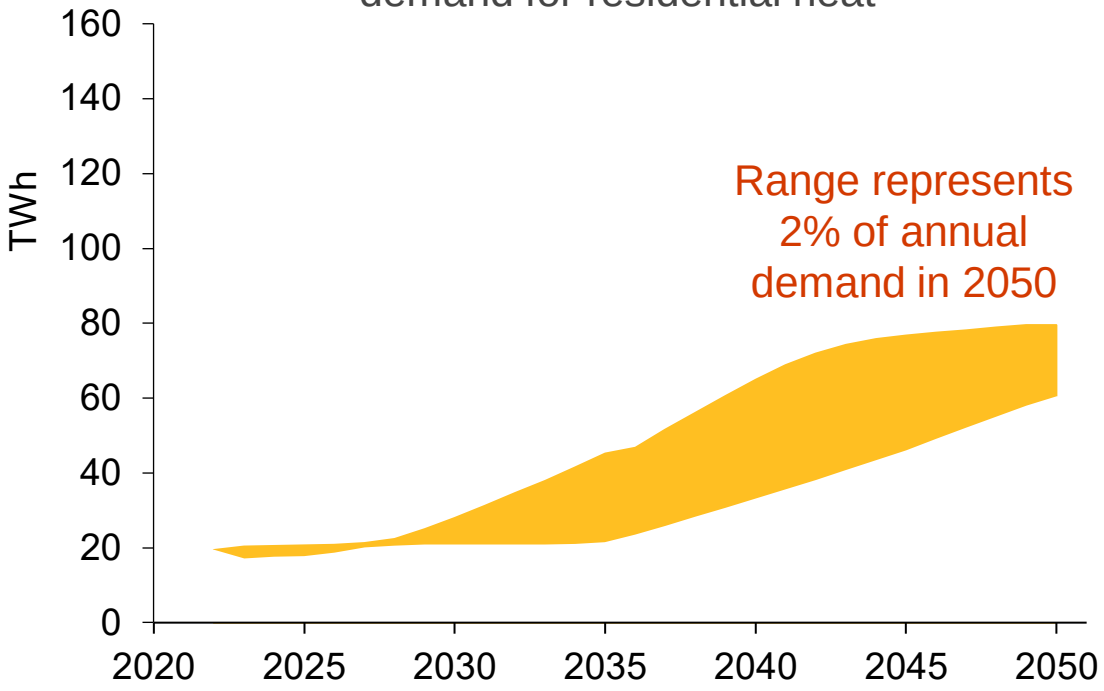
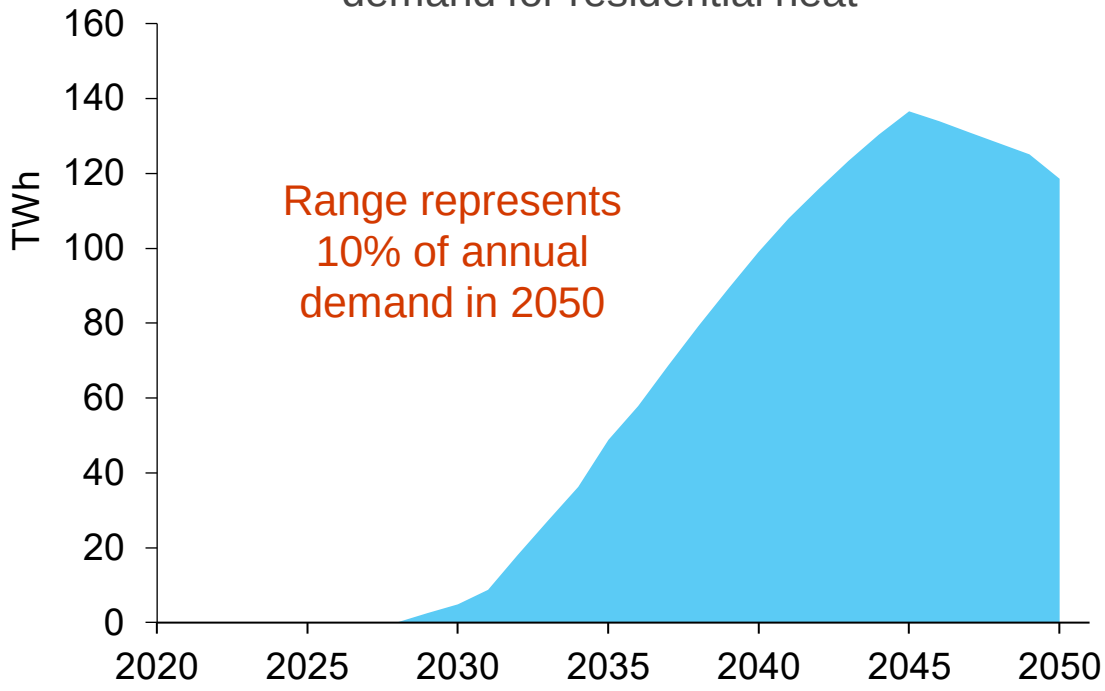
Scenario range: annual electricity demand for residential heat



Scenario range: annual hydrogen demand for residential heat



Insight Consumers and supply chains need strong incentives (grants) and clear pathways, at national and regional levels, to reduce uncertainty on the future of residential heat.

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Natural gas demand for heat declines in all scenarios, but there is still a wide range of possibilities for its demand by 2050

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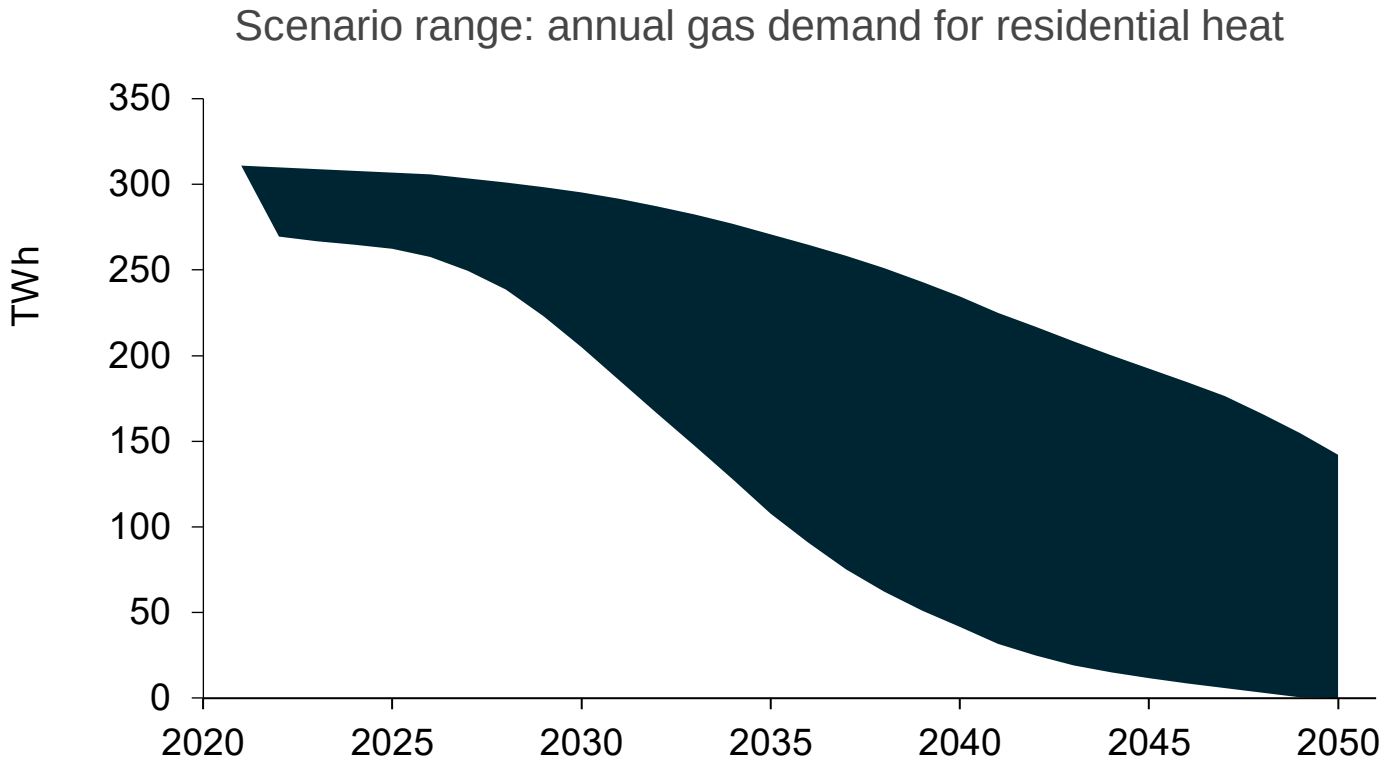

Range represents 12% of annual demand in 2050

Insight Consumers and supply chains need strong incentives (grants) and clear pathways, at national and regional levels, to reduce uncertainty on the future of residential heat.

Meeting the government target for annual heat pump installations is challenging but the right incentives make a big difference

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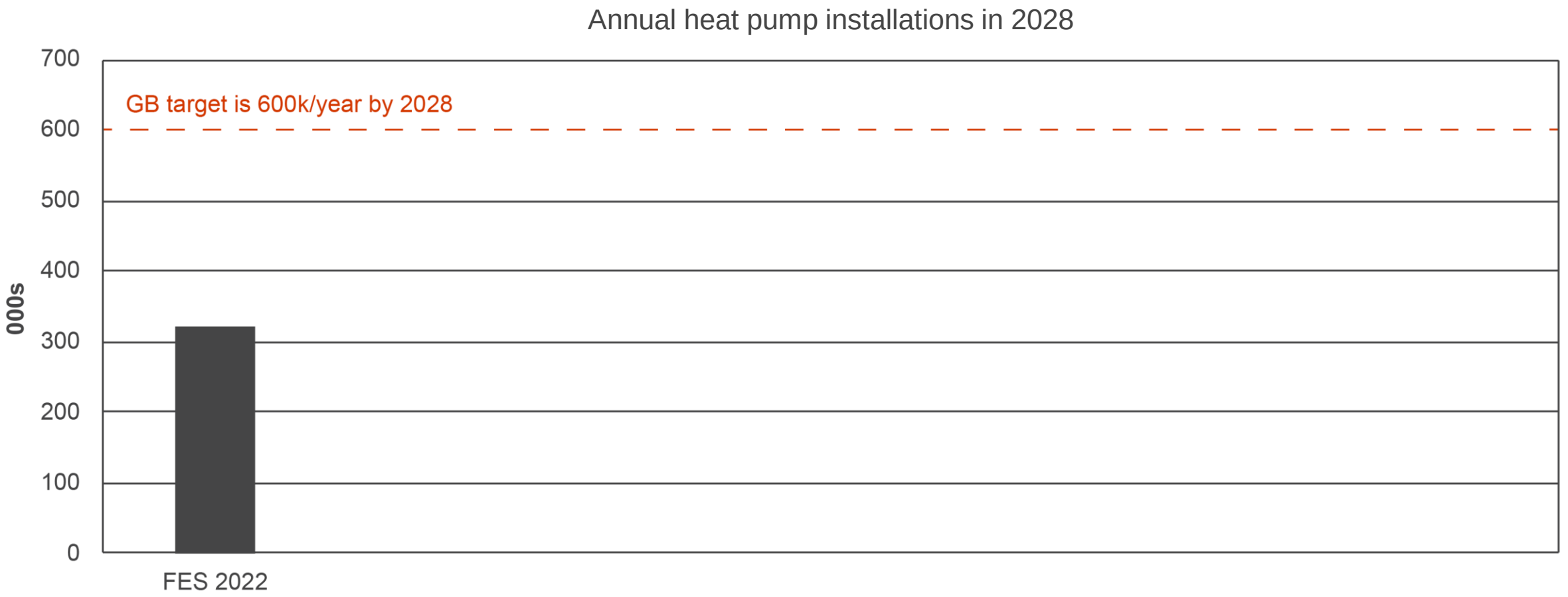

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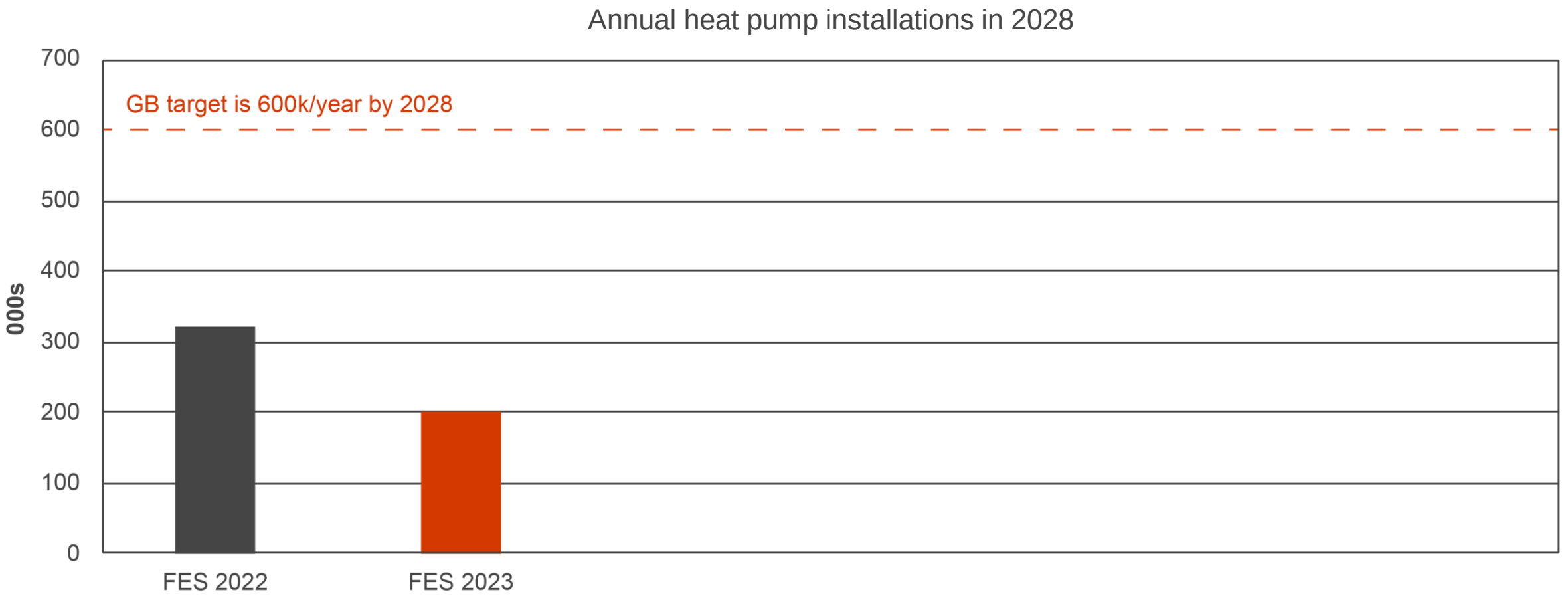

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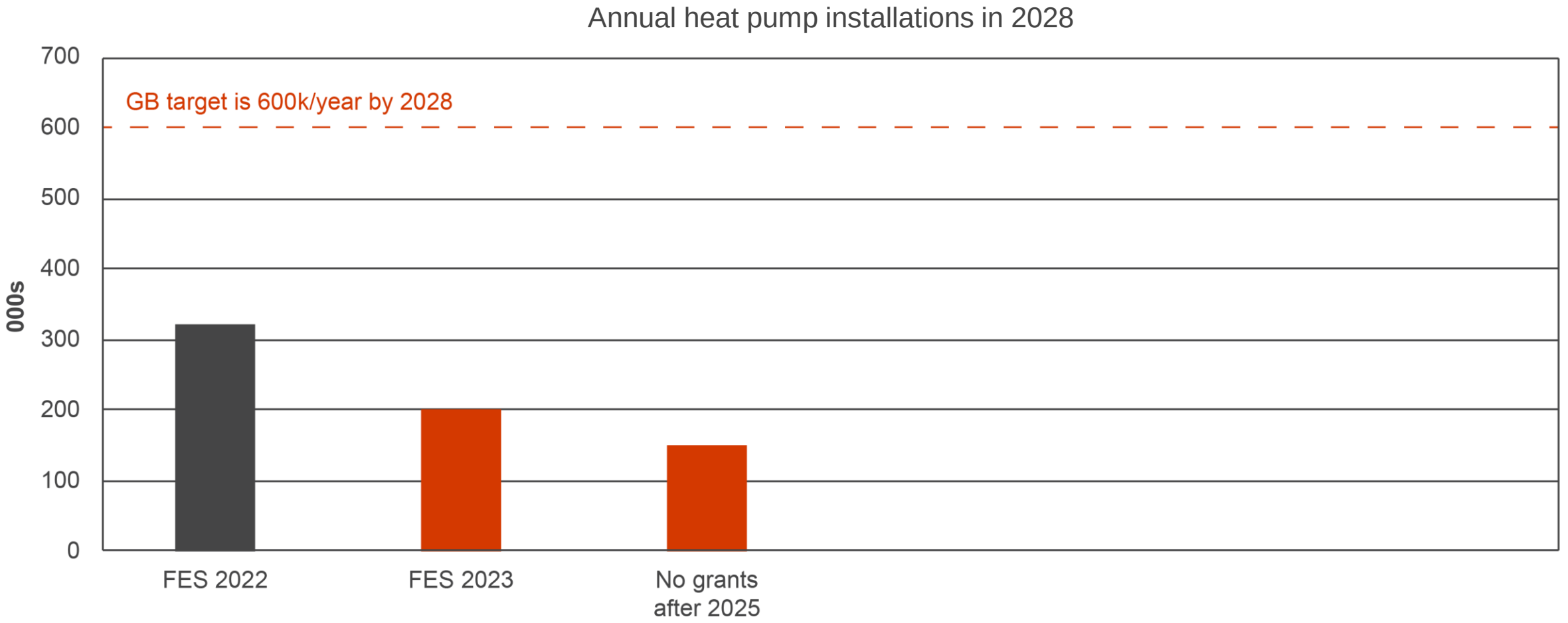

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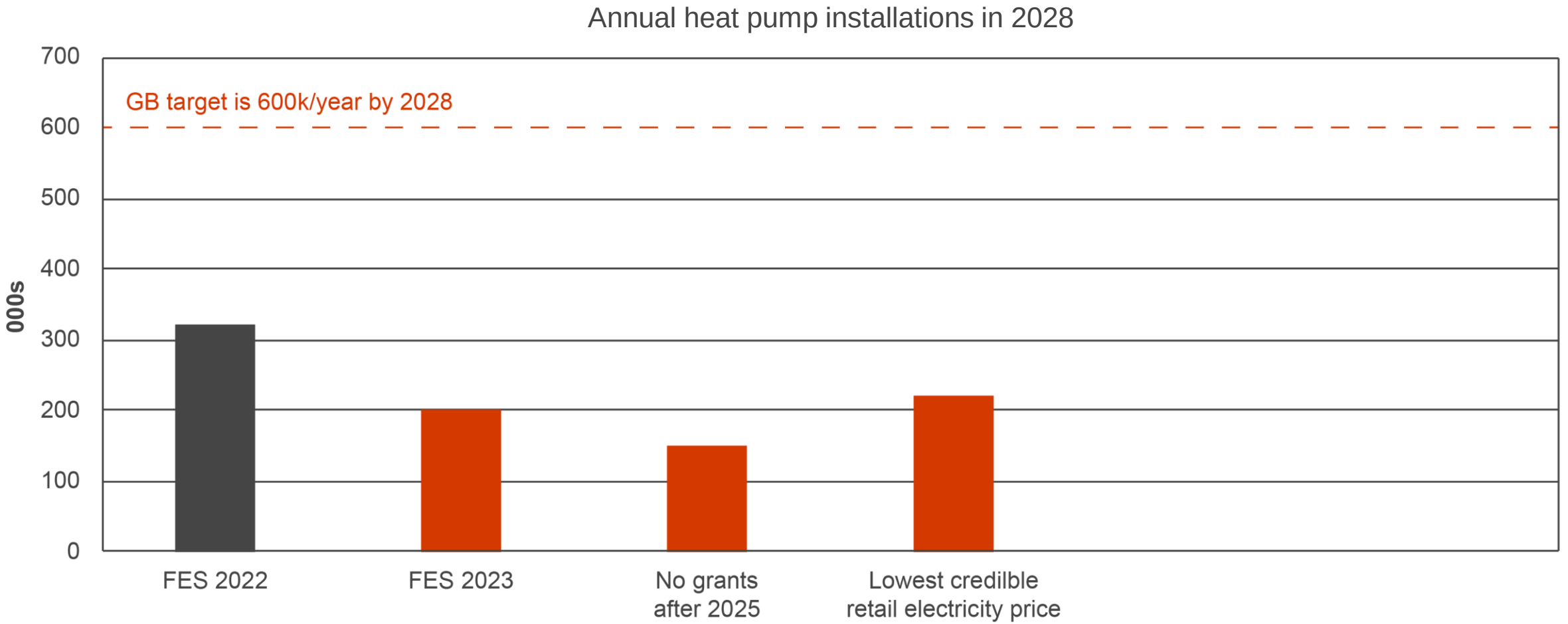

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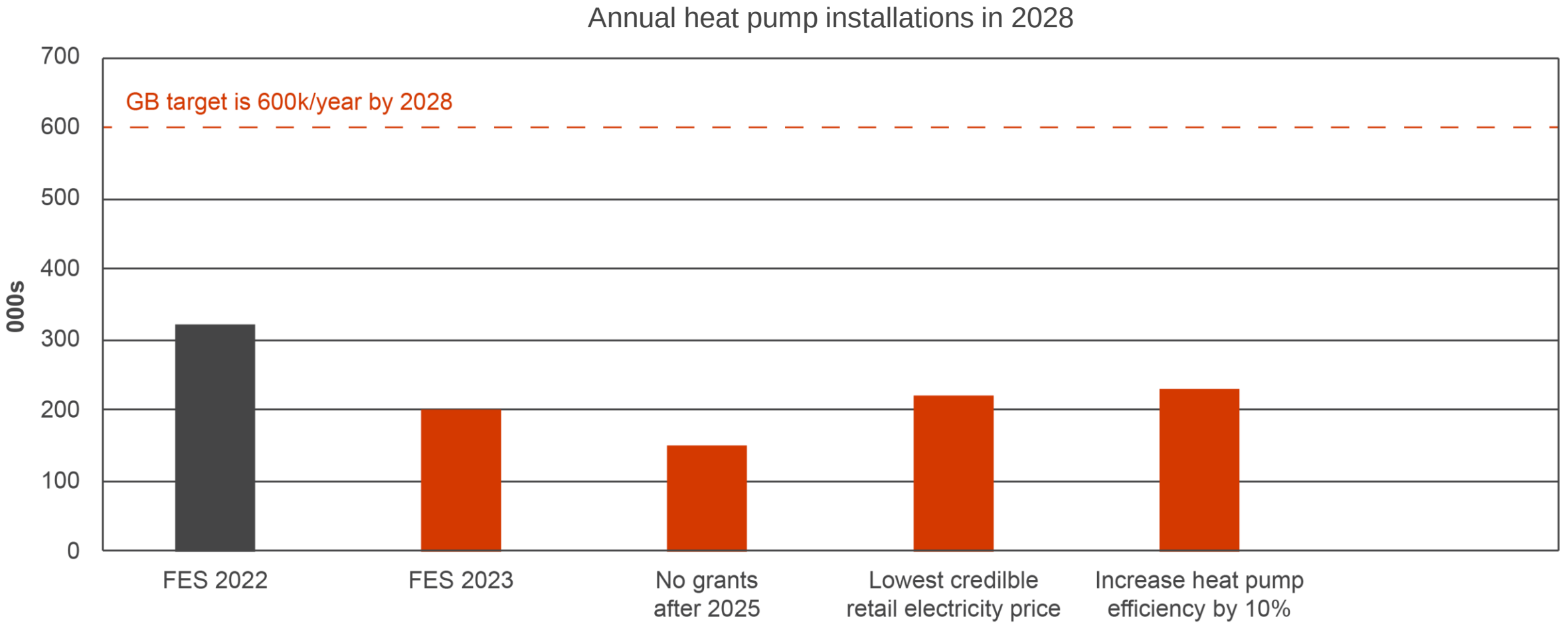

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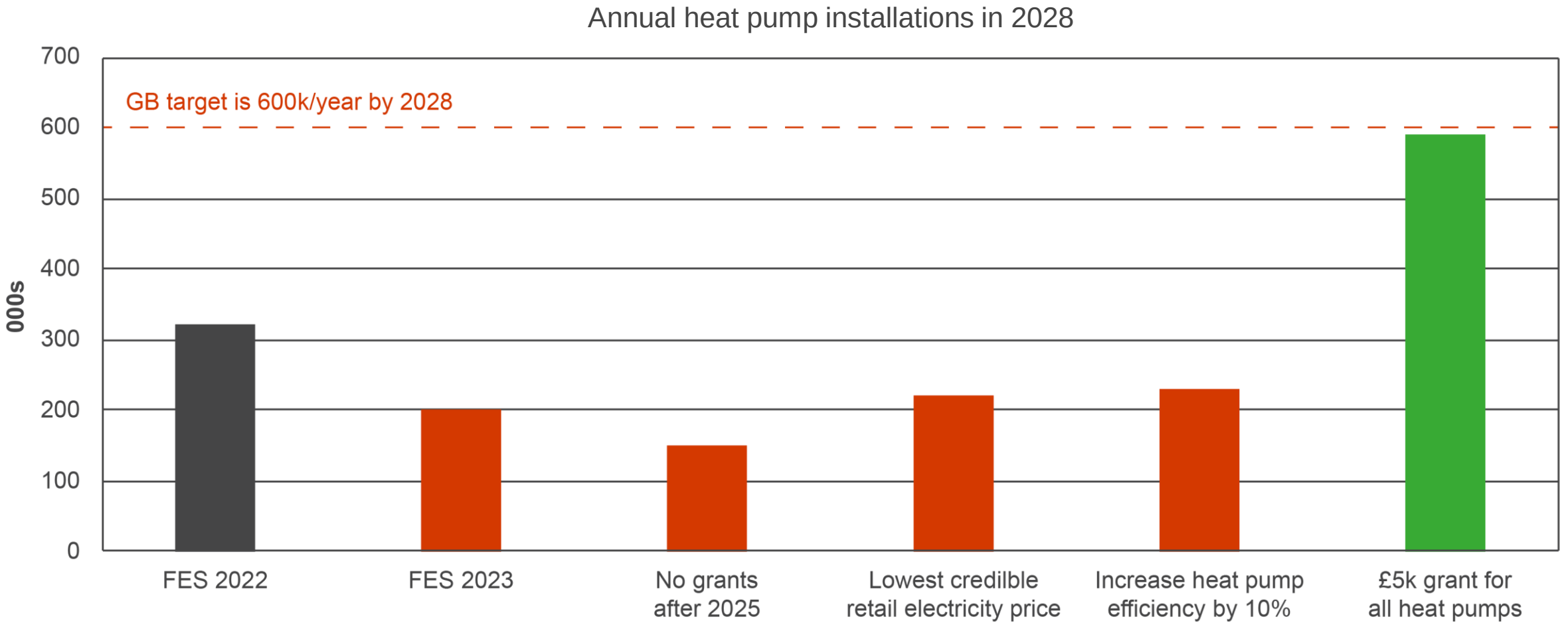

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The range of uncertainty for efficiency-based savings is also wide

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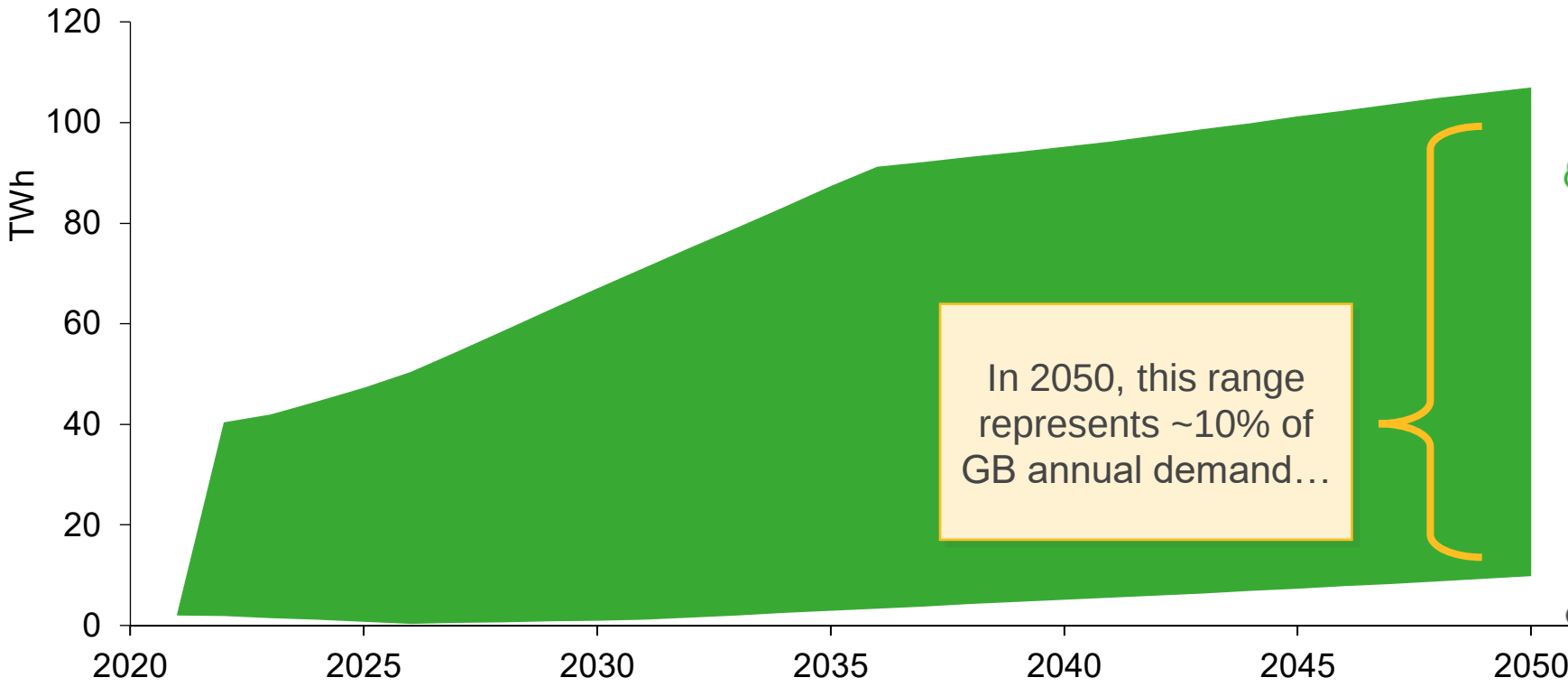
Scenario range: Cumulative saving in heat demand from insulation, higher new build standards and consumer behavioural change

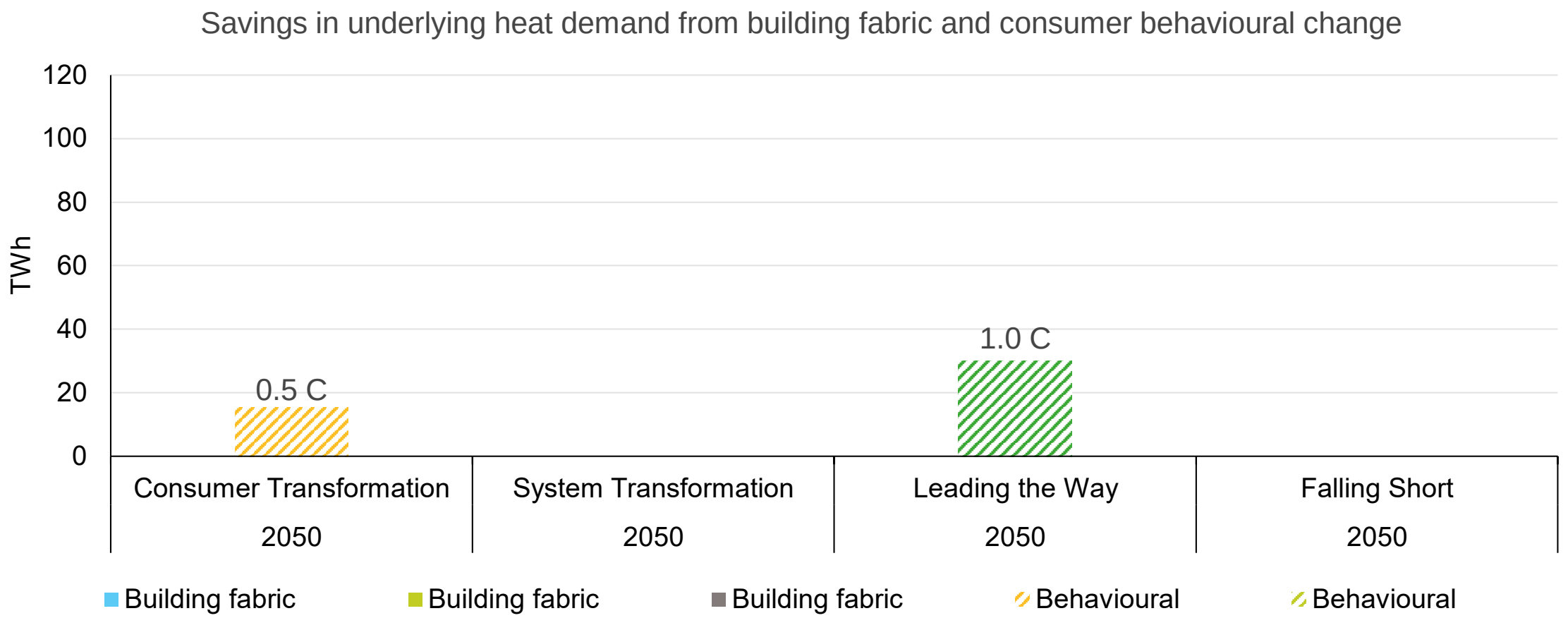


This household is Leading the Way and spending £135* less per year…

… than this household

Insight Consumers and supply chains need strong incentives (grants) and clear pathways, at national and regional levels, to reduce uncertainty on the future of residential heat.

Behaviour change is important…



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Behaviour change is important but fabric efficiency improvement is a no regret action

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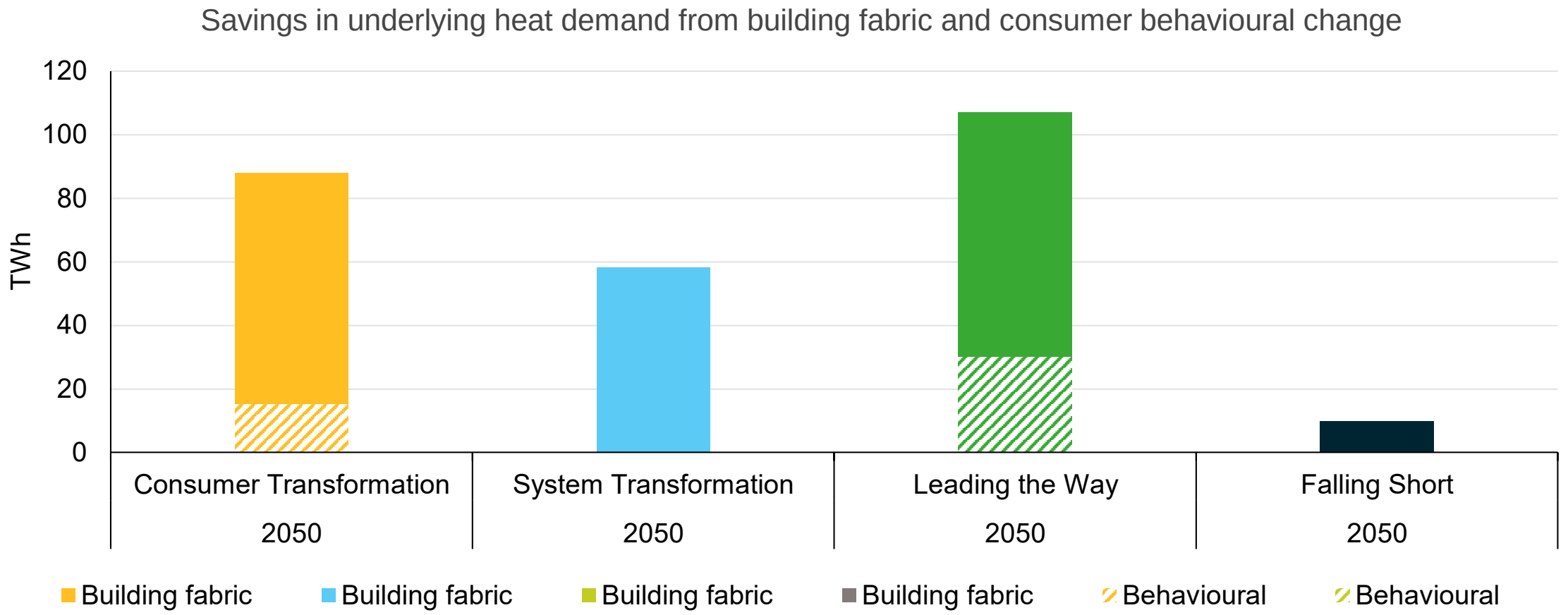

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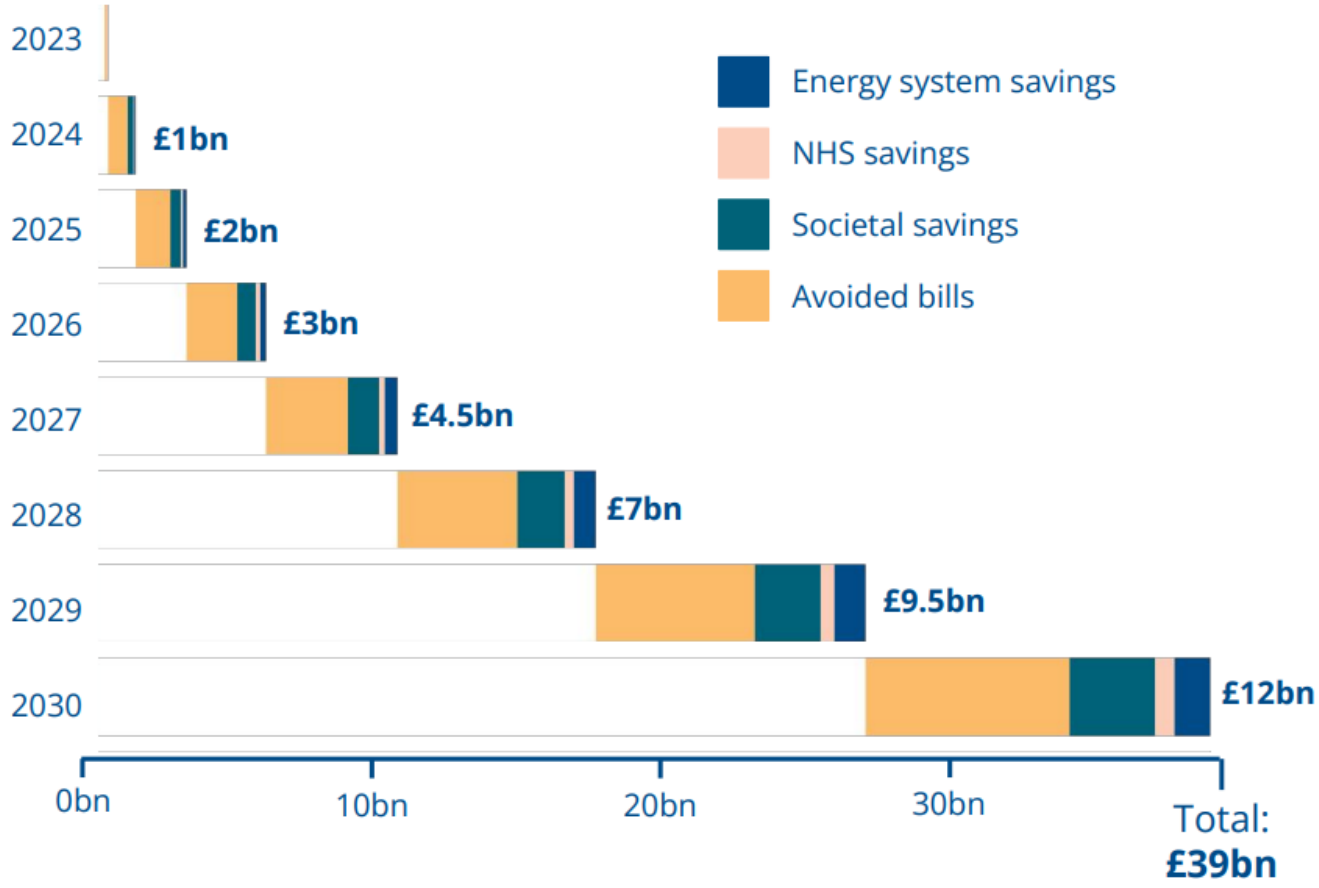
Citizens Advice estimate that upgrading 13 million homes to EPC C could save £39Bn by 2030

Home advantage

Unlocking the benefits of energy efficiency

Citizens Advice, June 2023

Total boost between now and 2030 from upgrading homes



Clarity on heat decarbonisation has significant benefits across the economy

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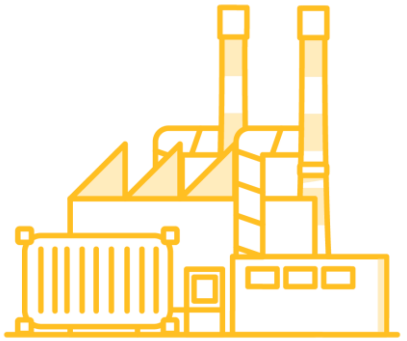
Networks

Build the right amount of infrastructure, for the right fuel, in the right place



Manufacturers

Less uncertainty allows earlier investment in technology and drives up economies of scale

Markets

Can be optimised for the mix of technologies we expect to see

Consumers

Can decide to adopt new technology earlier, with greater choice of provider

It works when we get it right. EV uptake is strongly linked to end of new ICE sales

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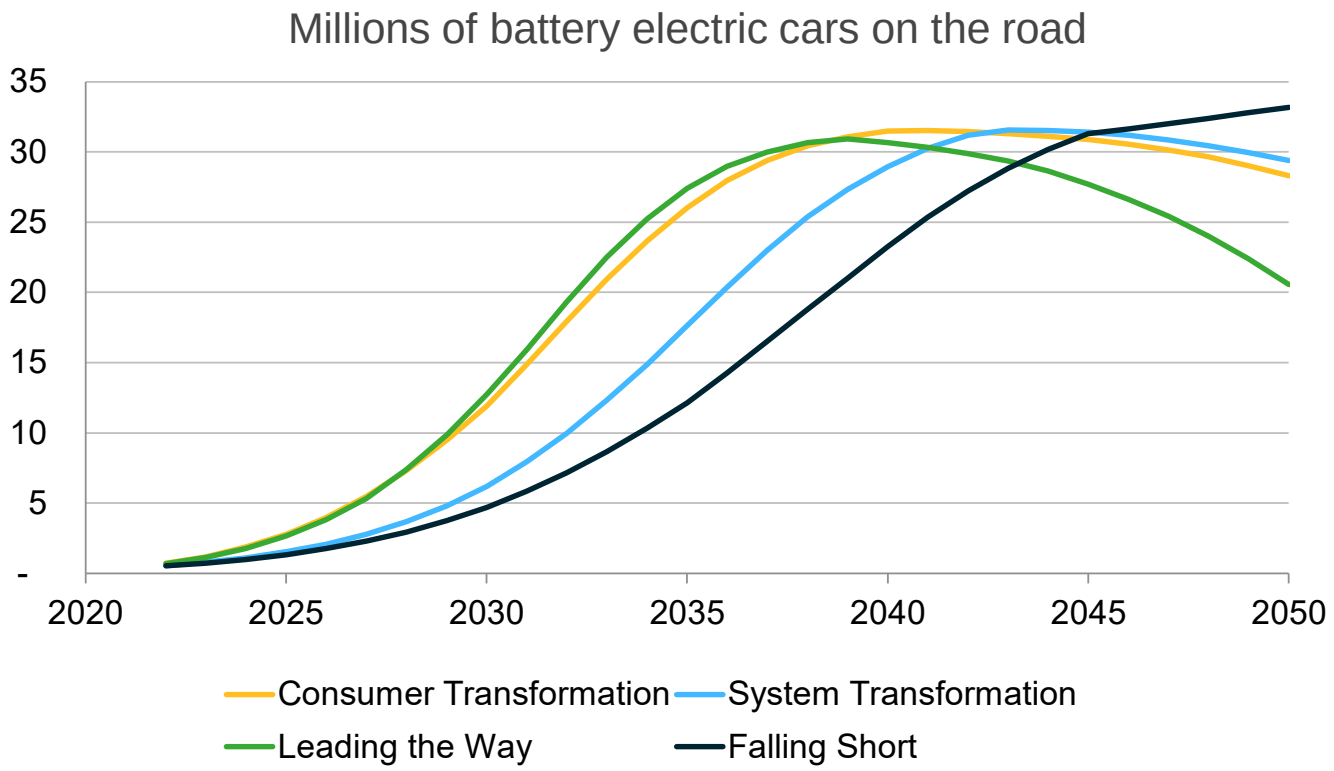

- 2030: ban on new ICE sales
- Manufacturers are investing in EV production and giving consumers choice
- EV uptake is still strong despite cost of living crisis

Sales of petrol and diesel cars and vans	By 2023	By 2035	By 2040
	CT LW	ST	FS

Electrified transport demand is an excellent source of potential demand flexibility

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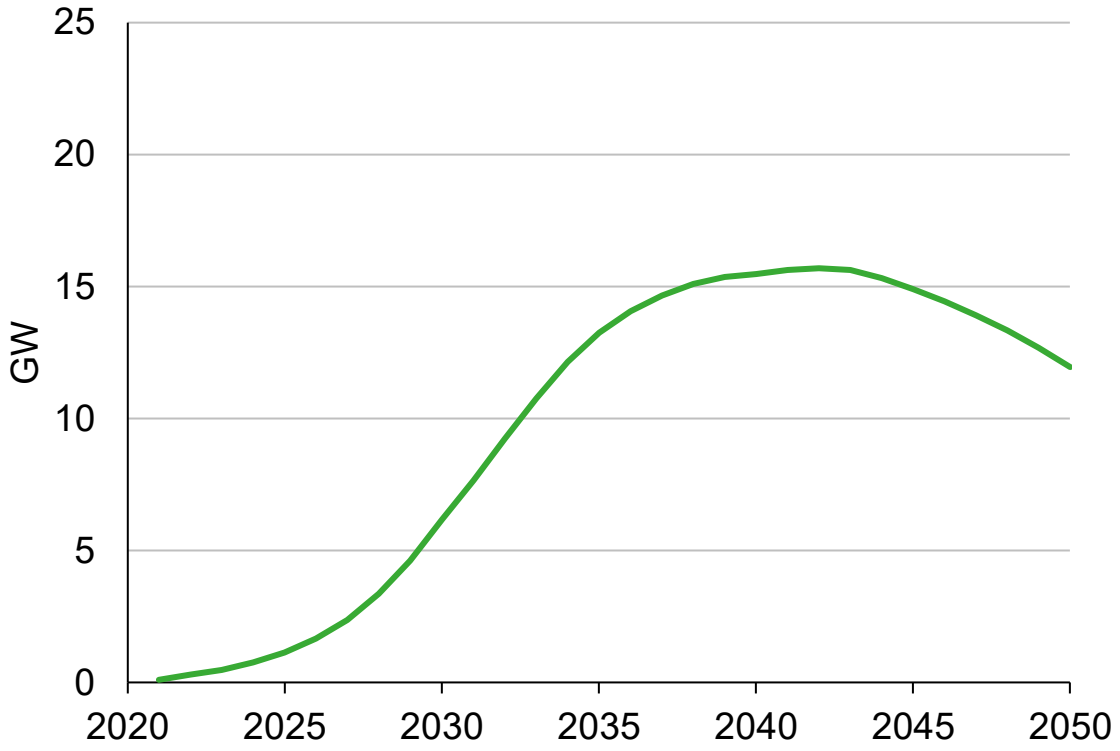
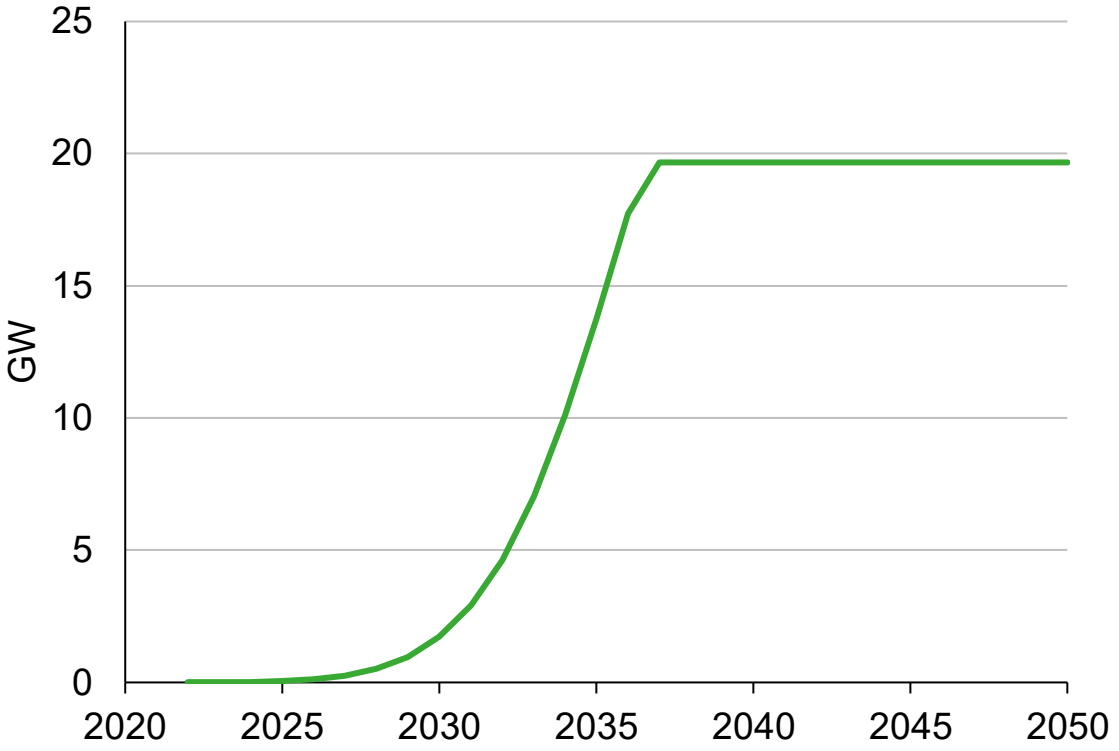
Peak demand reduction from smart charging in Leading the Way



V2G potential at peak times in Leading the Way



Insight When coupled with digitalisation, insulation and simplified consumer journeys, electrification of residential demand has great potential to reduce peak demand.

Electrified heat demand is an excellent source of potential demand flexibility

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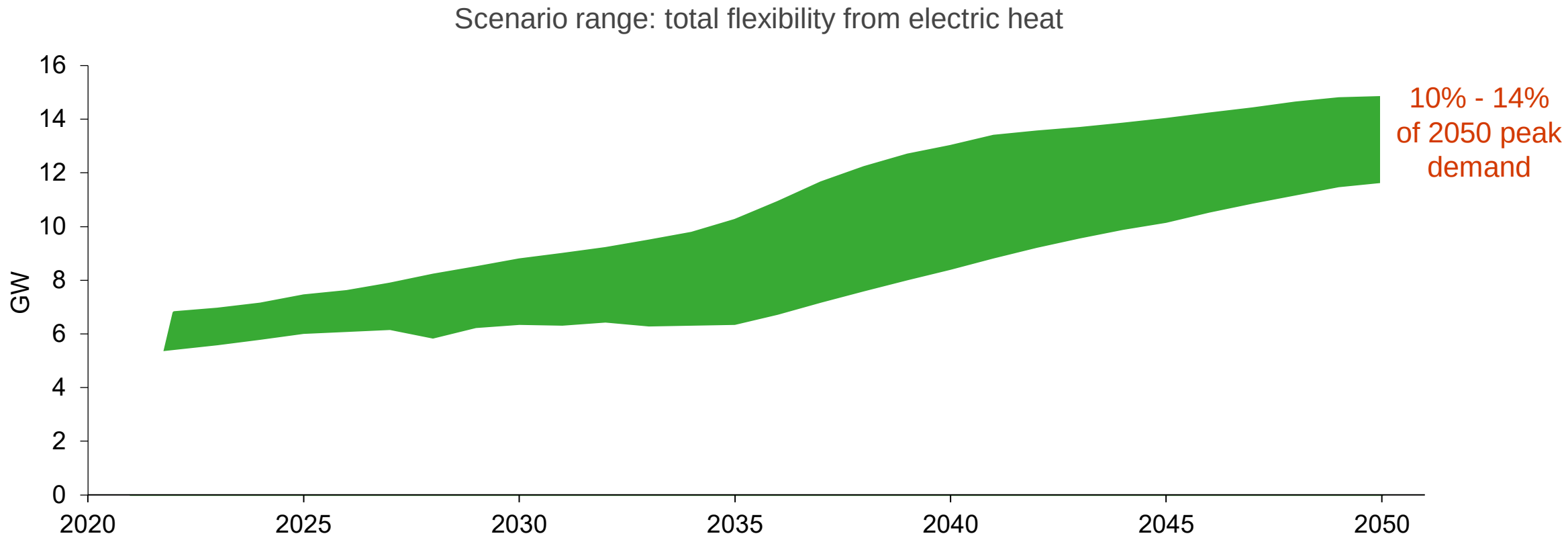

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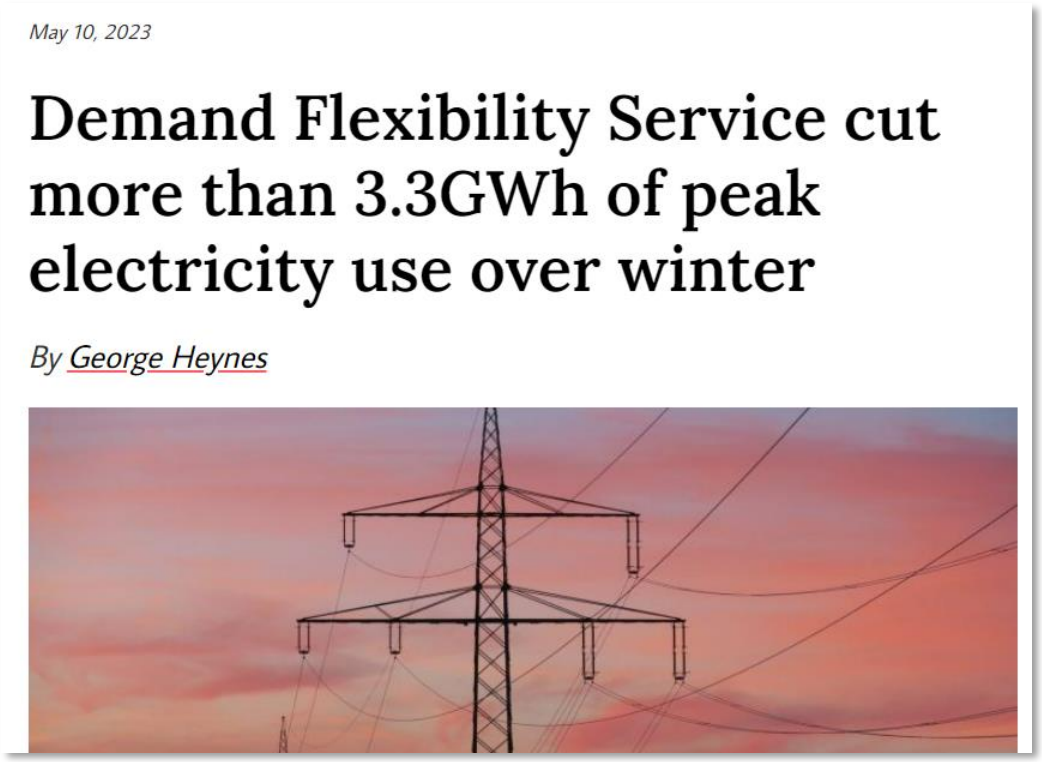
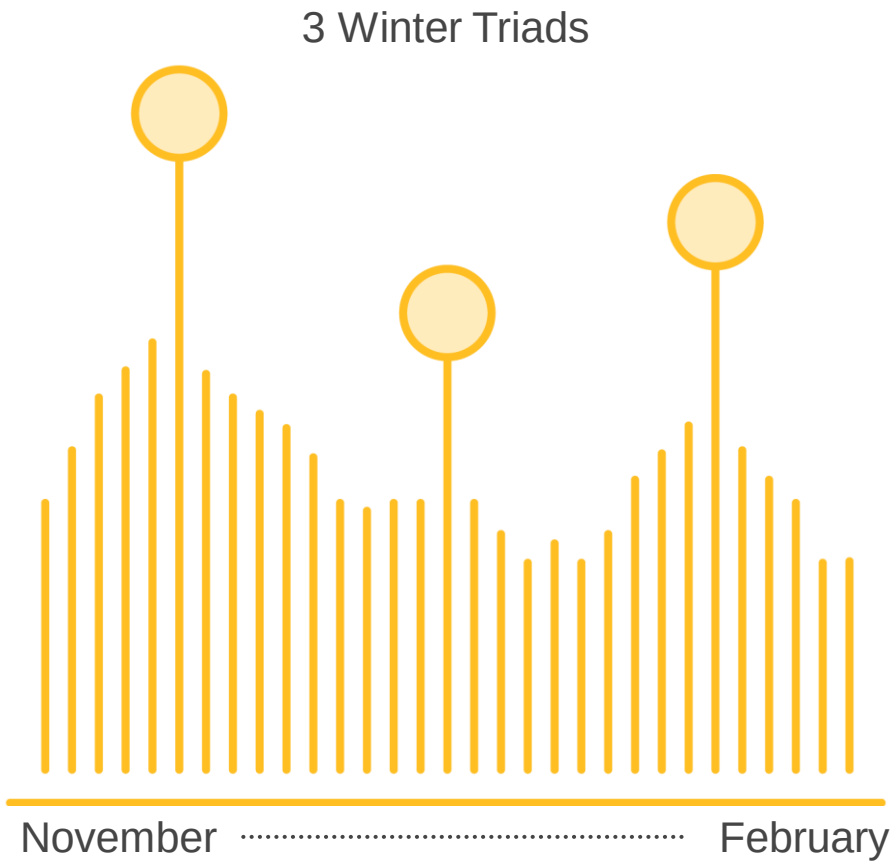
Consumers are already engaging in demand flexibility



23 Jan 2023, 17.00-17.30
324 MW total reduction in peak demand

The energy industry is uncertain about what replaces triad avoidance as an incentive for industrial demand flexibility



What is triad avoidance?
Major consumers could avoid TNUoS charges during the three half hourly periods (separated by 10 days) with the highest peak demand over winter.

The energy industry is uncertain about what replaces triad avoidance as an incentive for industrial demand flexibility

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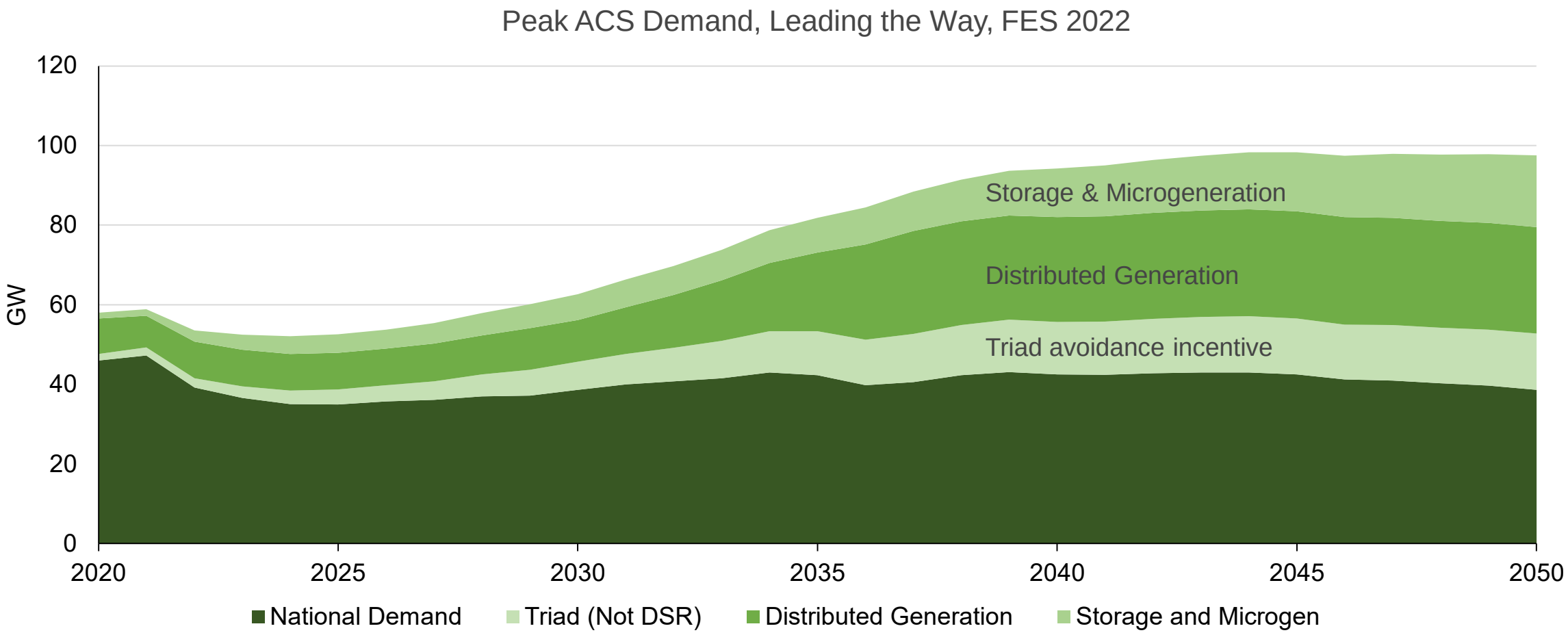

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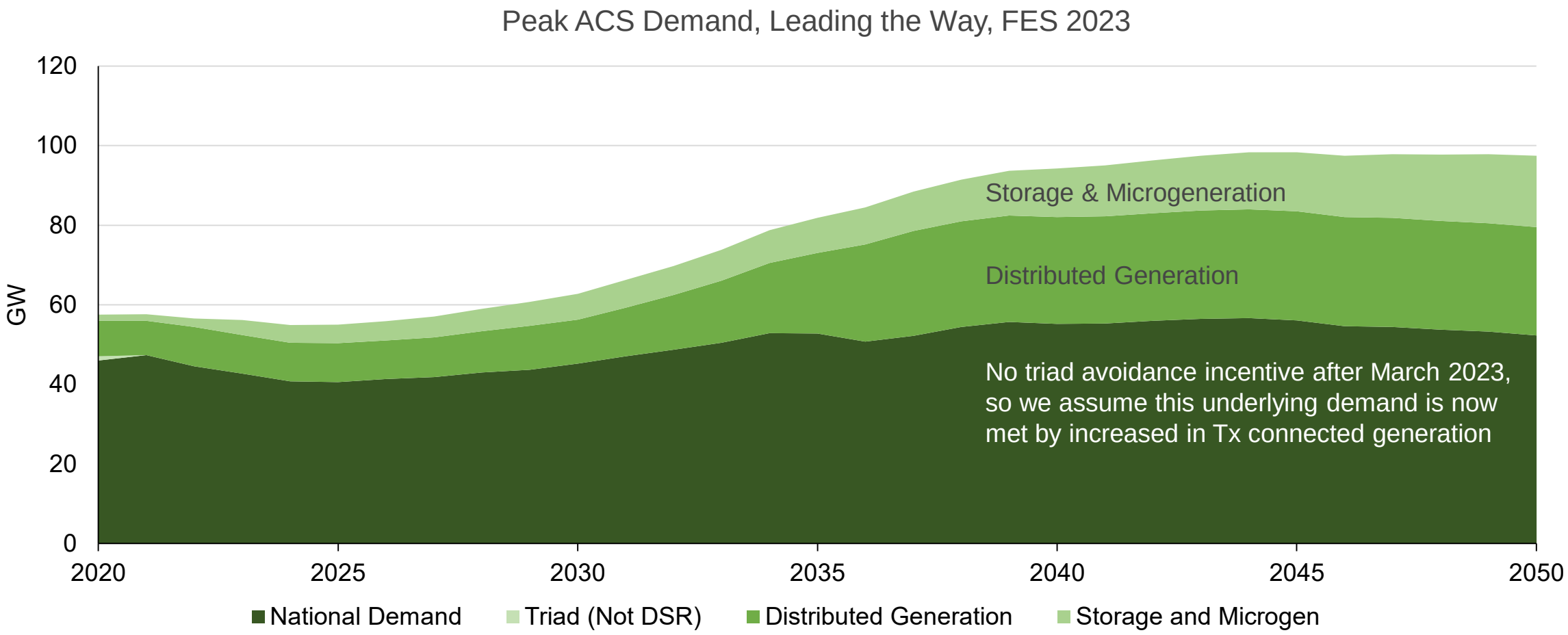


Main Takeaways

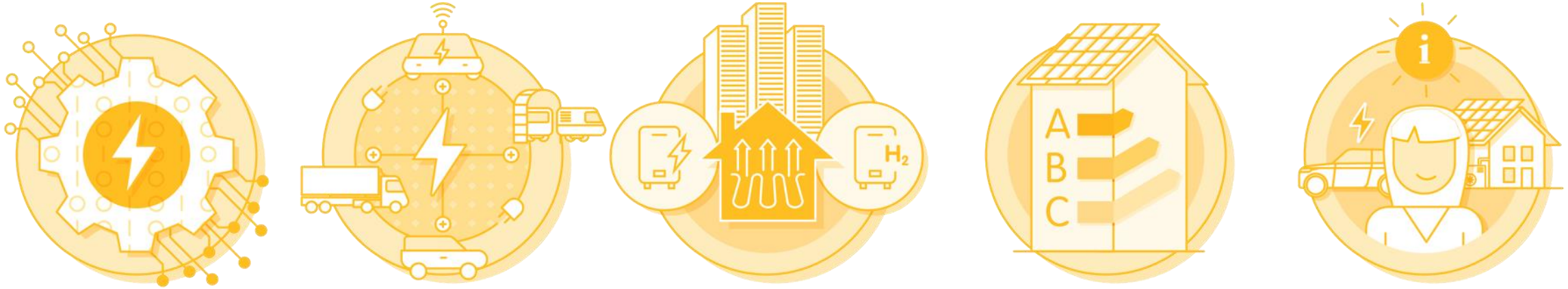
Consumers protect peak demand, but do engage in demand flexibility

Clear pathways needed for industrial flexibility and heat

Fabric efficiency and leveraging transport flexibility are no regret actions

Support for all consumers

What is needed over the next year?



Digitalisation and innovation

Grow the demand flexibility service

Transport flexibility

Make the most of transport electrification to boost flexibility

Focus on heat

Accelerate the decision on the future of residential heat

Energy efficiency

Prioritise fabric efficiency improvement and grants for decarbonised heat

Empowering change

Ensure the transition is fair for everyone by identifying clear pathways for consumers who find it difficult to decarbonise

James Whiteford

National Grid ESO

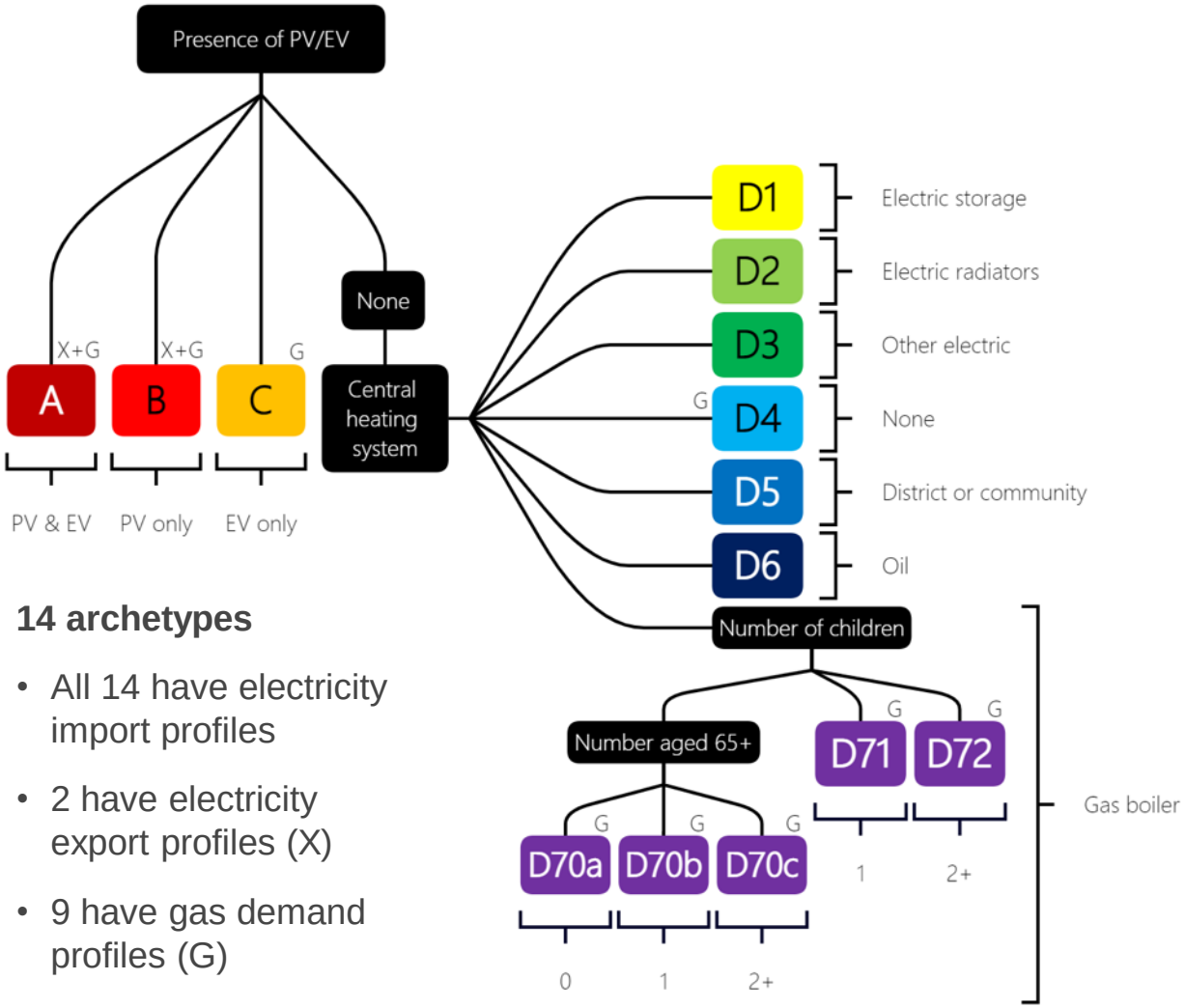
Sam Homan

Centre for Sustainable Energy

Arna Sigurdardottir

Element Energy

Domestic energy consumer archetypes



14 archetypes

- All 14 have electricity import profiles
- 2 have electricity export profiles (X)
- 9 have gas demand profiles (G)

Method

- Primary data source: Smart Energy Research Lab (SERL)
  - 13,000 GB households
  - Half-hourly electricity and gas consumption (and export) data from smart meters
  - Survey data on dwelling and household characteristics
- Archetypes created by splitting the SERL households based on variables with the greatest influence on demand profile shape

Outputs

- Half-hourly demand profiles for each archetype for each calendar month and weekday/weekend
- LSOA household count for each archetype (i.e., the geographic distribution of archetypes)
- For each archetype, at LSOA level, the average household income, proportion of homeowners, and a measure of attitudes towards PV and electric vehicles (Experian data)

Non-Domestic consumer archetypes

Methodology

1. **Initial segmentation based on sector**
2. Mapping of **organisation characteristics** against **requirements for engagement** with technologies and offers under three themes:
   - **Conditions**
   - **Capacity**
   - **Concern**
3. **Offer profiling tool:** Assessment of each organisations' engagement with different technologies and offers.
4. **Archetype segmentation** based on the type and number of offers engaged with.

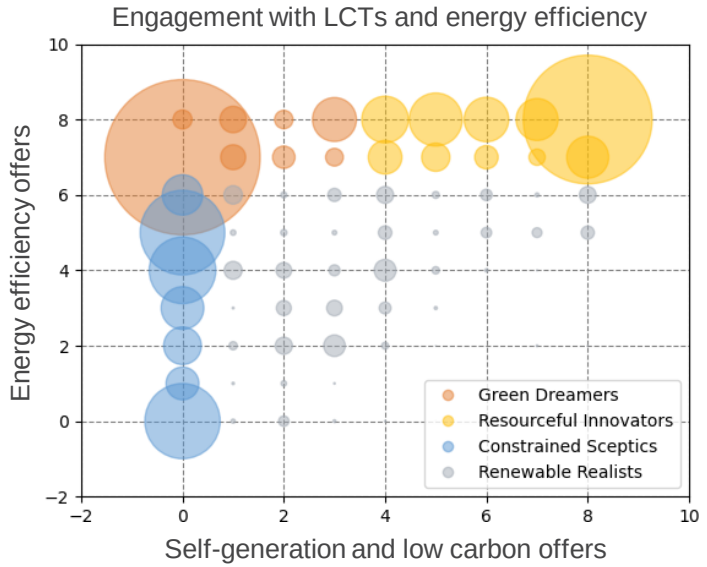
Supported by literature review and datasets including non-domestic ECP records, ND-NEED, BEES and Ofgem ND Consumer Research.

Results

- The outcome is a nested set of archetypes.
- Within each sector, there are four archetypes which are consistent across sectors.
- The distribution of each sector into the four archetypes varies between sectors.

Retail

- **Green Dreamers**
- **Resourceful Innovators**
- **Constrained Sceptics**
- **Renewable Realists**



- Building stock, floorspace, annual gas demand and annual and peak electricity demand is provided by archetype at LSOA resolution.
- Detailed descriptions and engagement attributes are provided for each archetype.
- Electricity demand load profiles and flexible proportion of peak load is provided by each sector.

Farhat Raza

Ofgem

ofgem Making a positive difference for energy consumers

Future Energy Scenarios 2023

Enabling Consumer Flexibility

Farhat Raza

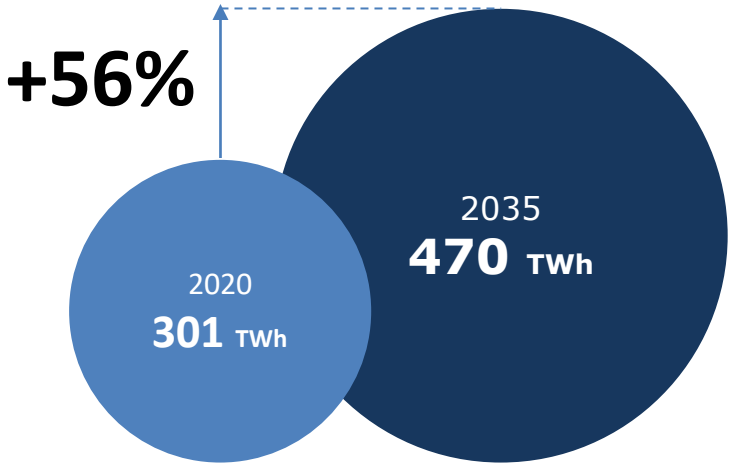
13 July 2023

OFG1161

Electricity demand is growing rapidly while the system becomes more complex

ELECTRIFICATION

Electricity demand is set to increase by approximately 50 percent by 2035, driven by transport and building sectors

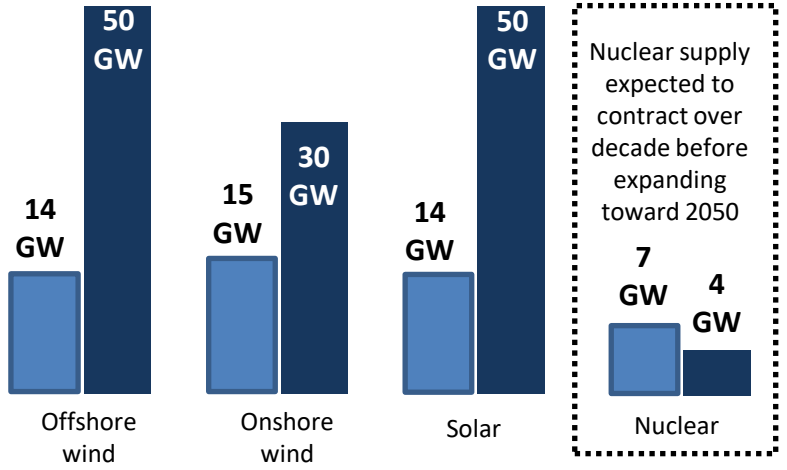


Expected growth in electricity demand

25 million electric vehicles expected on UK roads by 2035 and 11 million heat pumps will be installed across UK homes

TARGETS

Electricity supply is shifting toward a mix of renewable sources, with stretching targets that may not be met



Electricity supply today and 2030 forecasts

Renewable generation is largely weather dependent and will result in greater supply variability and intermittency

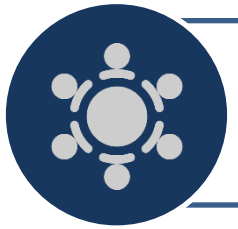
COMPLEXITY

Digital transformation across the economy and decentralisation is leading to a more complex and integrated energy system

Future integrated energy system

Existing systems are under pressure from more complexity and less predictability – while consumer expectations evolve

Changes in the market are exacerbating issues and creating new challenges; the solutions to these challenges present system wide opportunities and benefits



Changing Customer Expectations

Recent events within the energy market as well as wider societal trends, mean that consumes increasingly expect more choice and control. And while consumers are ready to play their part, they require guidance and clarity.

A need to ensure the customer journey is simple and seamless

Variable supply, variable demand

The proportion of hours with excess generation will increase to ~60% of hours. Conversely, the proportion of hours with residual demand will become less frequent but more extreme, with residual demand reaching 45GW at times.

A need to effectively manage demand and supply, to better match each other

Coordinated markets to unlock distributed flexibility

Creating a common, transparent digital infrastructure to better coordinate and align existing markets, unlocking the full value of distributed flexibility to enable a renewable electricity system.

Integrates and establishes flexibility as a key resource to manage supply shocks and meet net zero

The energy consumer of the future

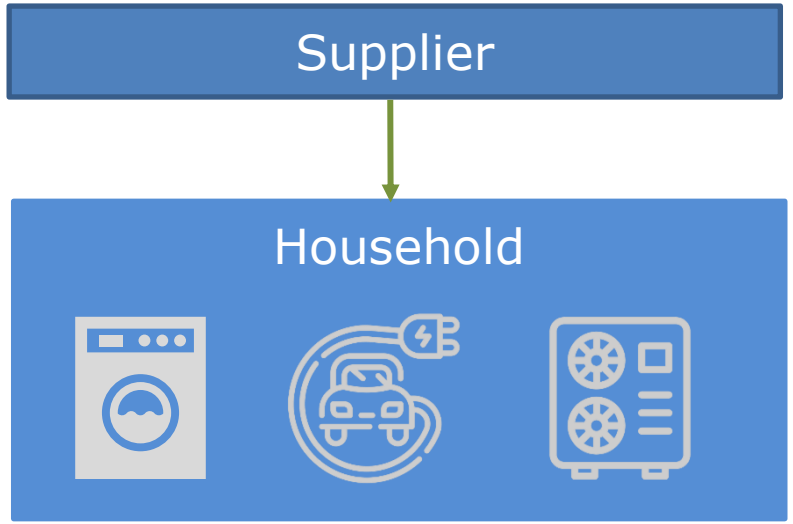
Enabling consumers to actively engage and participate in the energy system, with trust and confidence and to be appropriately rewarded for their contributions

Empowers and rewards consumers to participate in the energy system with confidence

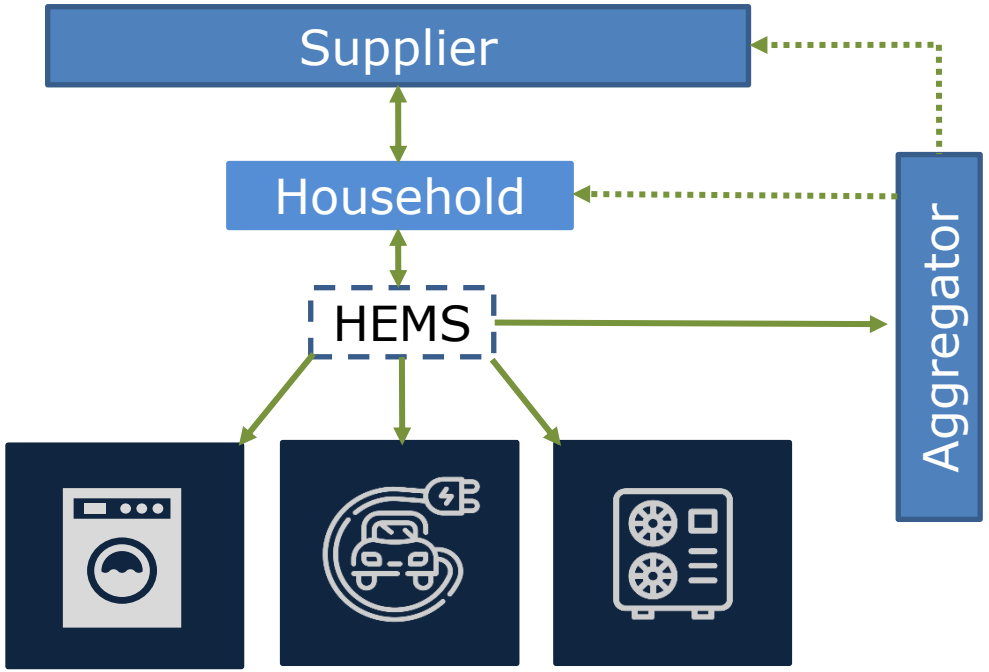
We are building a system that is dependent on consumers transitioning **from passive bill payers to active participants?**

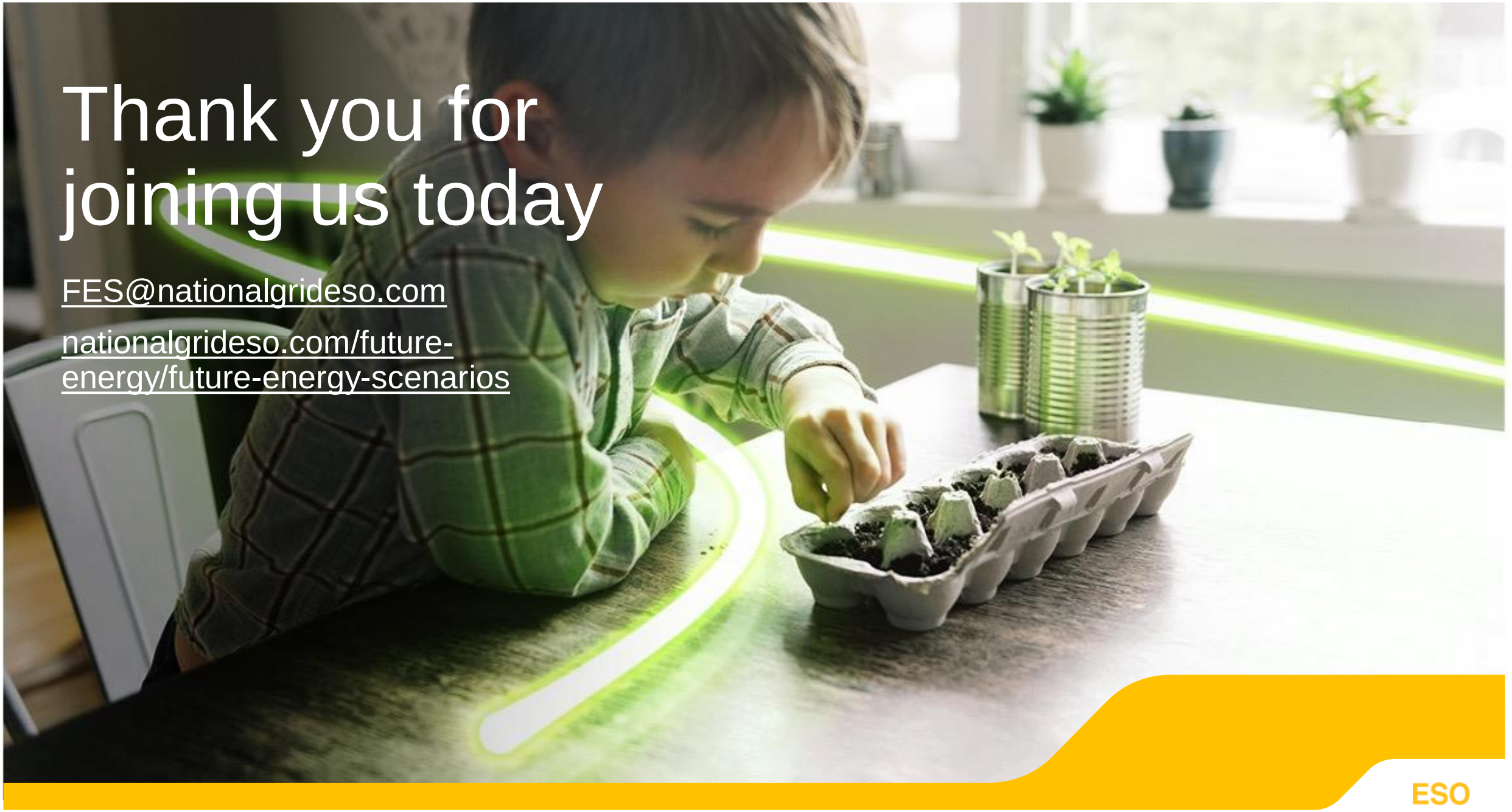
How do we do that – and how do we ensure **consumers consent**, have **control/choice** and **confidence?**

Consumer relationship today



Consumer relationship in the future





Thank you for joining us today

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