4. Energy System

13 July 2023, 2pm

ESO

Energy System

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Agenda

2pm	Welcome:	Sian Ramirez Bower
	Key messages:	James Whiteford
	Key insights & analysis:	Aneesa Parkar
	Guest speaker:	Paul Wakeley, National Grid ESO
	Guest speaker:	Faisal Haroon, Cadent Gas
	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

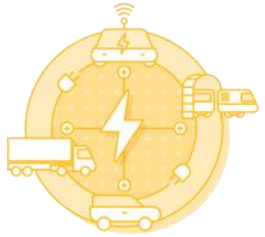
Digitalisation and innovation

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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Executive summary

What we've found	Benefits to the whole energy system must be considered to optimise the cost of delivering net zero technology and infrastructure
Greatest uncertainty	Making sure supply and demand are in the right place, connections reform, market changes
No regret actions	Deliver whole system solutions via the CSNP, implementation of market changes through REMA
Bottom line	Consumers require energy that is clean, secure, affordable, and fair. This is achievable but relies on strategic development of whole energy networks, markets and technologies to make the most of the abundant renewable energy available in Great Britain

The energy system landscape is changing with significant growth from renewable energy and decline in dispatchable energy from fossil fuels

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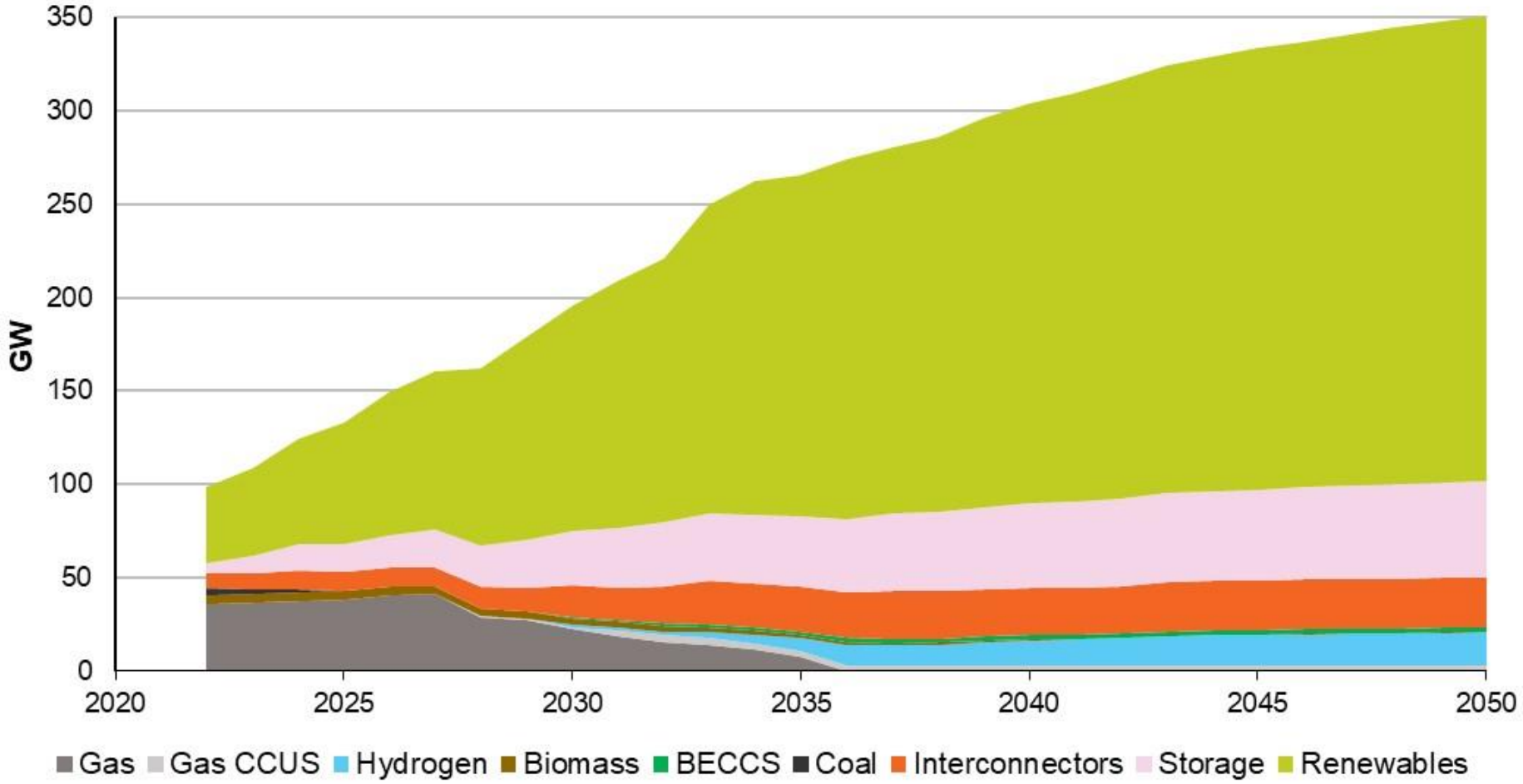
Sources of installed generation capacity, Leading the Way, FES 2023 (GW)



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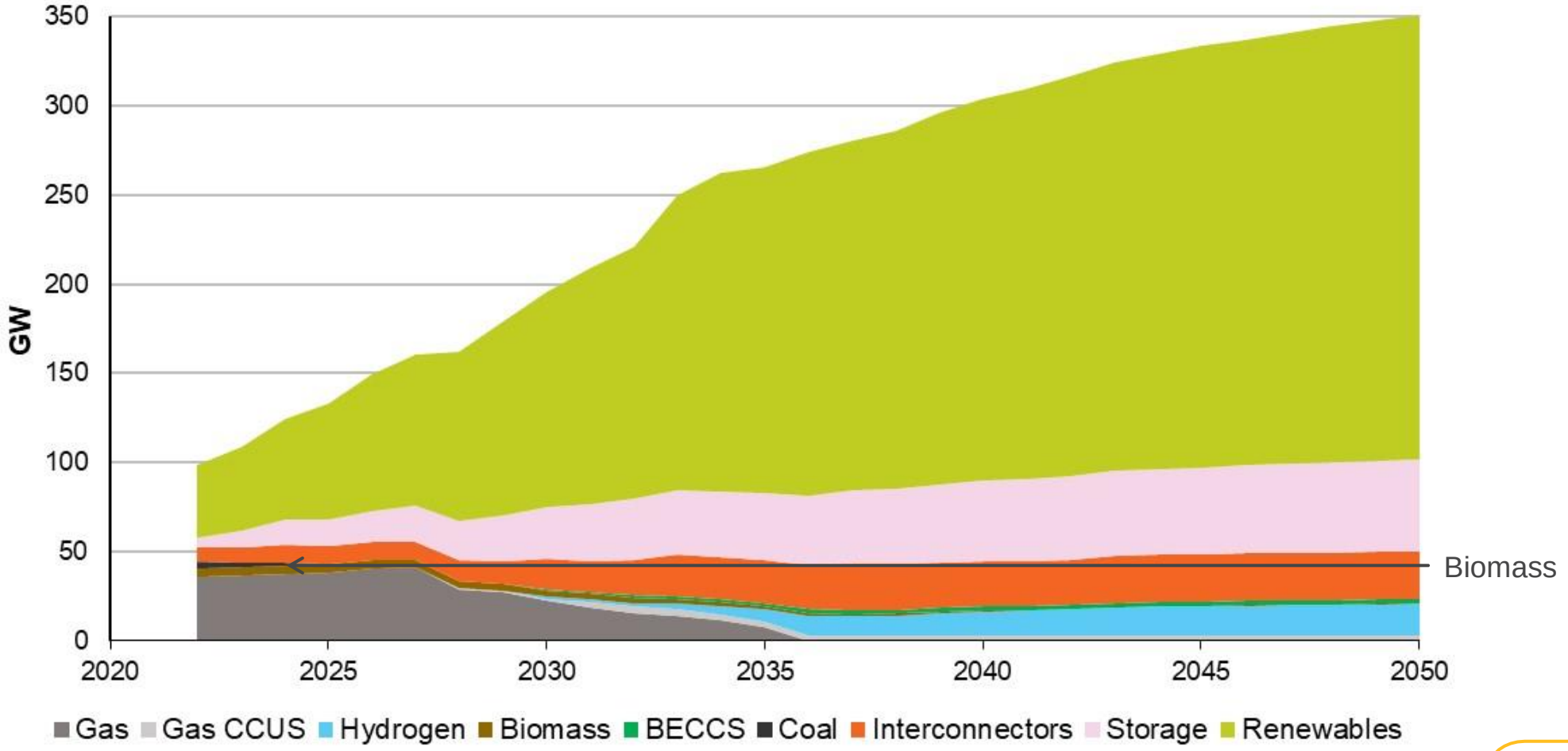

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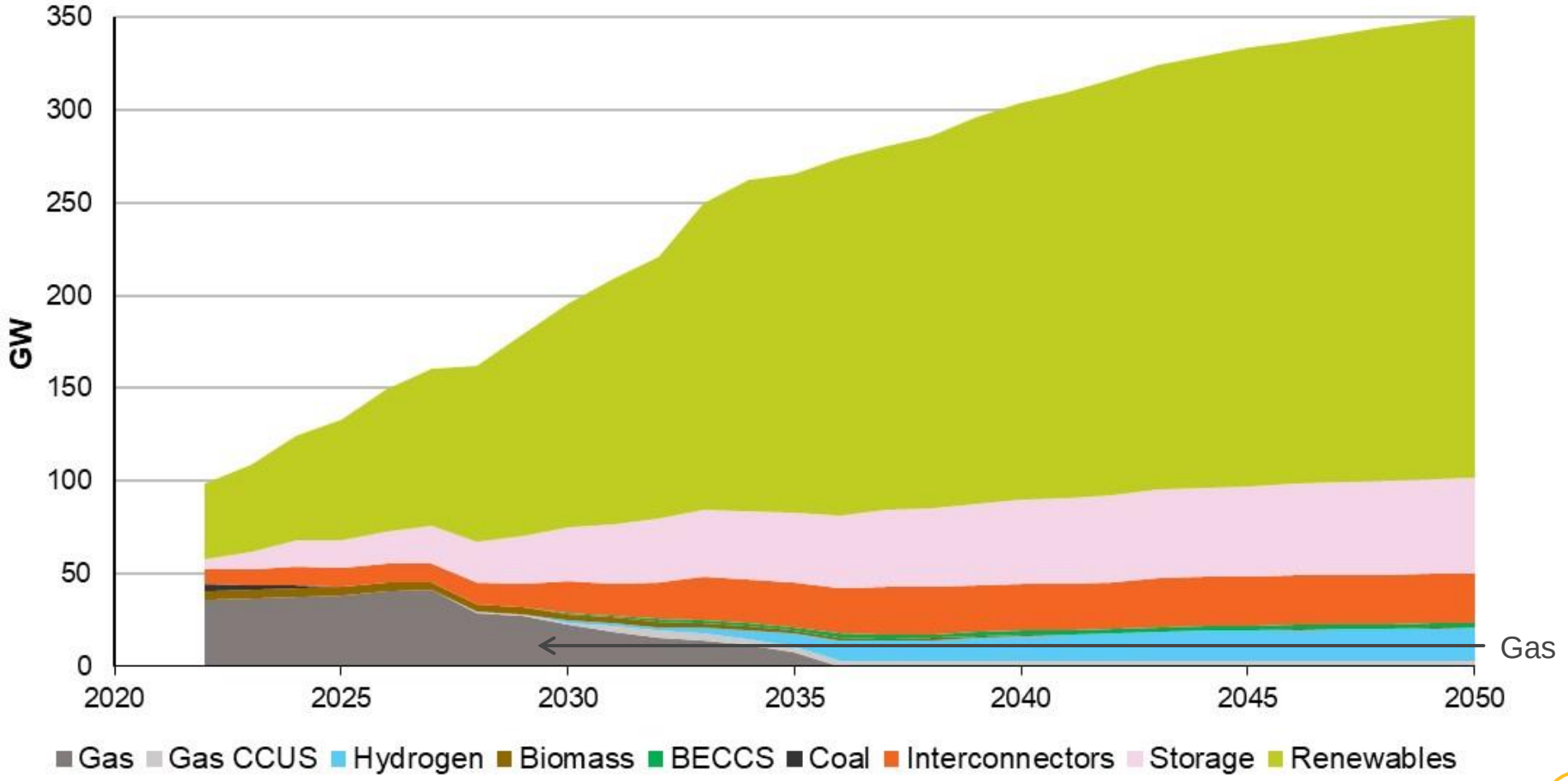

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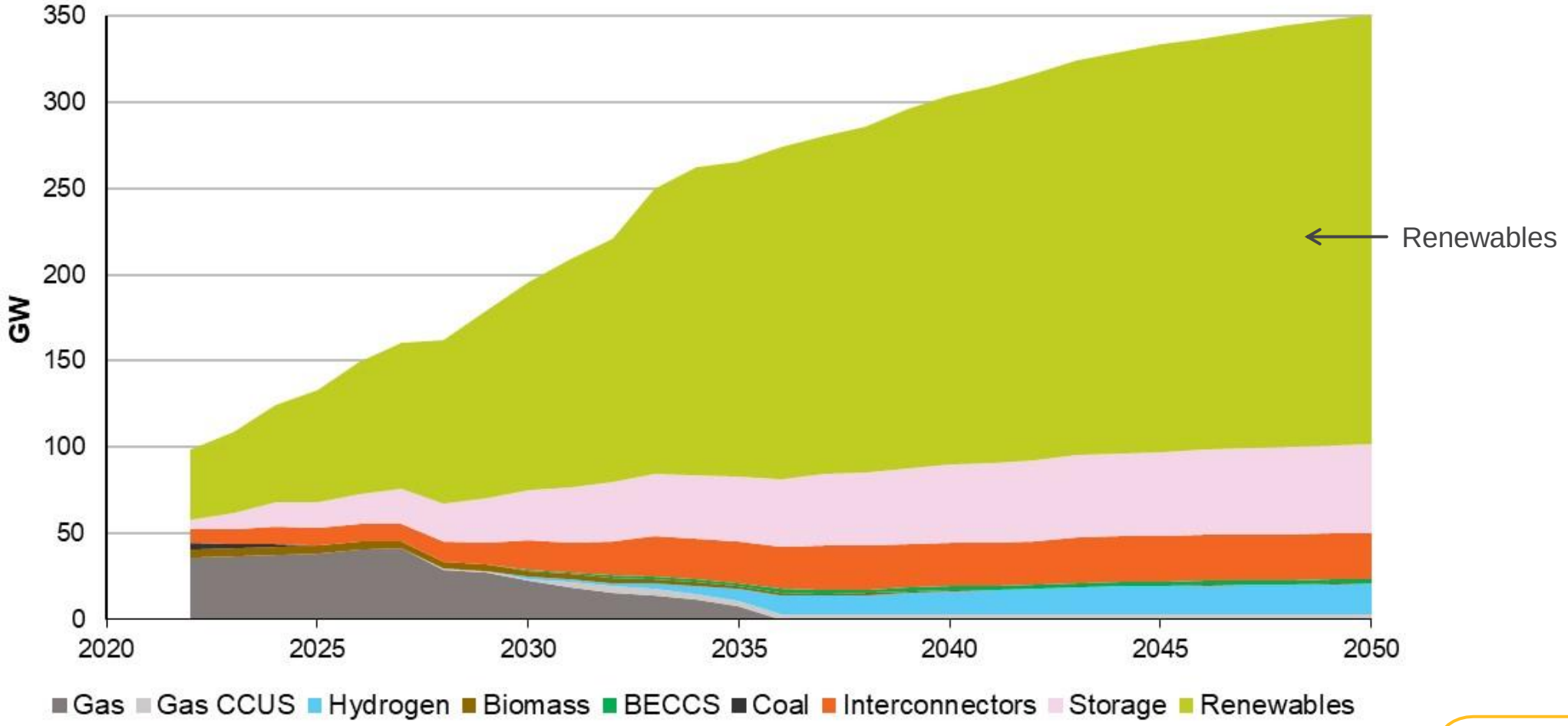

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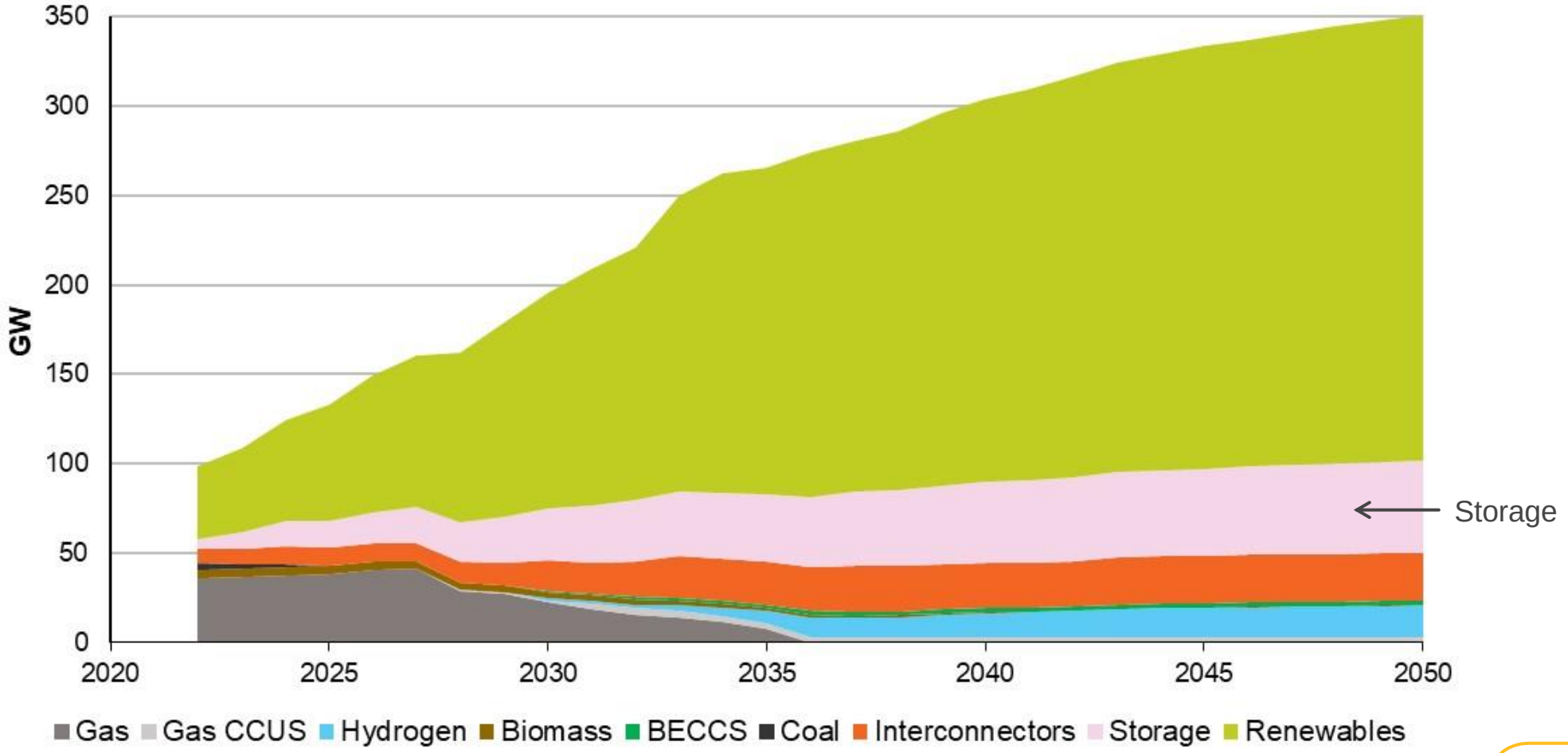

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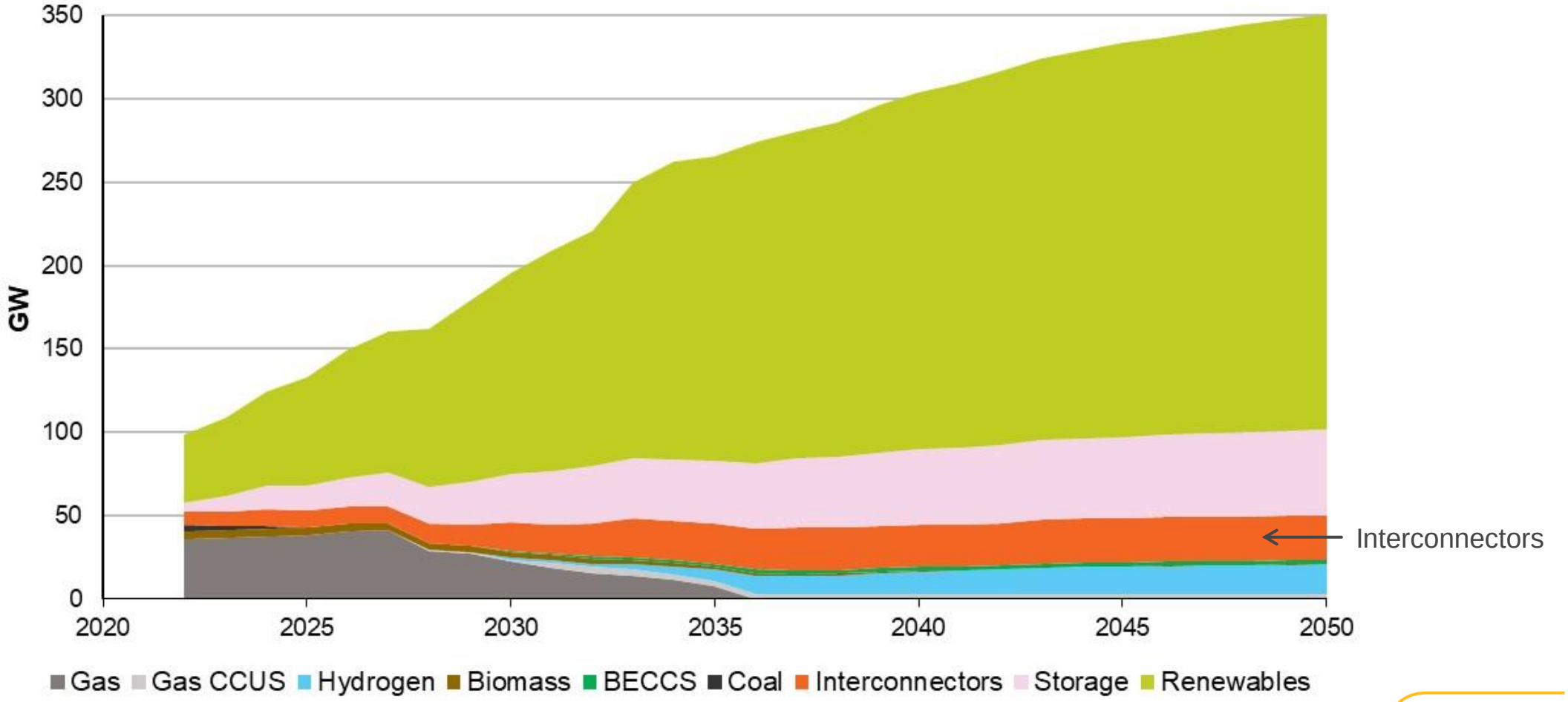

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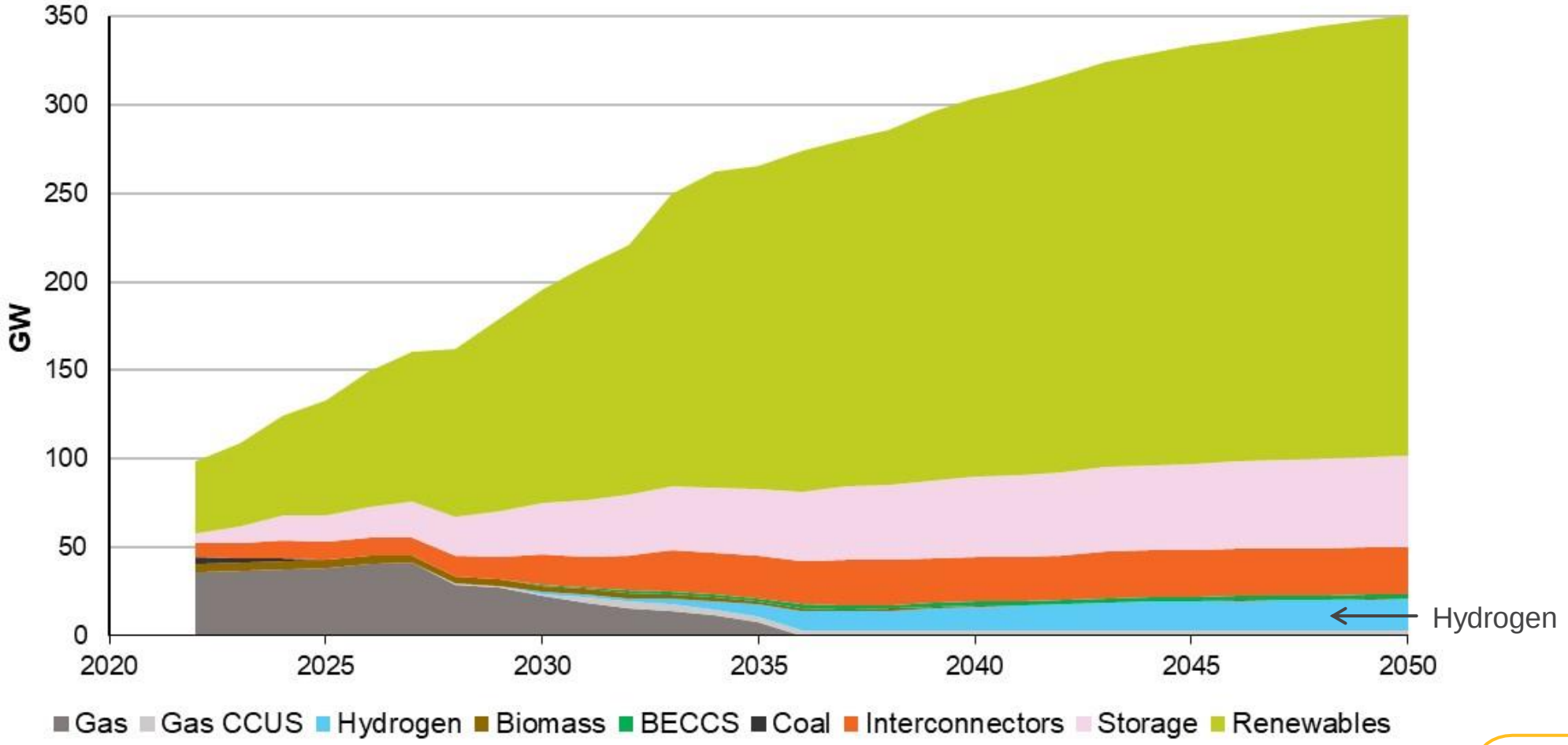

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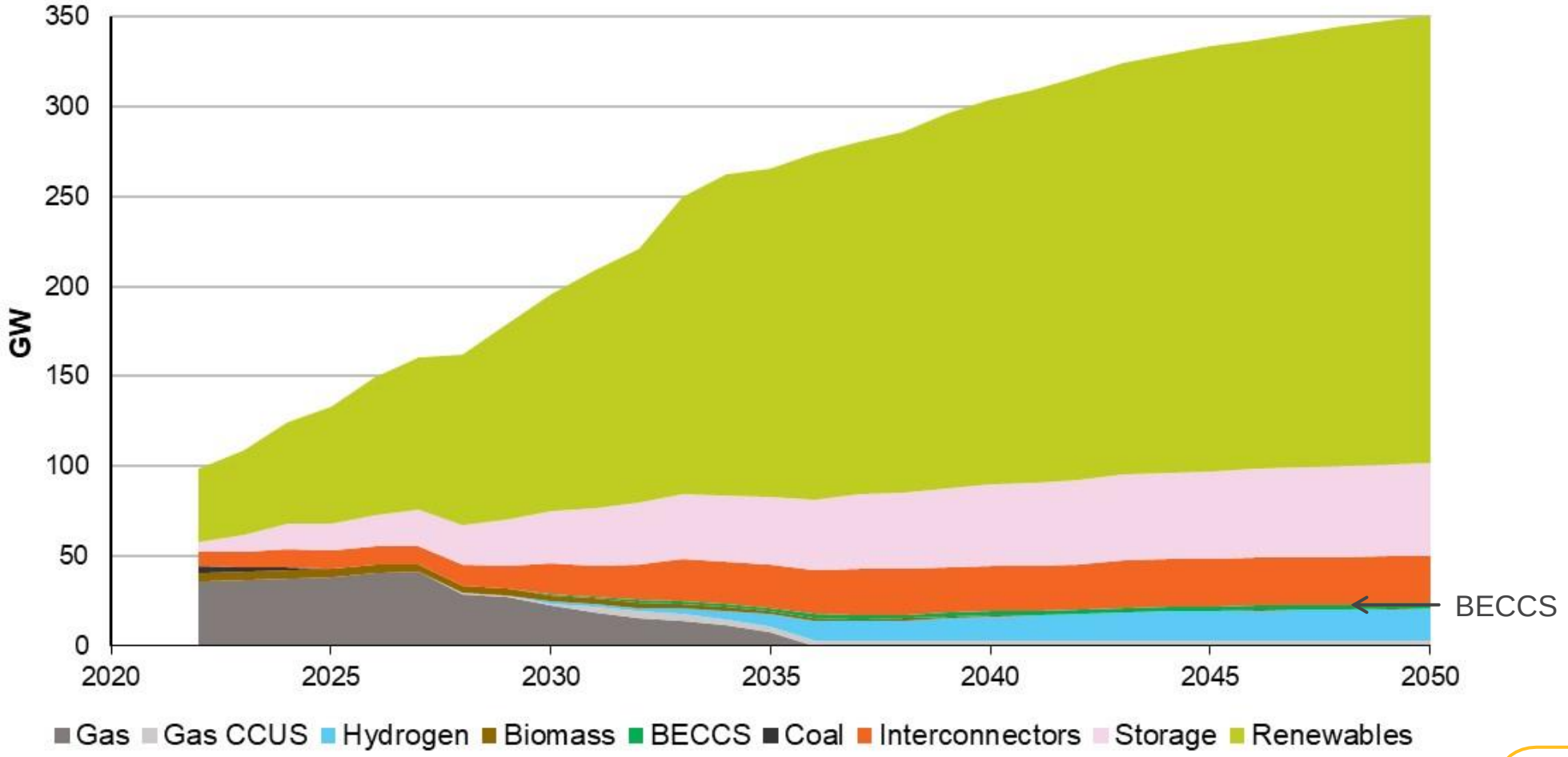
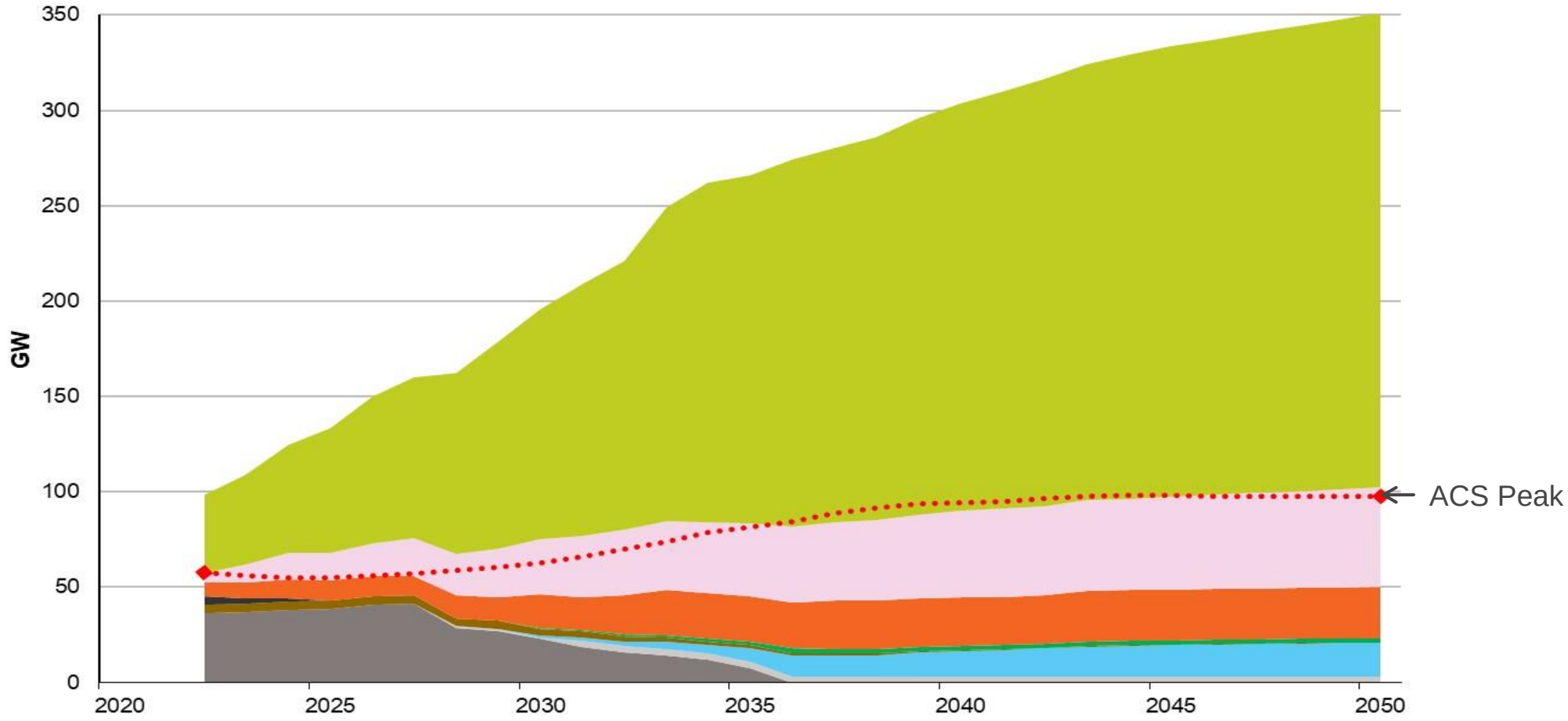
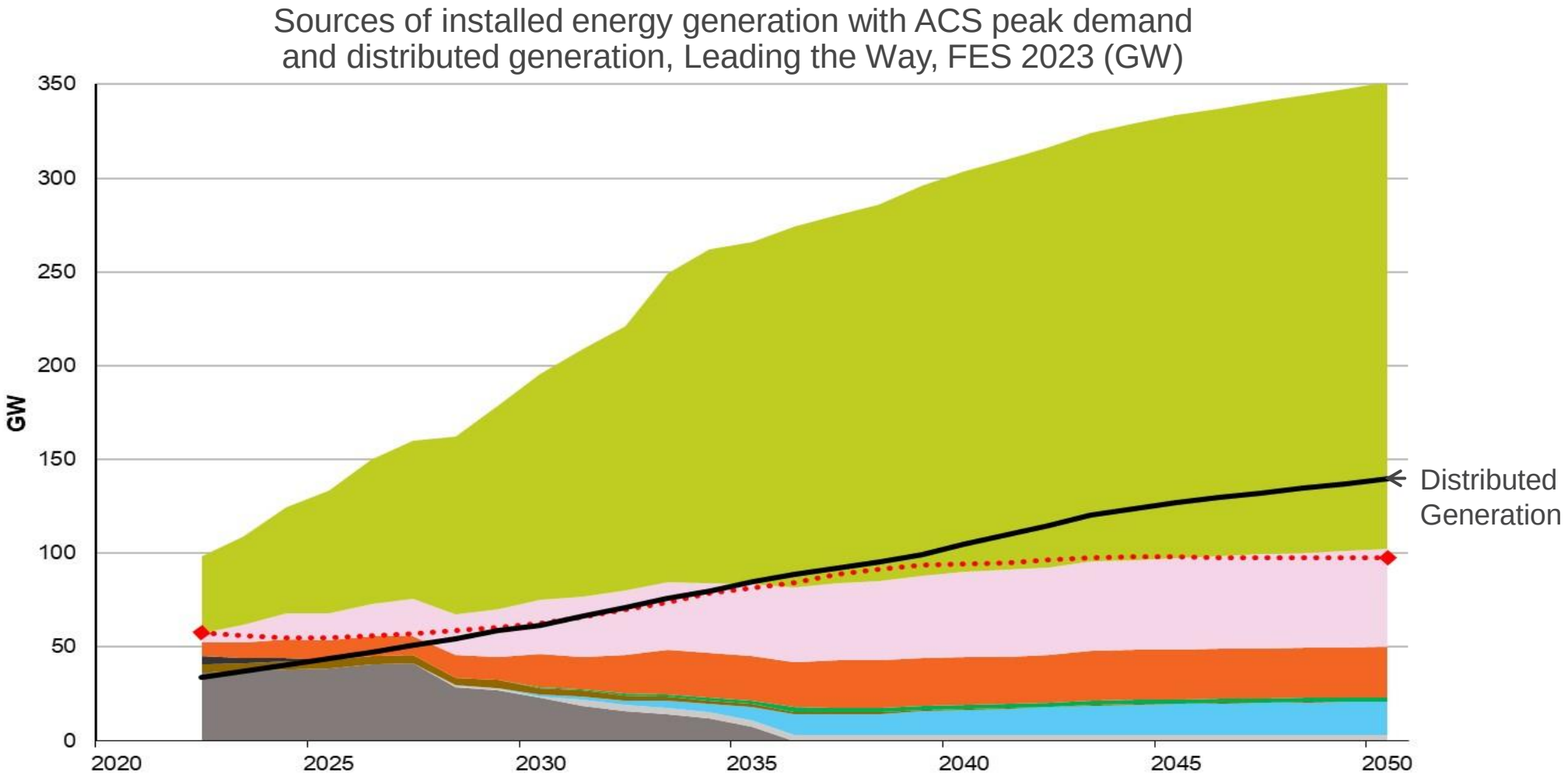


ACS peak demand is growing over time

Sources of installed energy generation with ACS peak demand, Leading the Way, FES 2023 (GW)



Distributed generation is also set to grow



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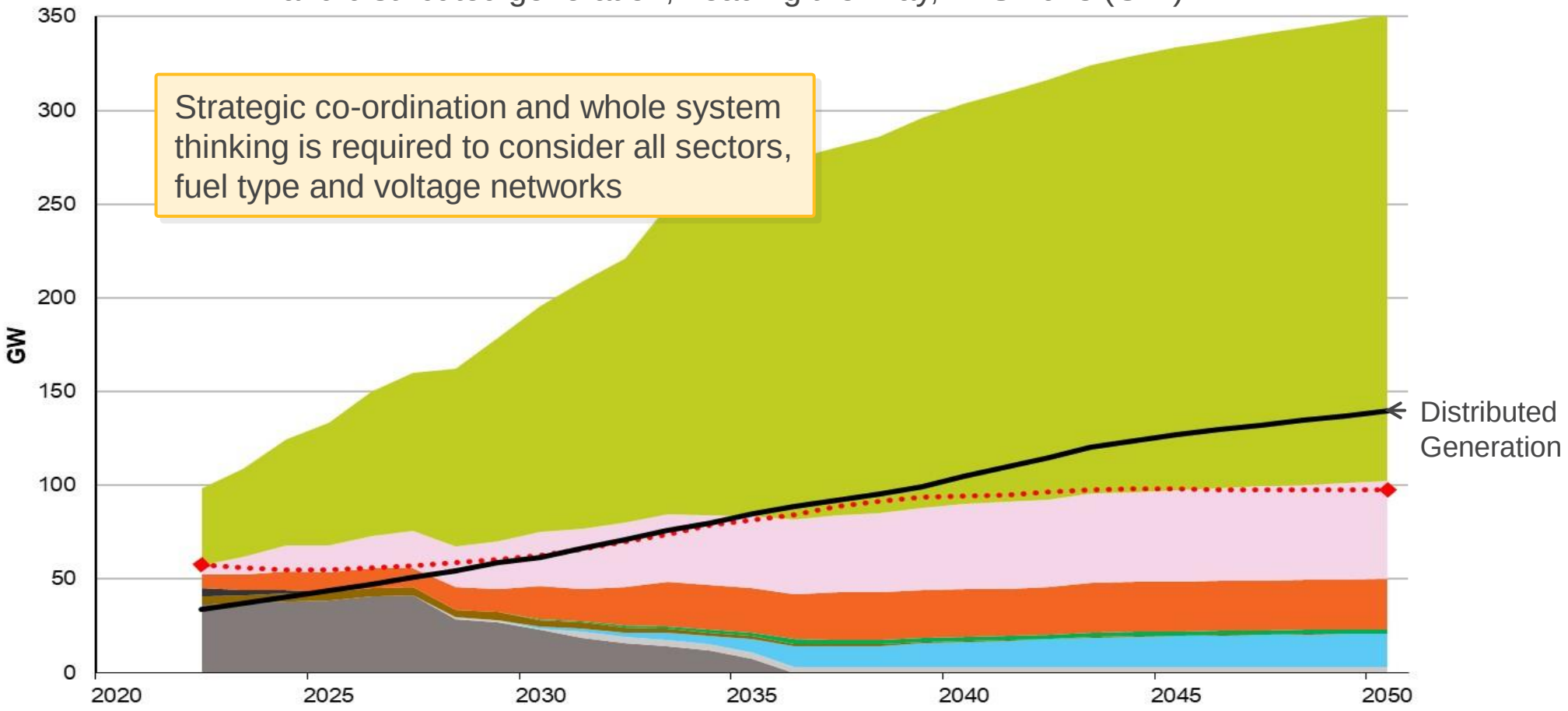
Sources of installed energy generation with ACS peak demand and distributed generation, Leading the Way, FES 2023 (GW)



There is significant growth in distributed generation capacity across all of our scenarios

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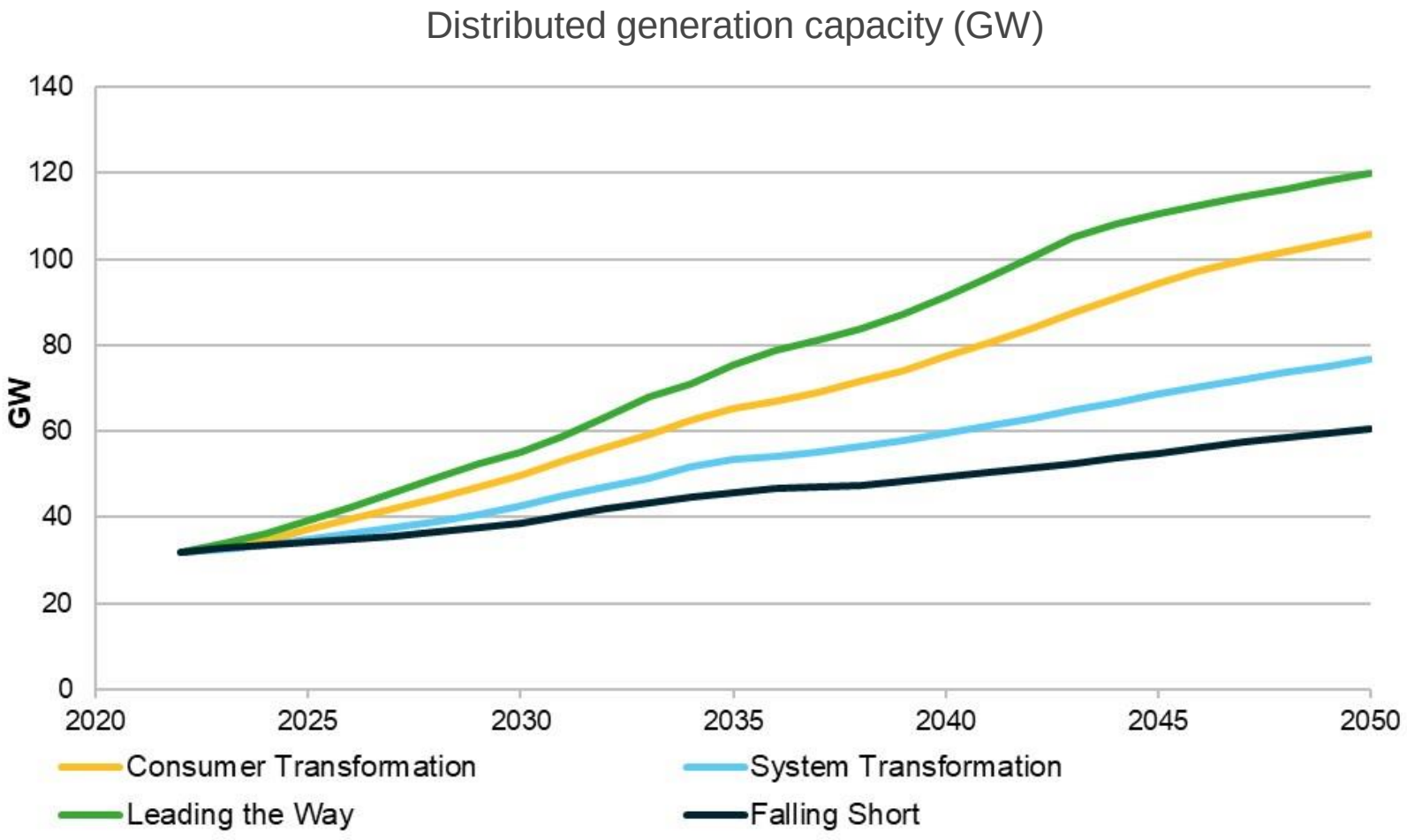
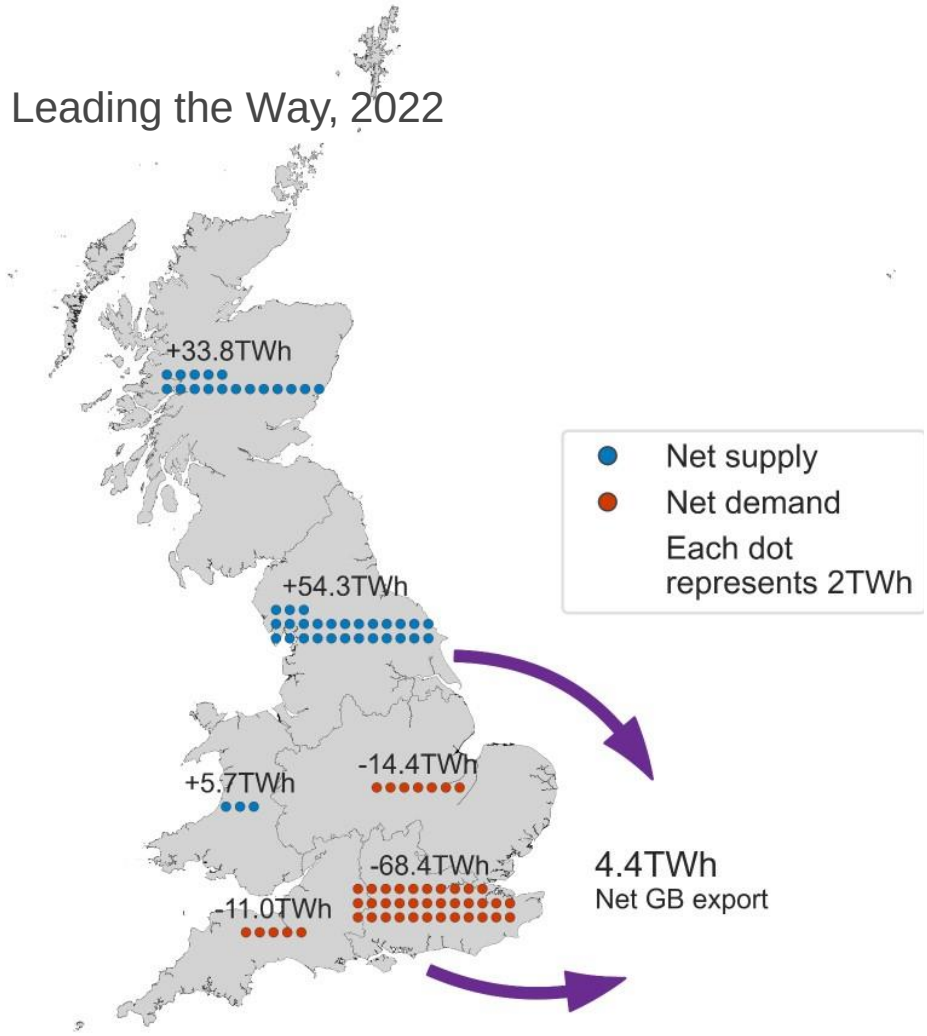


Whole system thinking needs to consider both transmission and distribution network, and generation needs to connect in the right location

Net generation and demand is set to grow but not in the same place



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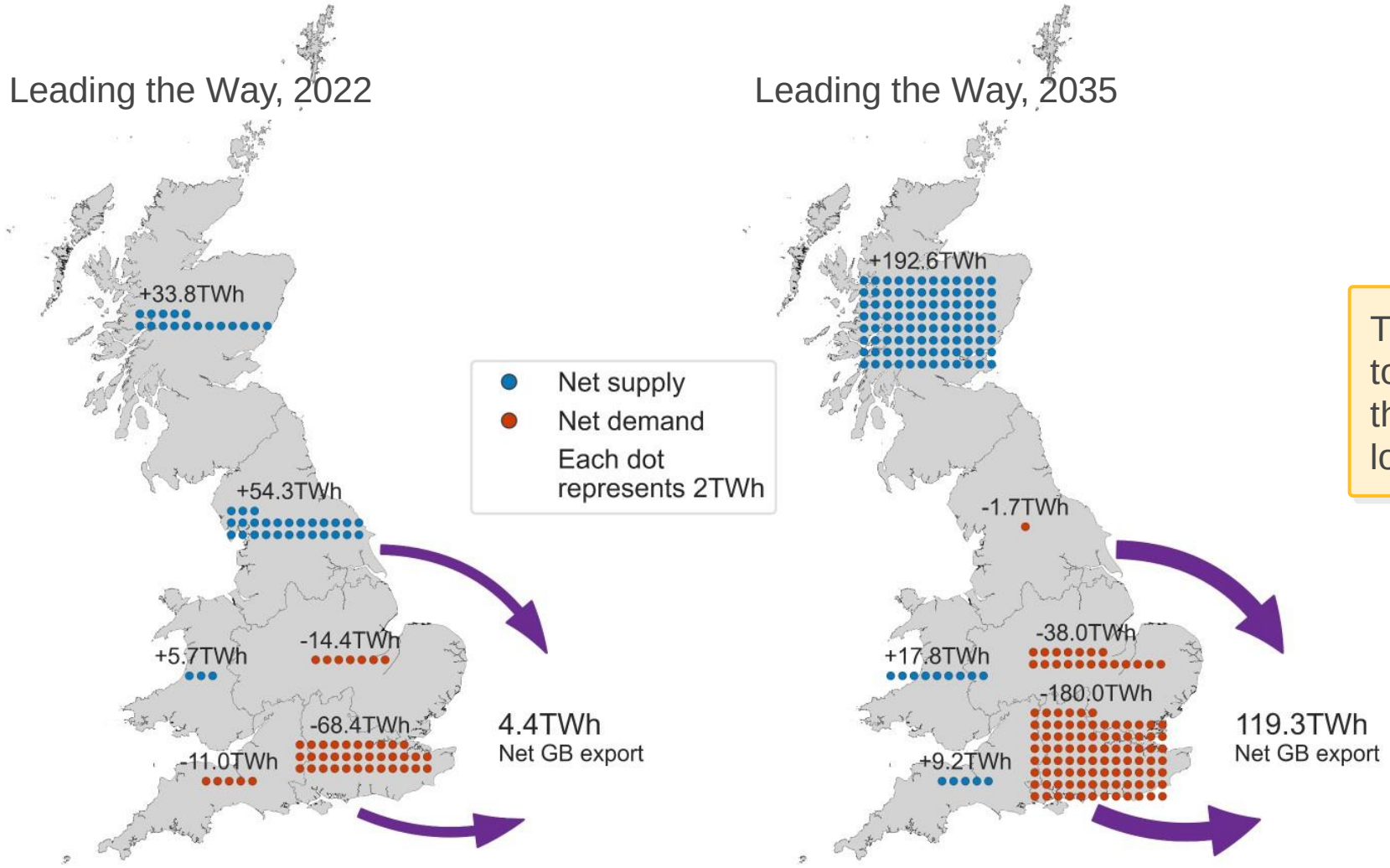
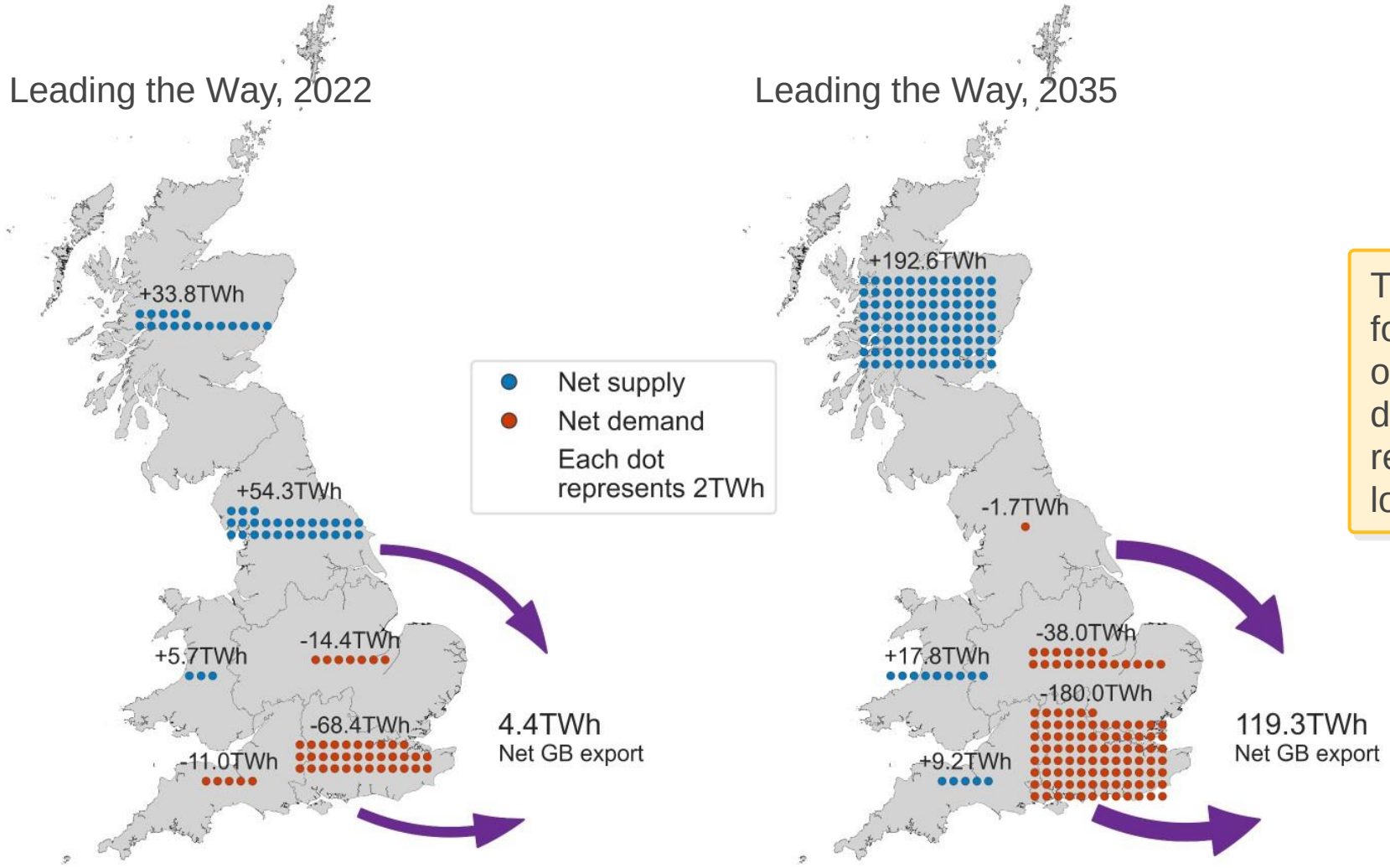


There is an opportunity to apply whole system thinking and strategically locate large demand sites

Locational signals, market reform is needed to provide the real-time locational signals for sitting and dispatch decisions



There is an opportunity for the large requirements of additional supply and demand capacity to respond to stronger locational signals

Our scenarios show periods where supply is higher than demand and therefore curtailment cannot be avoided

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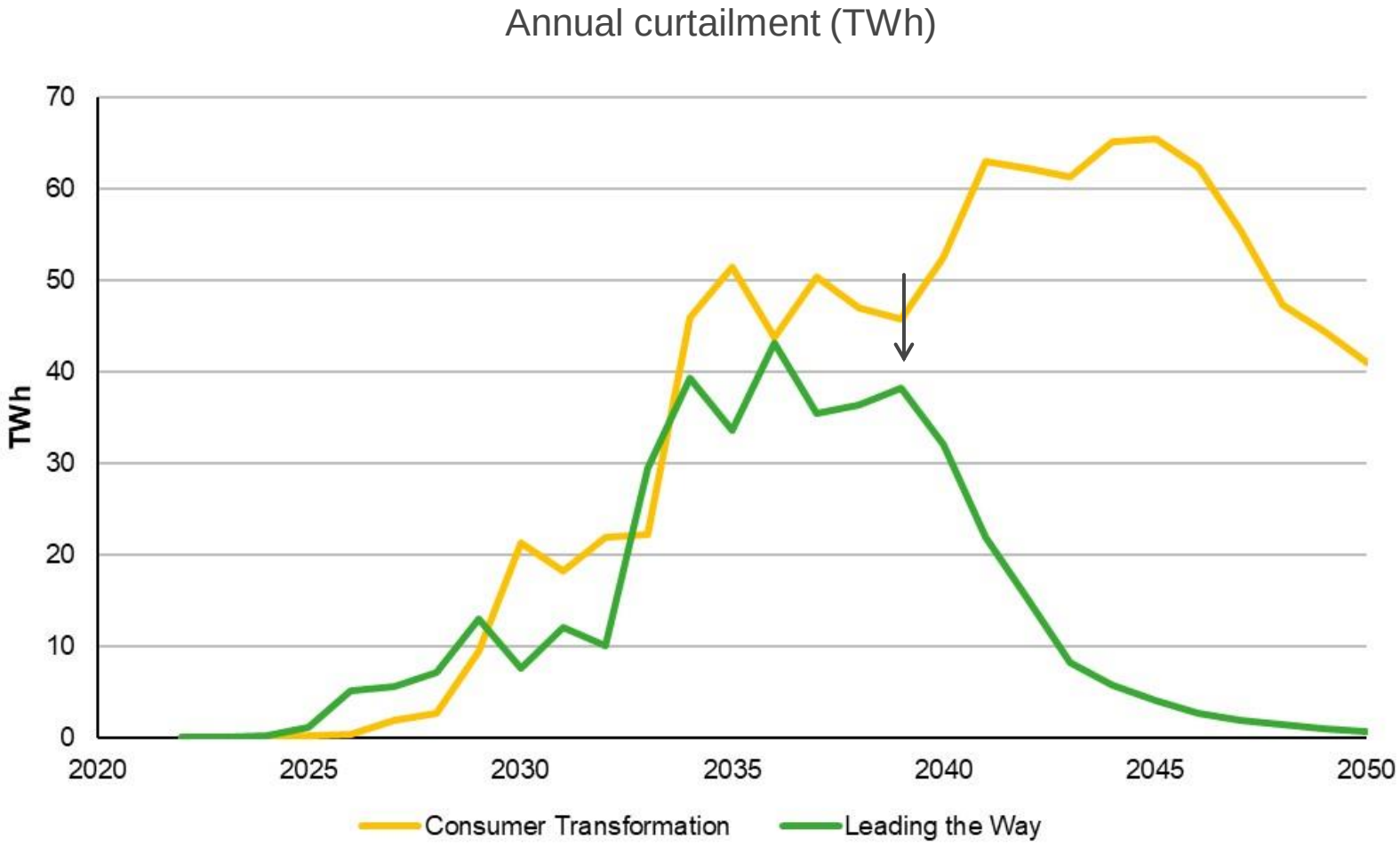
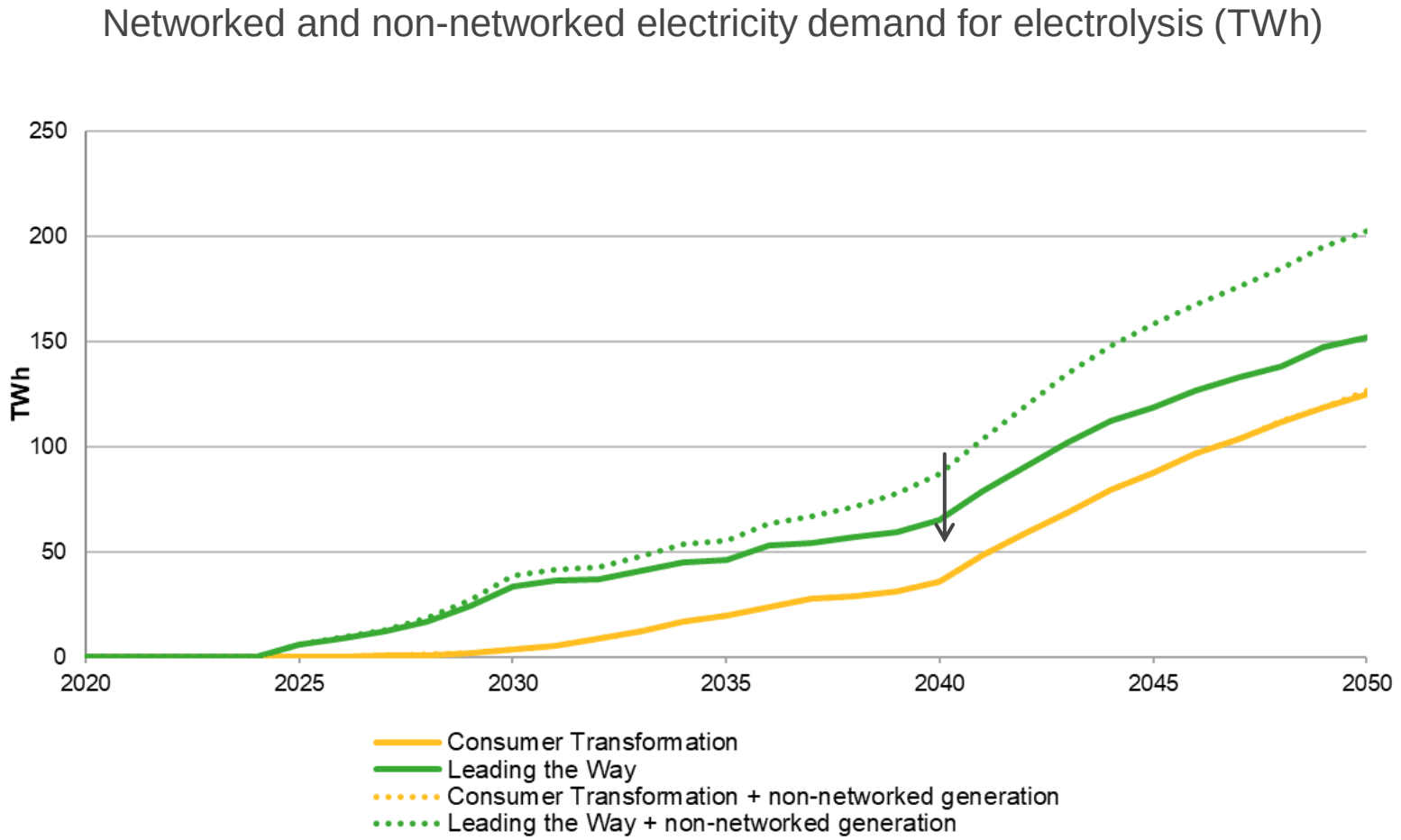
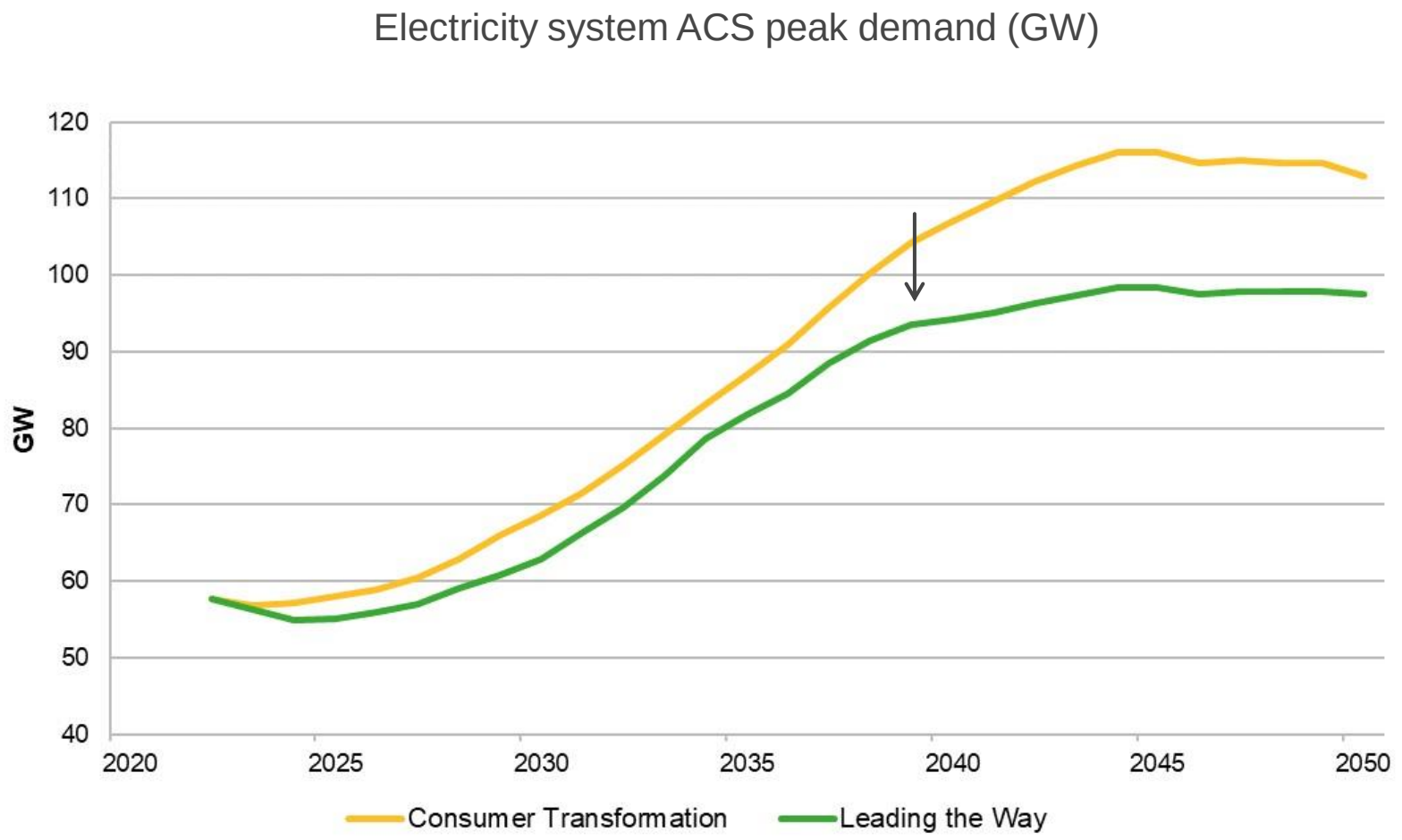


Strategically located electrolytic hydrogen can help manage curtailment



Lower levels of electrification and greater energy efficiency measures in Leading the Way reduces the rise in peak electricity demand



Investment in flexibility is needed as energy storage, interconnectors, DSR or electrolysis can help reduce curtailment if strategically located

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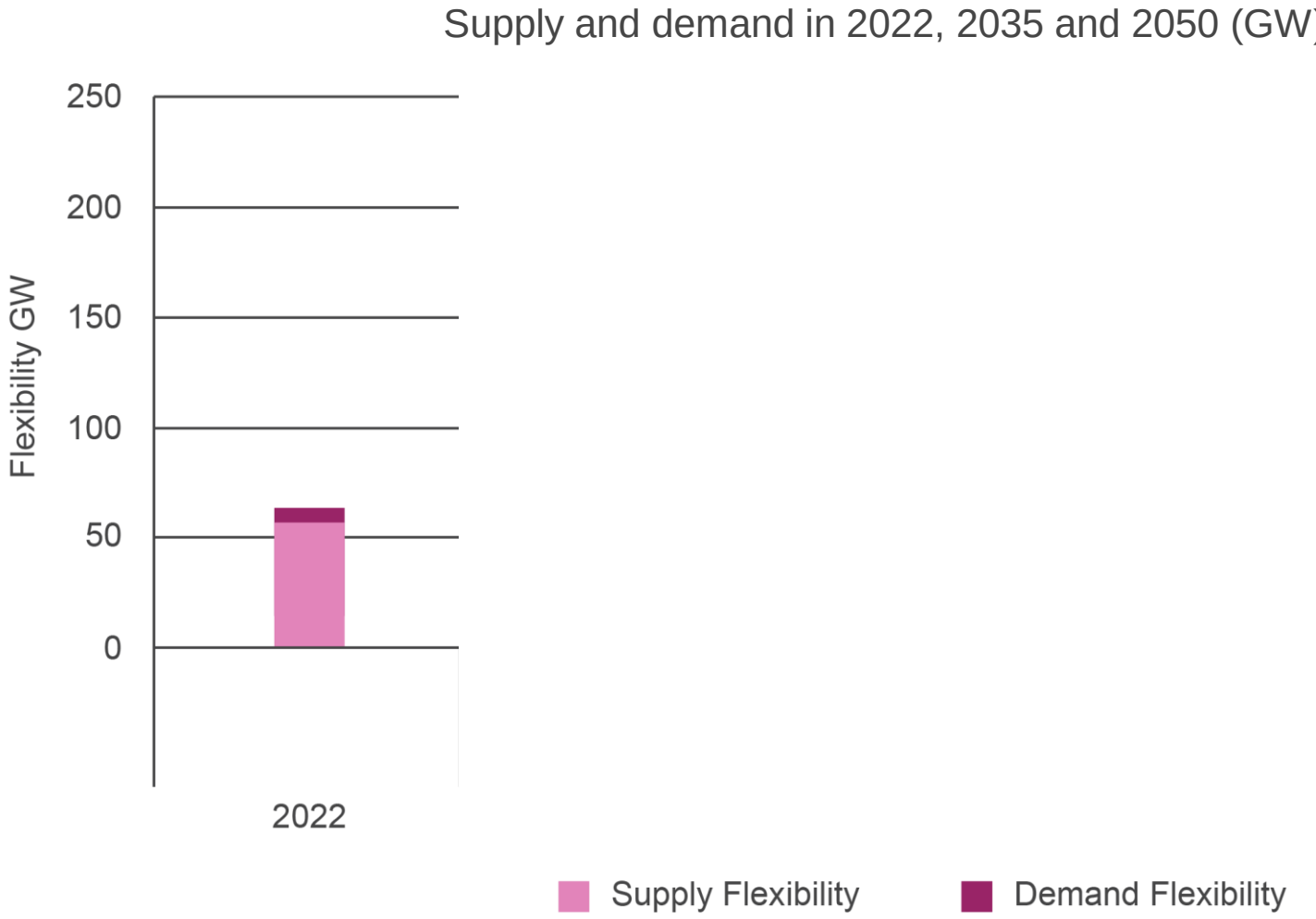

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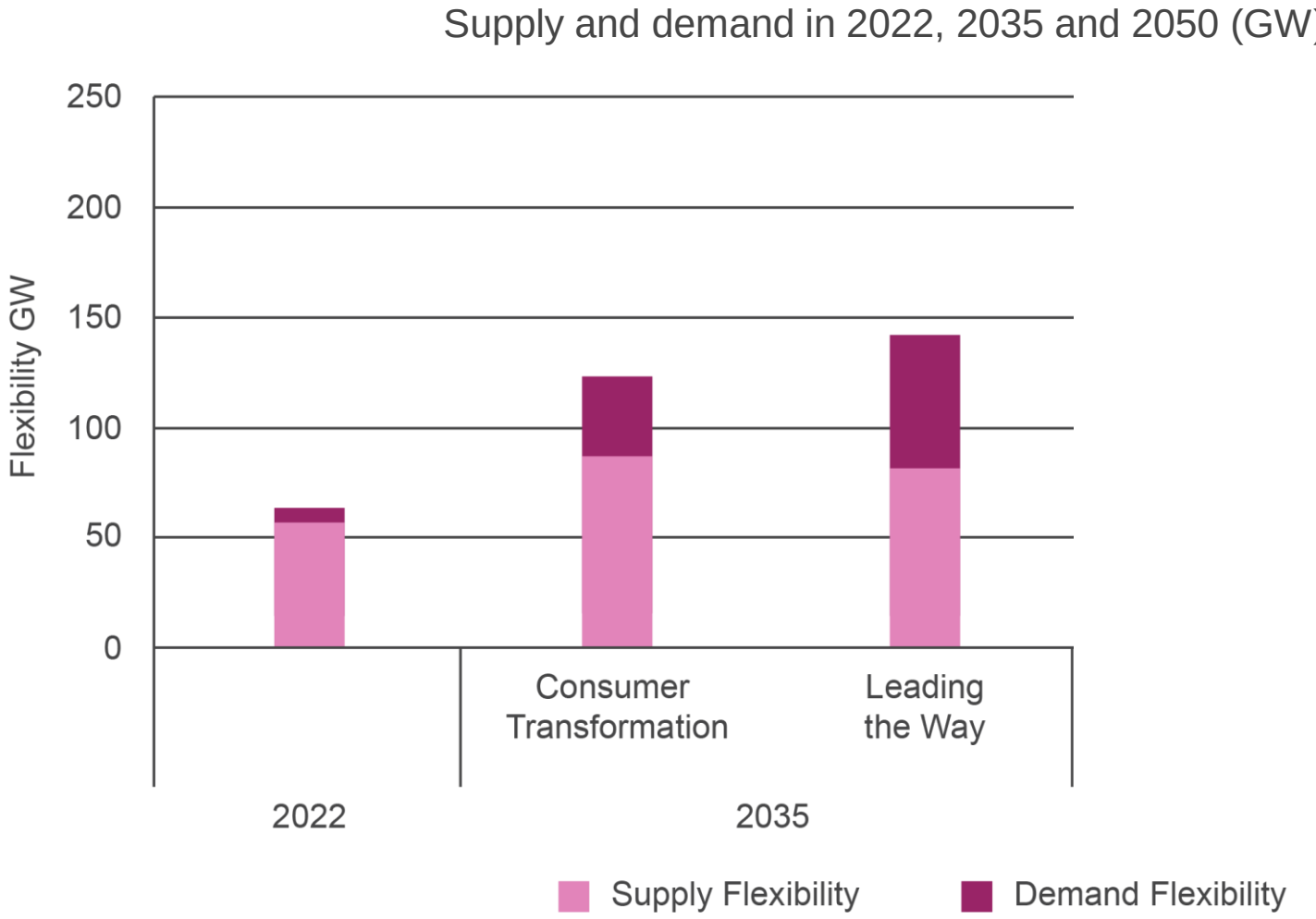

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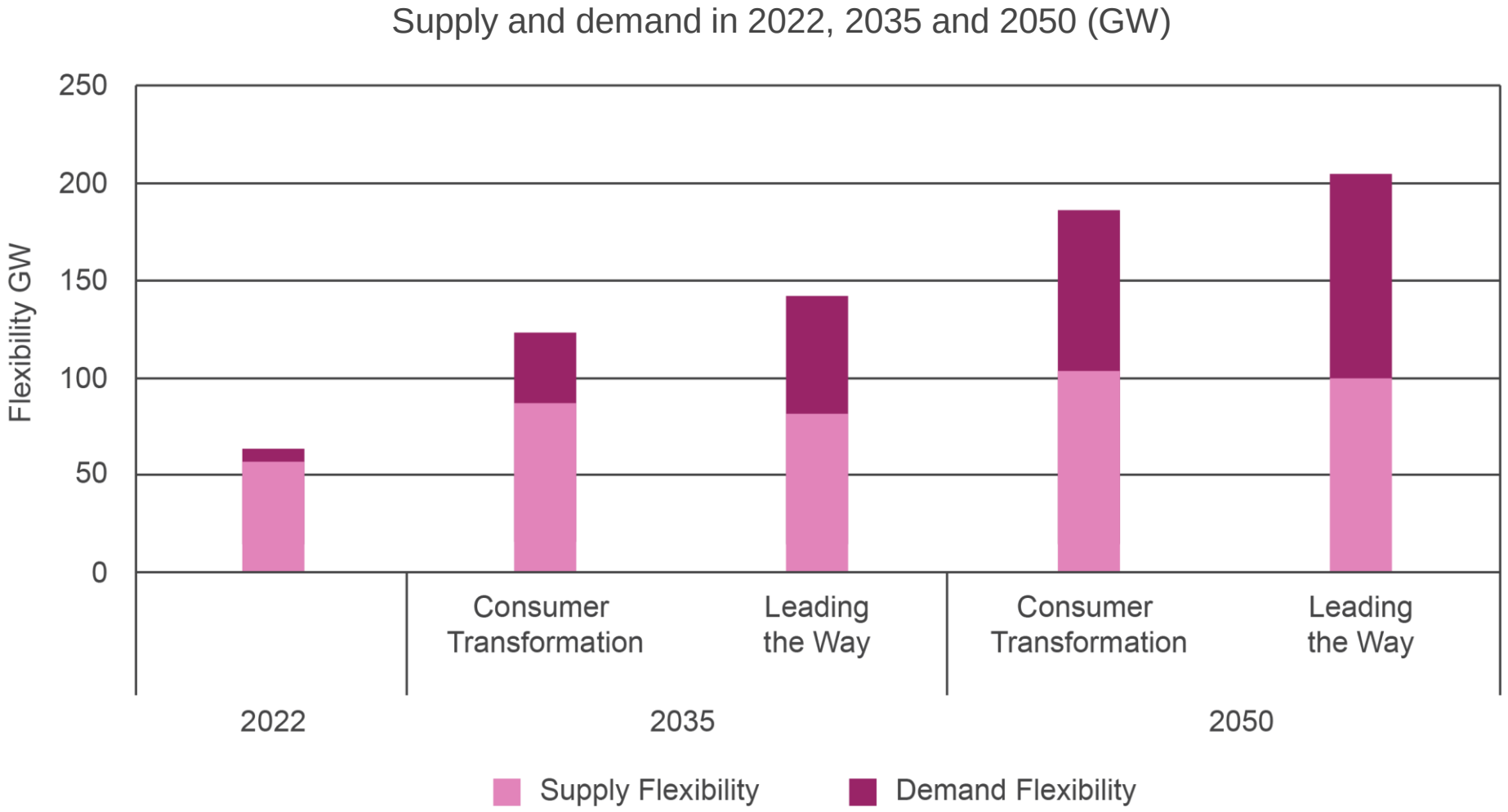
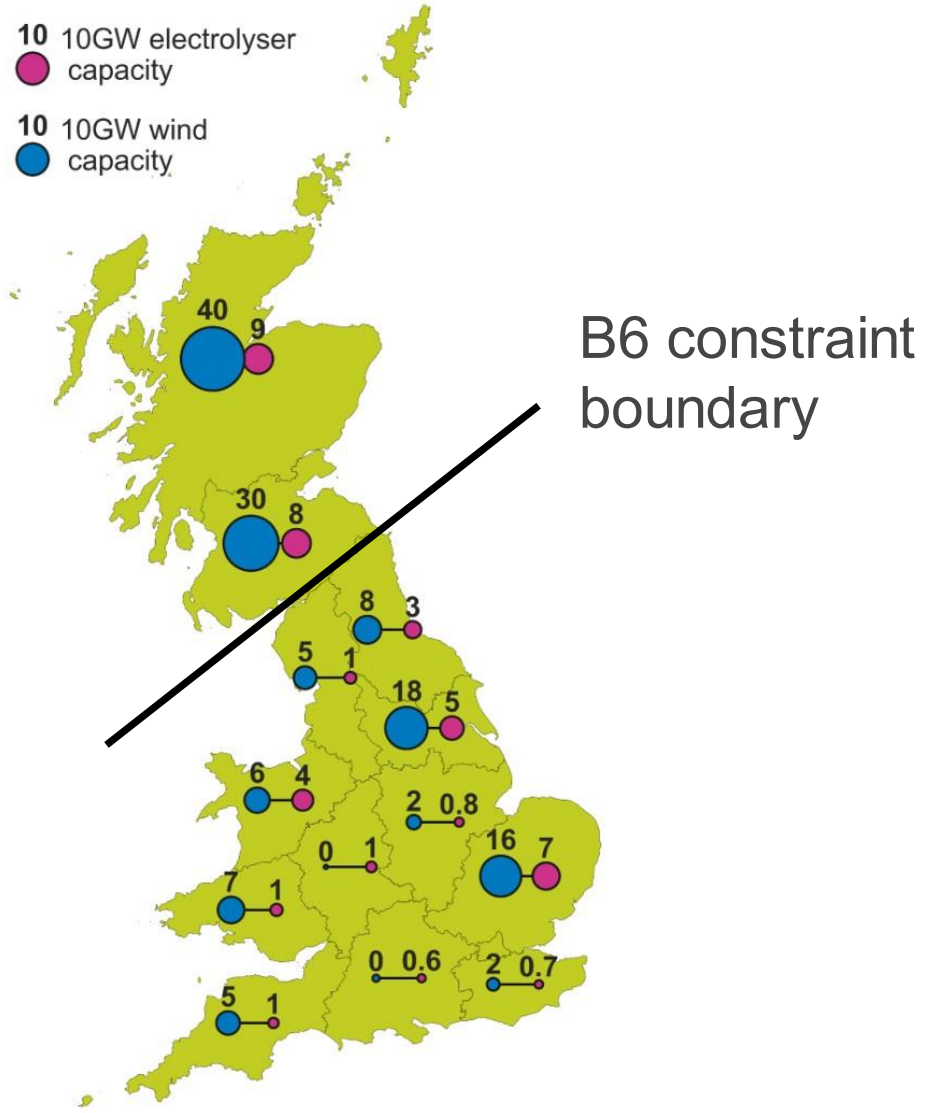


Whole energy locational strategy and incentives are required to deliver an efficient net zero energy system

Location of electrolyser and wind capacities, Leading the Way 2050



Main Takeaways

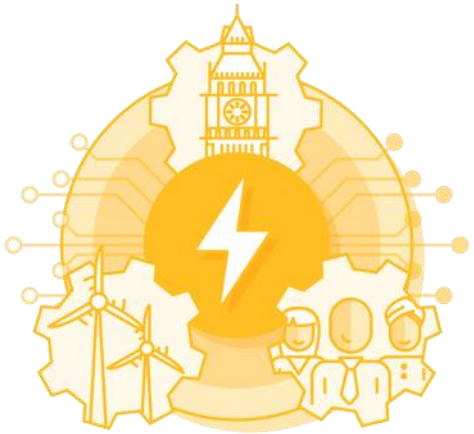
Whole system thinking

Locational signals from market reform

Strategic investment in flexibility

Whole energy locational strategy

Targets for the year ahead



Connections reform

Consultation responses and progress towards proposals for connections reform

Strategic network investment

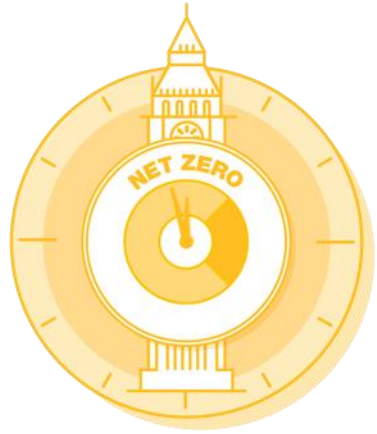
Progress towards delivery of the CSNP

Location of large electricity demands

Progress towards a coherent strategy for the location of large electricity demand

Locational signals

Progress towards the implementation of market changes through REMA



Net zero policy

Clear plan for deployment of hydrogen and CCS beyond the first clusters

Paul Wakeley

Networks, National Grid ESO

Faisal Haroon

Cadent Gas

Cadent

Your Gas Network

Cadent Gas

Faisal Haroon

July 2023

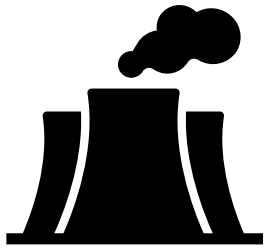
Who are Cadent?

- UK’s largest gas distribution network bringing gas to 12 million homes and businesses.
- Managing more than 82,000 miles of pipes, most of them underground, which transport gas throughout the North West, West Midlands, East Midlands, South Yorkshire, East of England and North London.
- Maintain, repair and replace gas pipes to ensure safe and reliable flow of gas.

Cadent firmly supports the UK's ambition to reach net zero

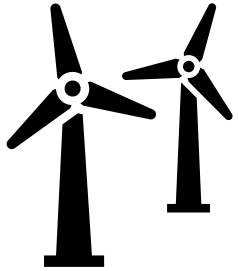
Ending our reliance on natural gas

- UK is legally obligated to meet net zero emissions by 2050.
- This will require a shift away from fossil fuels.



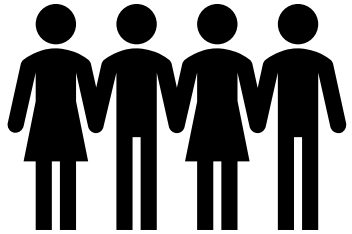
Utilising a range of technologies

- There is no silver bullet to meeting net zero.
- We need a suite of options to help us get there.

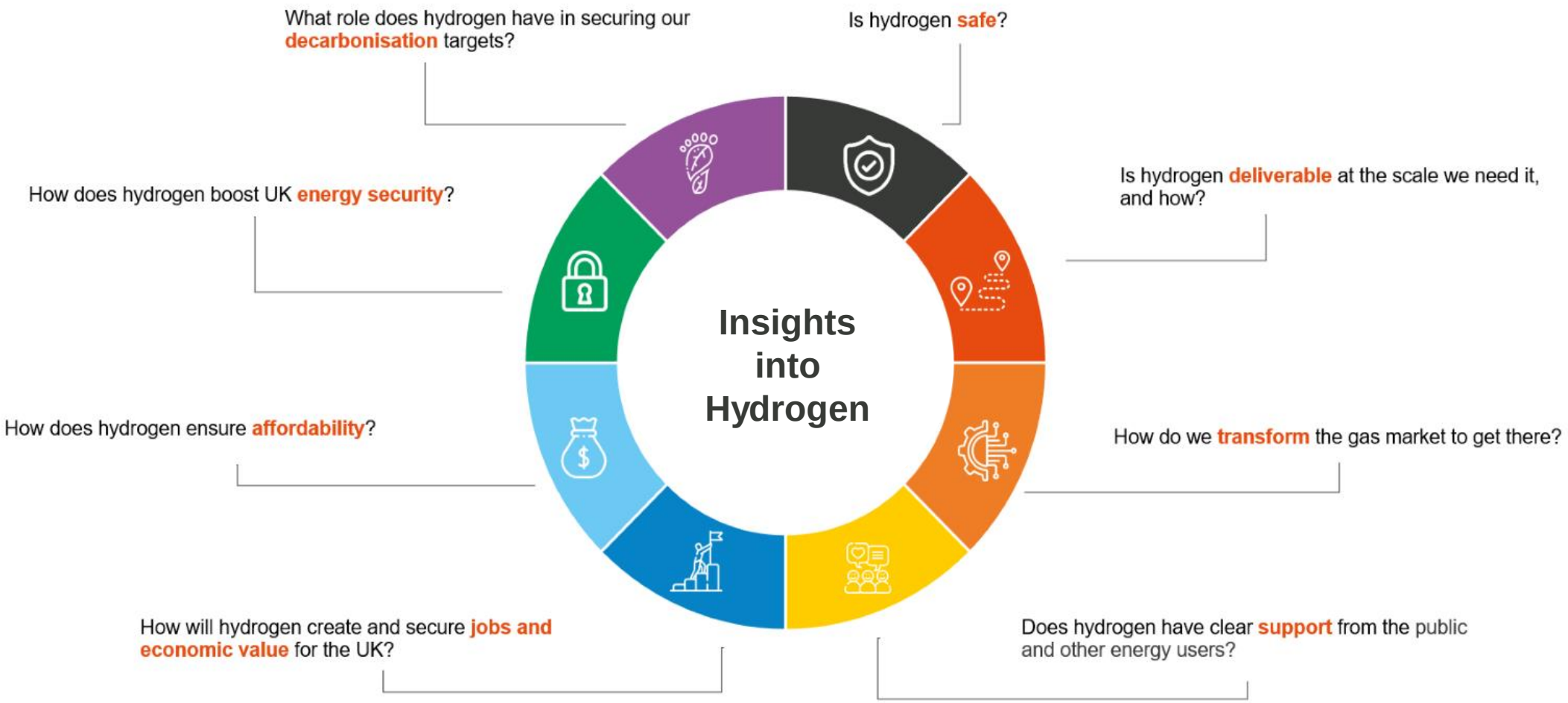


Engaging with people and communities

- A net zero transition must be just and fair.
- Educating and engaging with people and communities enables greater buy-in.



Cadent is working to answer these questions and provide policymakers with robust insight to help provide a balanced view on hydrogen



Where are we today?

1. While there have been some positive developments, CCC and FES analysis shows action being significantly off track in a range of areas.
2. In buildings, policy today can currently be characterised as deploying heat pumps at scale now whilst we determine the extent of the role hydrogen will have in the future.
3. Yet, we are on course to miss near-term heat pump targets with installation rates at around 1/9th of what's needed.
4. We agree with the FES recommendation that a clear decision on hydrogen for heating should be accelerated.

Table 1
Summary of progress against key indicators

Surface transport	Energy supply	Buildings	Industry	Agriculture and land
Electric car sales (G)	Grid storage (G)	Electricity to gas price ration (G)	Bioenergy use in industry (G)	Livestock numbers (G)
Battery cell prices (O)	Dispatchable low-carbon capacity in development (G)	Greening Government commitments (G)	Electricity use in industry (O)	Livestock exports (G)
Petrol / diesel car intensity (O)	Offshore wind (O)	Low-carbon share of heat supply (O)	Energy consumption per unit of GVA (O)	Food waste (G)
Petrol/diesel van intensity (O)	Onshore wind (O)	Energy efficiency measures (R)	Private sector targets (R)	Woodland management (O)
Van km (O)	Unabated gas (O)	Heat pump installations (R)	Industrial process emissions (R)	Crop yields (O)
HGV km (O)	Refineries emissions (O)	Heat pump costs (R)	Hydrogen use in industry (W)	New woodland (R)
Electric van sales (R)	Solar PV (R)	Trained heat pump installers (R)	Pipeline of hydrogen projects (Gr)	Peatland restoration (R)
Car km (W)	Active demand response (W)	Residential energy demand (W)	Industrial energy efficiency (Gr)	Anaerobic digestion (R)
Public chargepoints (W)	Low-carbon hydrogen production (W)	Non-residential energy demand (W)	Pipeline of industrial CCS projects (Gr)	Energy crops (W)
Public transport demand (LGr)	Oil and gas production emissions (W)	Non-residential buildings energy intensity (W)	Industry consumption emissions (LGr)	Meat consumption (W)

Key:
On track (G) | Too early to say (W)
Slightly off track (O) | Data not reported (Gr)
Significantly off track (R) | No benchmark or target (LGr)

Notes: An indicator is on track if it is going in the right direction at an appropriate rate. This is determined by comparing the historical data to Government ambition or the CCC's recommended path and considering wider contextual factors.

Climate Change Committee

Focus on heat

There is a need to accelerate both the uptake of heat pumps and the decision on whether hydrogen will be used for large scale heating.

Further policy support and incentives are needed to increase uptake rates of heat pumps.

A clear decision on hydrogen for heating should be accelerated and heat pump targets and incentives reviewed accordingly.

Future Energy Scenarios

What role does hydrogen have in securing our decarbonisation targets?

Hydrogen is versatile

- Capable of being created from a range of different energy sources.
- Can be stored for long periods of time.
- Can be distributed as a liquid or gas.
- Can be used in a variety of use cases; including electricity, transport fuel, industrial processes and in homes and businesses as heat.

Without hydrogen there will be no net zero

- Policy today is rightly focused on electrification whilst determining the extent of the role hydrogen will have in the future.
- Government believe hydrogen could meet 20-35% of UK energy demand by 2050.

Supporting a two-track and whole-system approach

- Cadent supports the two-track approach of electrifying heat wherever appropriate now alongside using hydrogen to decarbonise industry and some transport.
- At the same time, assessing the options of hydrogen for heat later.
- We think the most cost-effective proposition is one that takes a whole-system approach to decarbonisation.

Hydrogen use cases

1. Power and Industry

- Key source of flexibility in a power system dominated by intermittent renewables.
- Long-term storage when supply > demand; supplying energy when demand > supply.
- Utilise clean hydrogen to decarbonise ‘hard to abate’ industrial sectors.

2. Transport

- Longer-range, quicker refuelling for vehicles like HGVs and buses.
- Can be converted to ammonia for shipping.
- Potential long-term solution for decarbonising some aviation.

3. Homes and businesses

- Hydrogen suits homes that are ‘hard to abate’ due to the heterogeneity, quality of housing stock and the requirement of individual action (and investment required).
- Many households will not be able to afford the £13k average cost to install a heat pump.
- What are the alternative options for these households?

Cadent are the leading the way by delivering a series of important projects that are making hydrogen a reality

HyNet

- HyNet will provide the infrastructure to produce, transport and store low carbon hydrogen across the North West and North Wales.
- There will also be the infrastructure to capture, transport and lock away carbon dioxide emissions from industry.
- Over 40 organisations have signed up to decarbonise their operations through HyNet.

HyNet North West

East Coast Hydrogen

- A collaboration between Cadent, Norther Gas Networks and National Grid Gas Transmission to see over 7GW of hydrogen production connected by 2030.
- In the next 15 years it could see up to 39,000 businesses and over 4 million homes converted to hydrogen.

East Coast Hydrogen

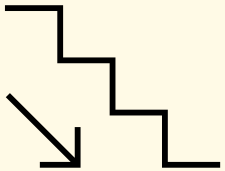
Hydrogen Valley

- An east-west corridor that encompasses Norfolk in the East and Shropshire in the West.
- Project is being delivered in collaboration by Cadent and National Gas Transmission.
- Aim to establish the hydrogen economy in the region to accelerate industrial decarbonisation.

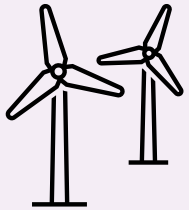
Hydrogen Valley

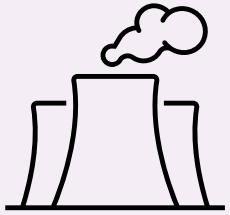
Main takeaways

1. Cadent firmly supports the UK's ambition to meet net zero

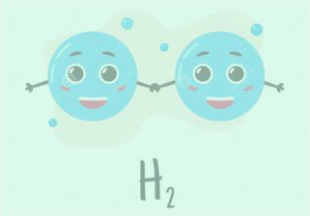


2. A range of technologies will be needed to get there

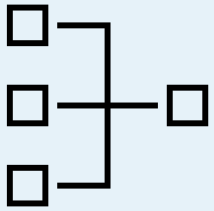




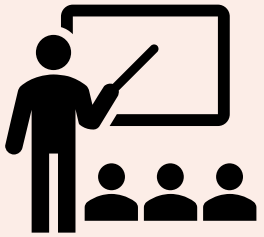
3. Without hydrogen, we won't meet net zero

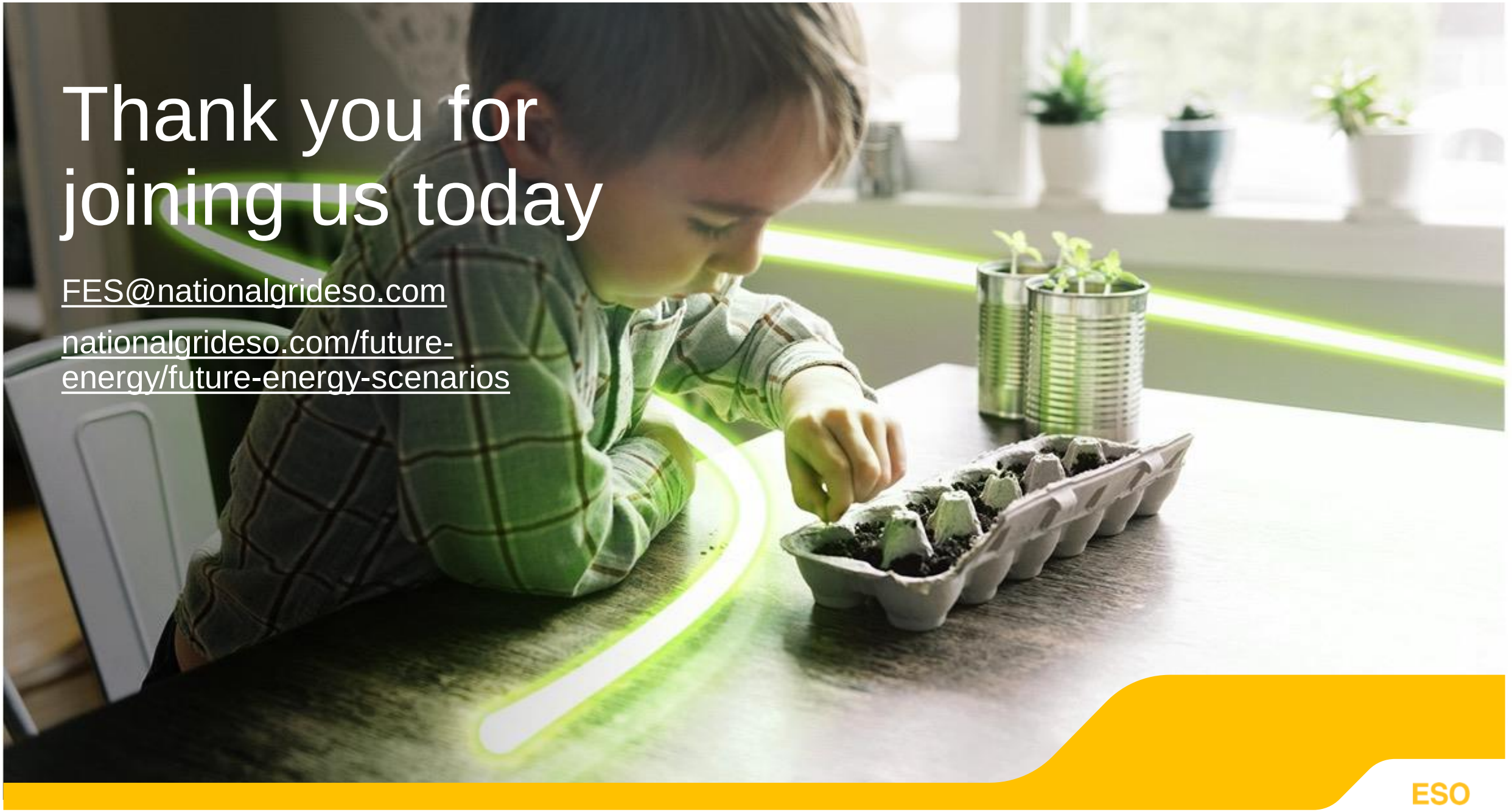


4. We need a whole-system and holistic approach to lowering emissions



5. Engaging and educating consumers will enable greater buy-in





Thank you for joining us today

FES@nationalgrideso.com

nationalgrideso.com/future-energy/future-energy-scenarios