

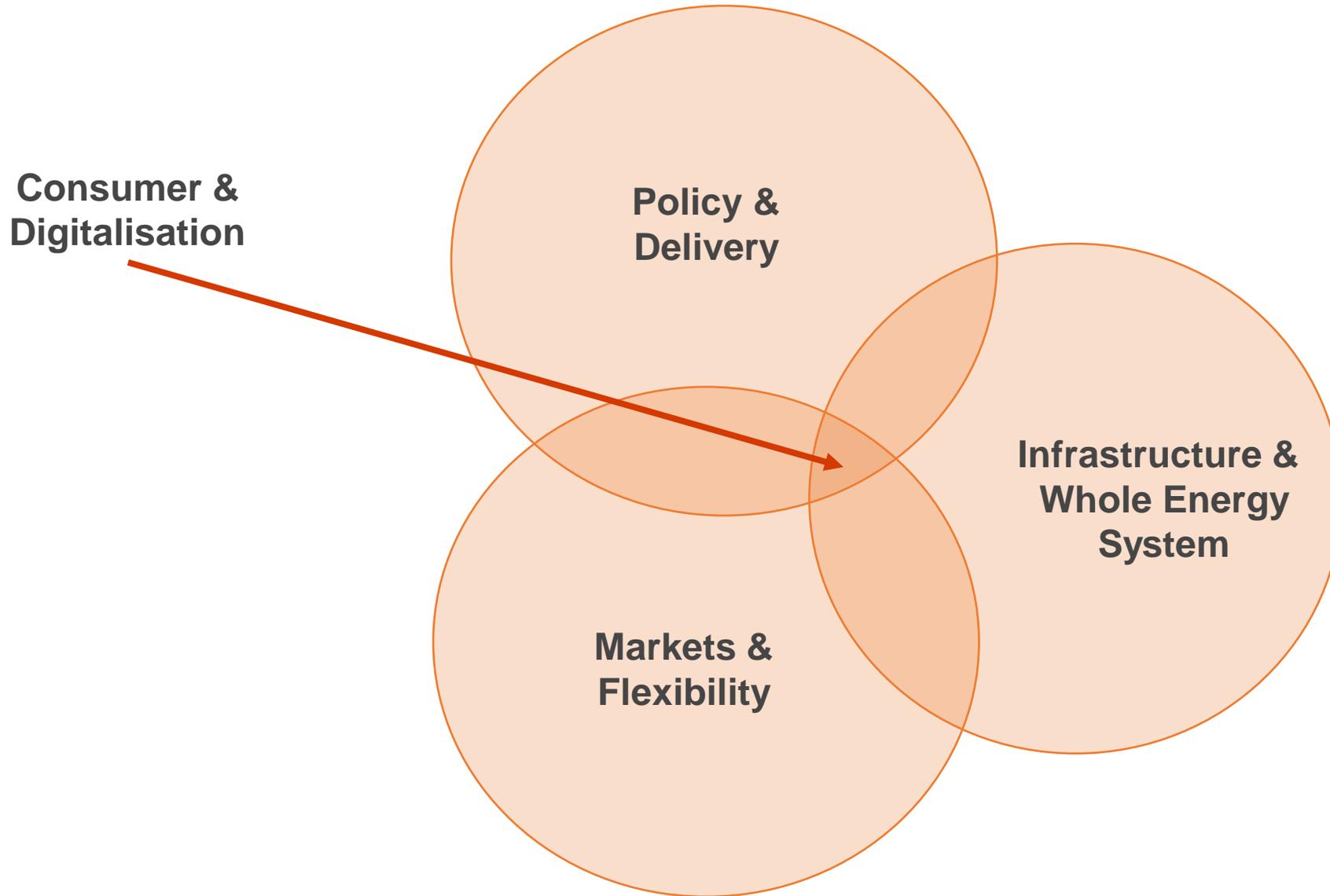
**Key Message 3**  
**Markets and Flexibility**  
**10:00 21/07/22**

July 2022

# Future Energy Scenarios

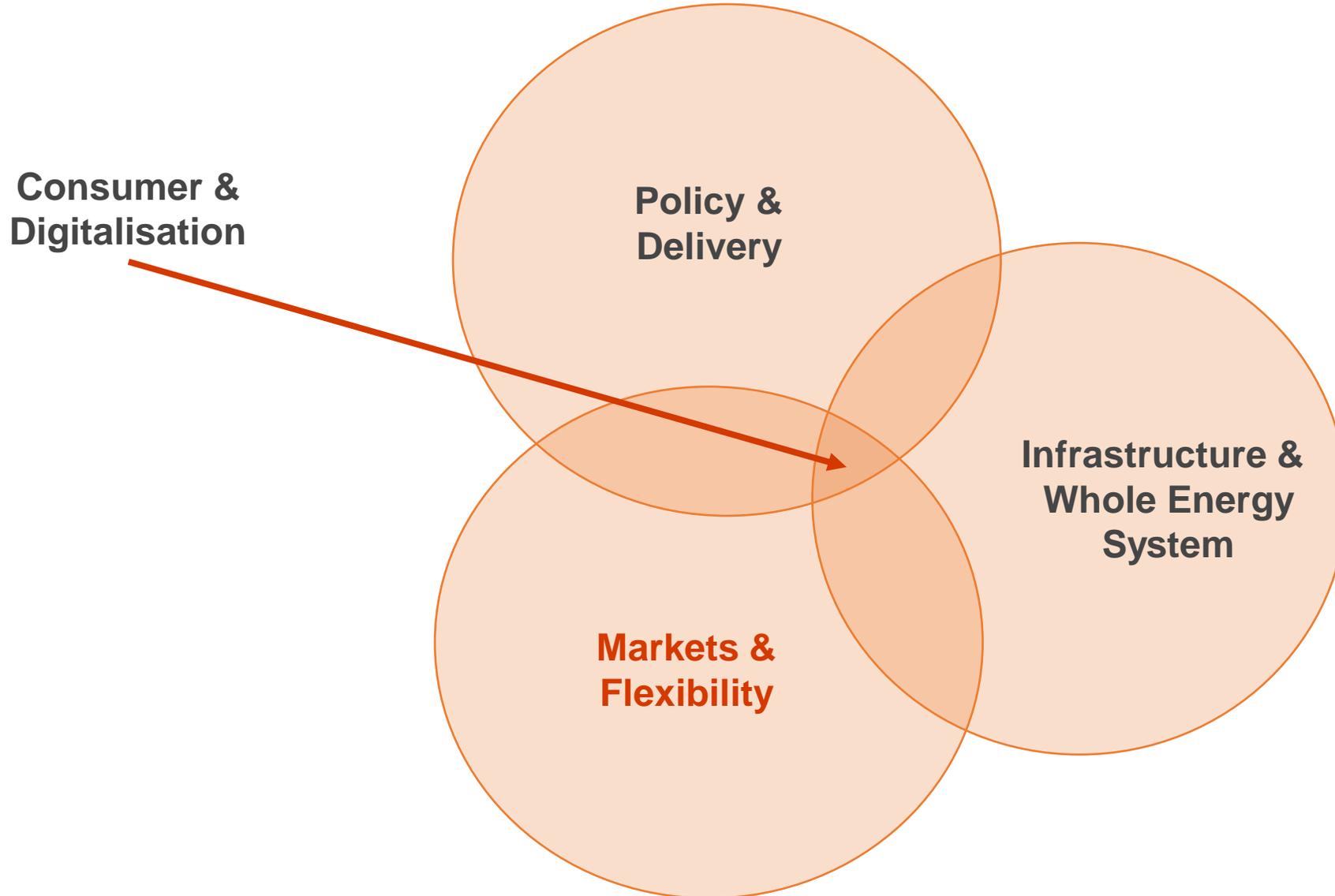
# The FES 2022 key messages are all connected

#KM1



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## Key Message

# Markets and flexibility

Reforming energy markets to improve price signals will help unlock the flexible solutions needed to integrate renewables efficiently.



Wind and solar generation currently make up 43% of GB energy supply and this rises to at least 66% across the scenarios by 2030



Annual transmission constraint costs have increased from £170m in 2010 to £1.3bn in 2022 and are expected to continue rising

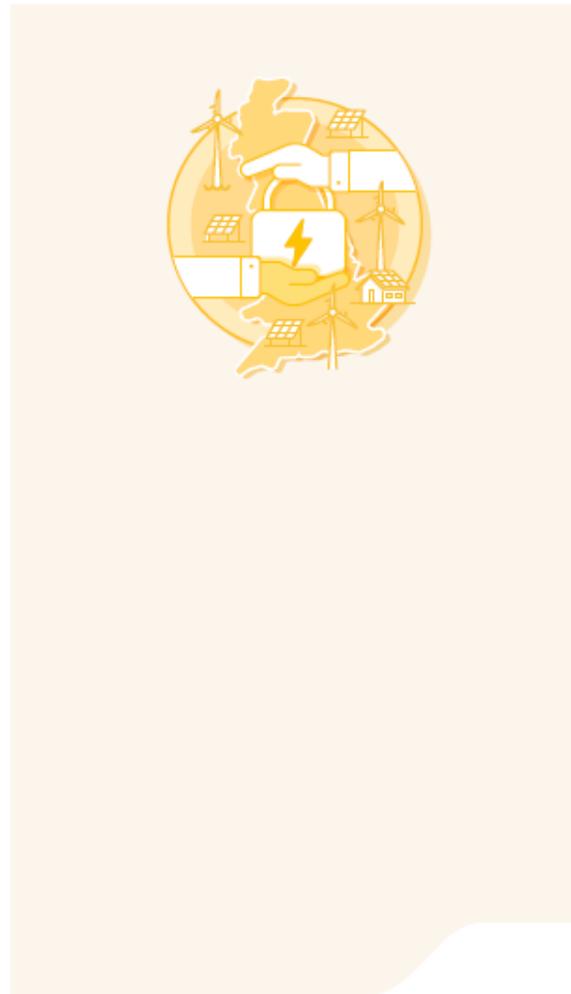
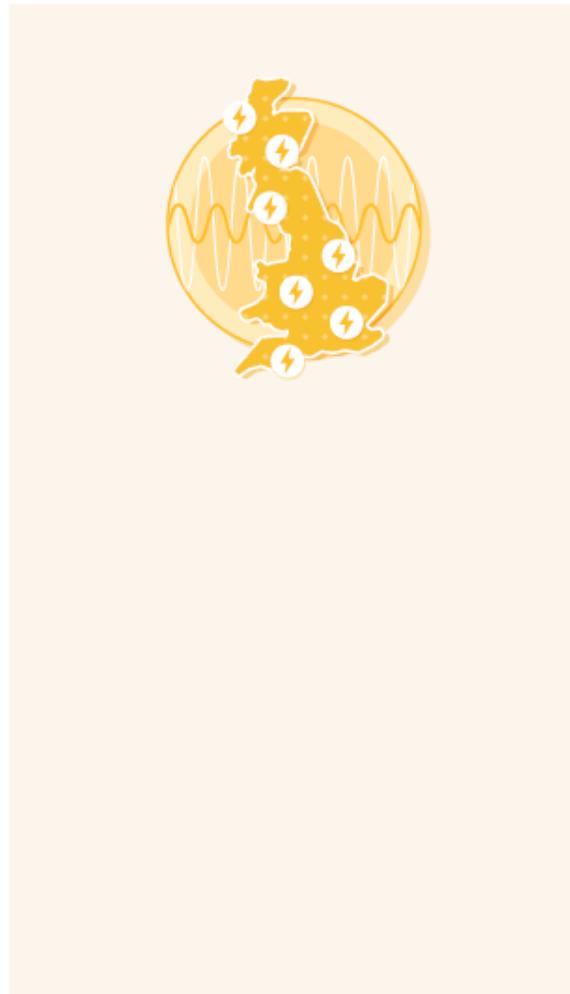
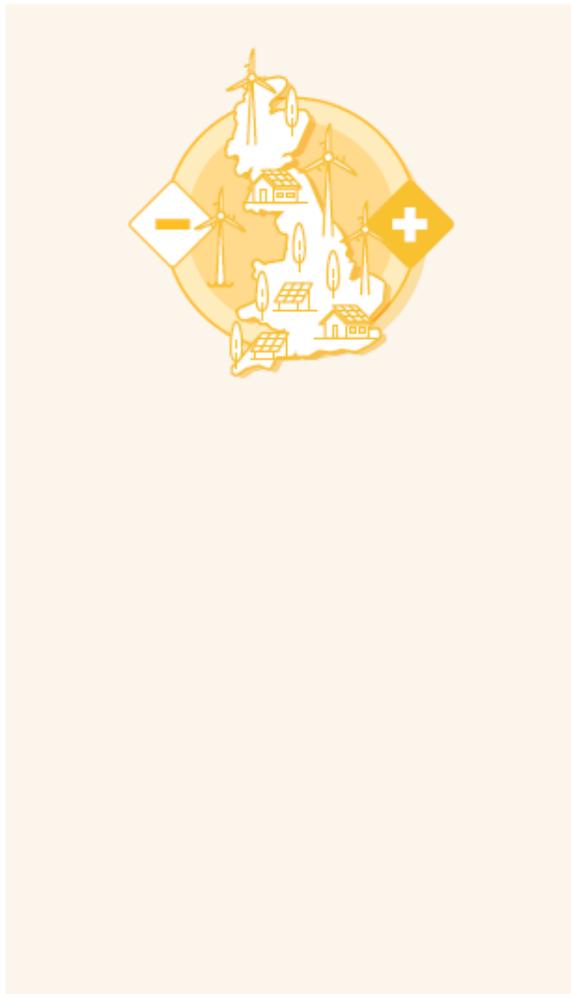


In **Leading the Way**, demand side flexibility reduces unmanaged peak demand by over 40% by 2035



**Consumer Transformation** and **Leading the Way** have more than 115 GWh of electricity storage in 2035 compared to less than 30 GWh today

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### Flexibility requirement

Operating a future energy system with high levels of renewables and no unabated natural gas generation will require significantly more flexible capacity than we have today.

Current market signals mean that flexible assets cannot contribute their full value to the system and may at times exacerbate network constraints - the impact of this will only increase in the future if changes are not made now.



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### Locational signals

ESO analysis shows that market reform is needed to provide the dynamic real-time locational signals required to optimise dispatch and siting decisions of flexible capacity on the whole energy system.

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### Market participation

The energy market of the future must harness the vast potential of demand side flexibility to integrate renewables and ensure security of supply at least cost for all.

Market changes must facilitate flexible tariffs, support innovation and reduce barriers to participation for new market entrants from the industrial and commercial sector or in the form of aggregated residential demand.

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Call to action

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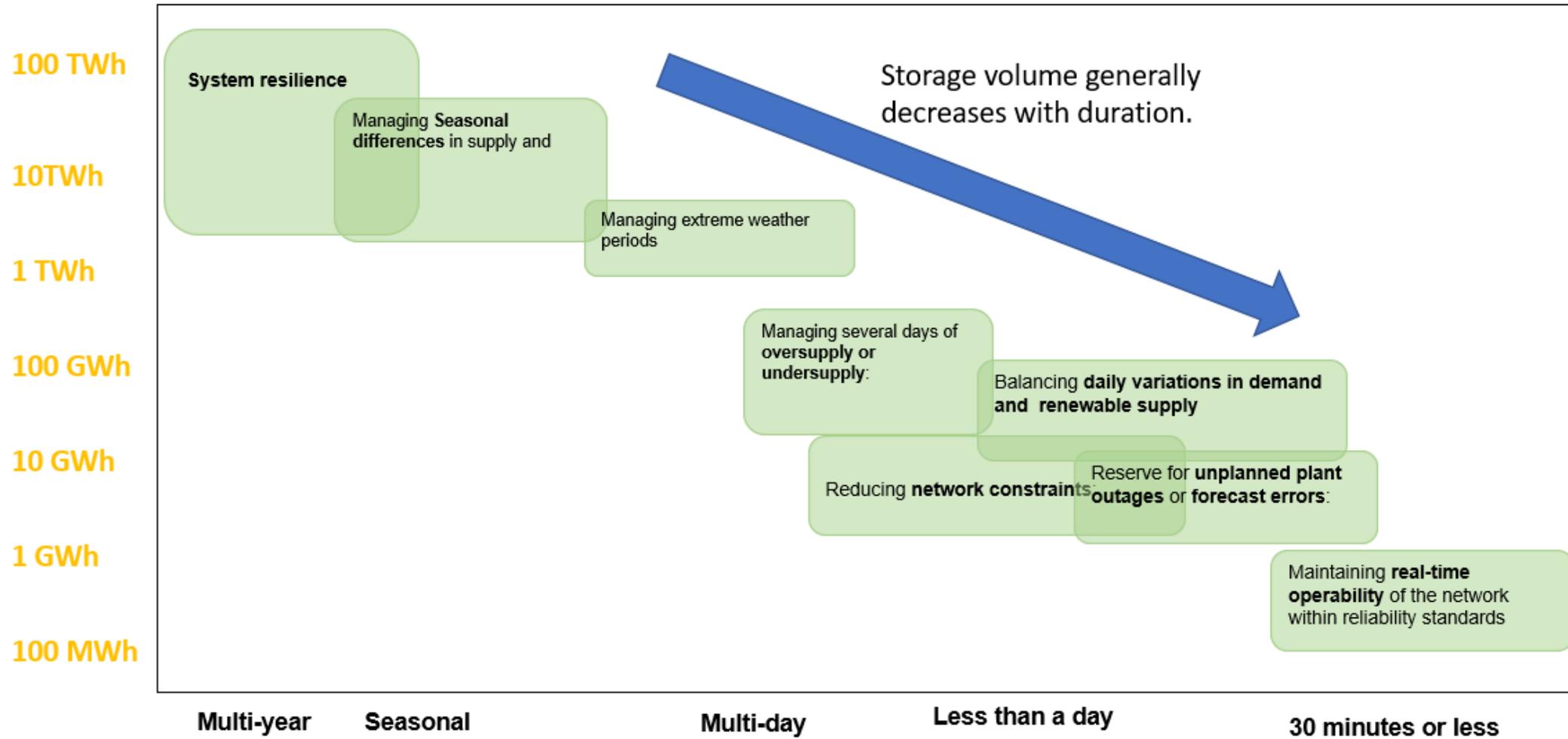


### Market participation

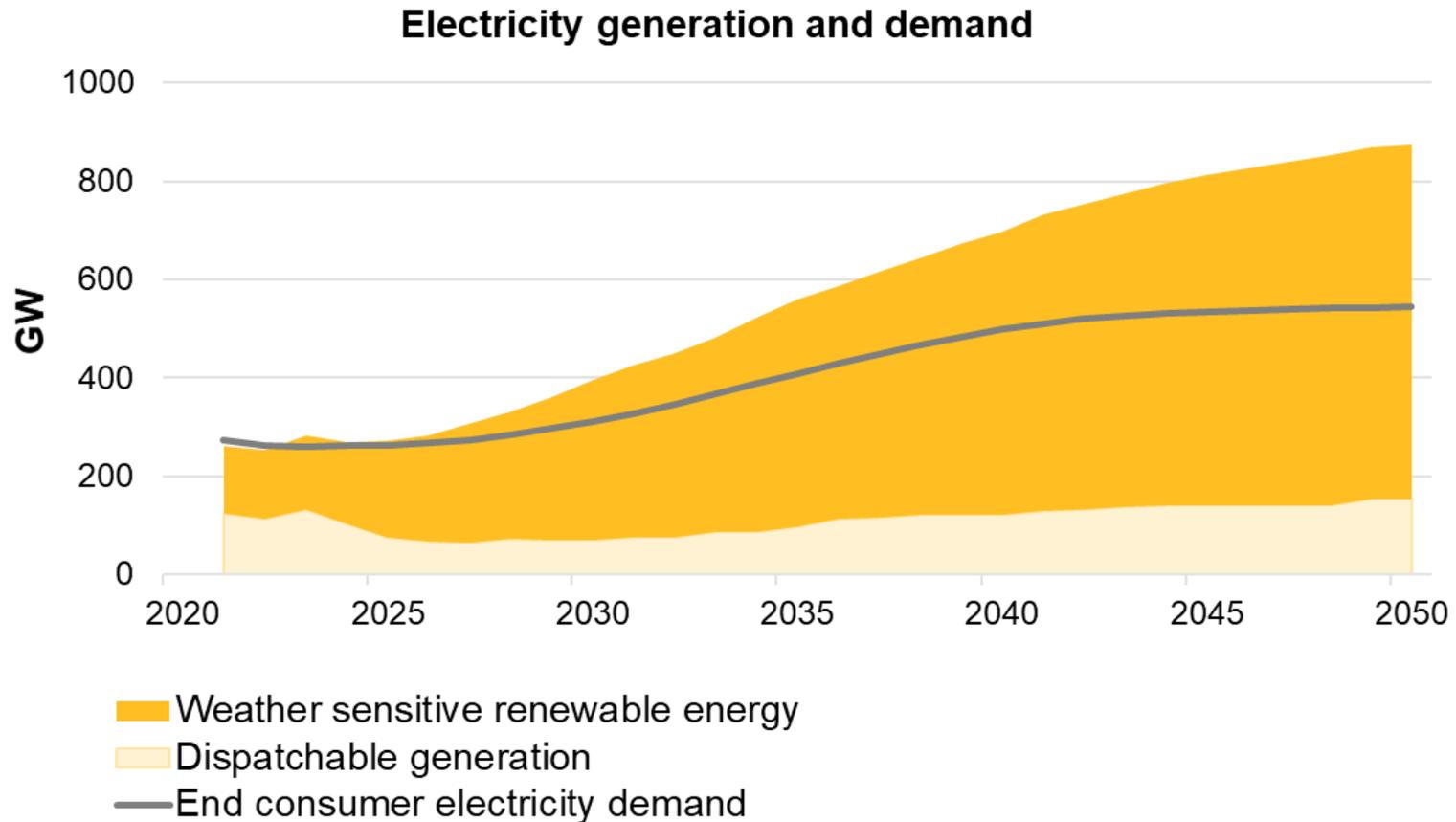
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# We need flexibility to adjust supply and demand to ensure energy systems are balanced



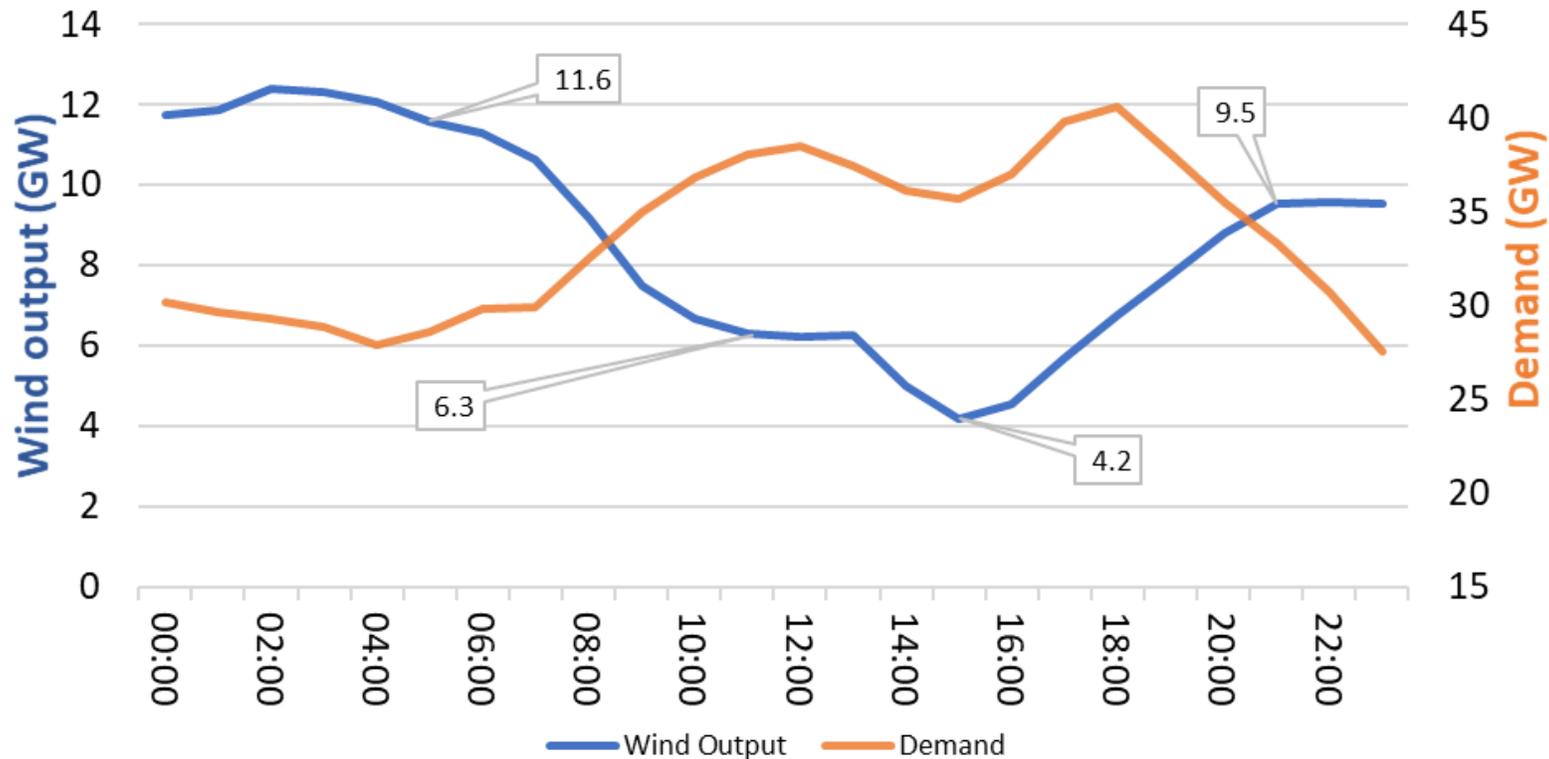
# Increased renewable deployment, and reduction in fossil fuel usage, will require increased flexibility across the whole energy system



- Many sectors electrify to decarbonise, increasing electricity demand.
- To meet this increased electricity demand, renewable generation will increase significantly while fossil fuel (gas) generation decreases.
- Renewable generation is weather sensitive but there are flexibility options to manage this.

# Future flexibility will need to shift demand as well as supply

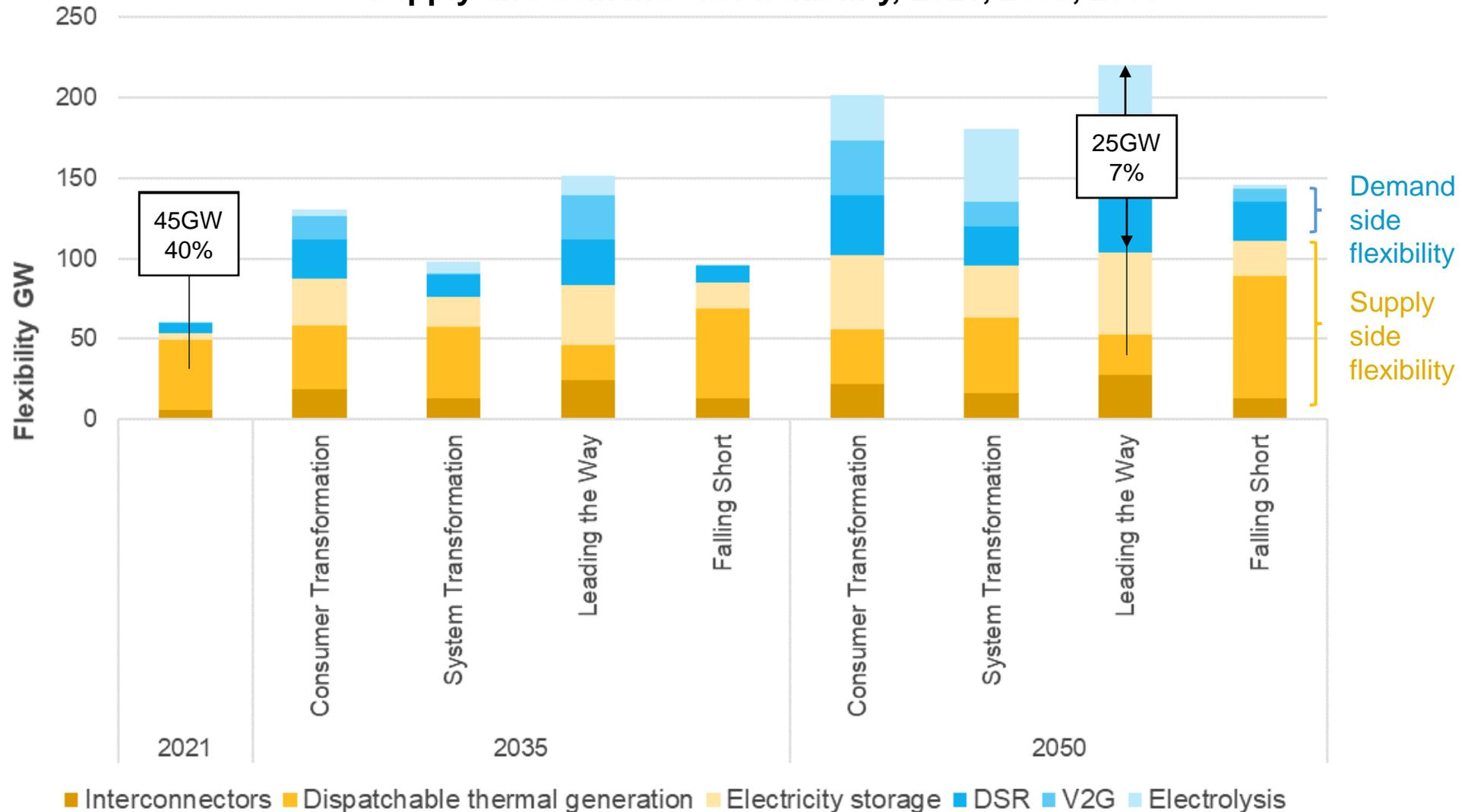
Average hourly wind output, 19 February 2022



- Renewable generation is weather sensitive so changes in supply as well as changes in demand will need to be managed.
- This will require the ability to flex both demand and supply.

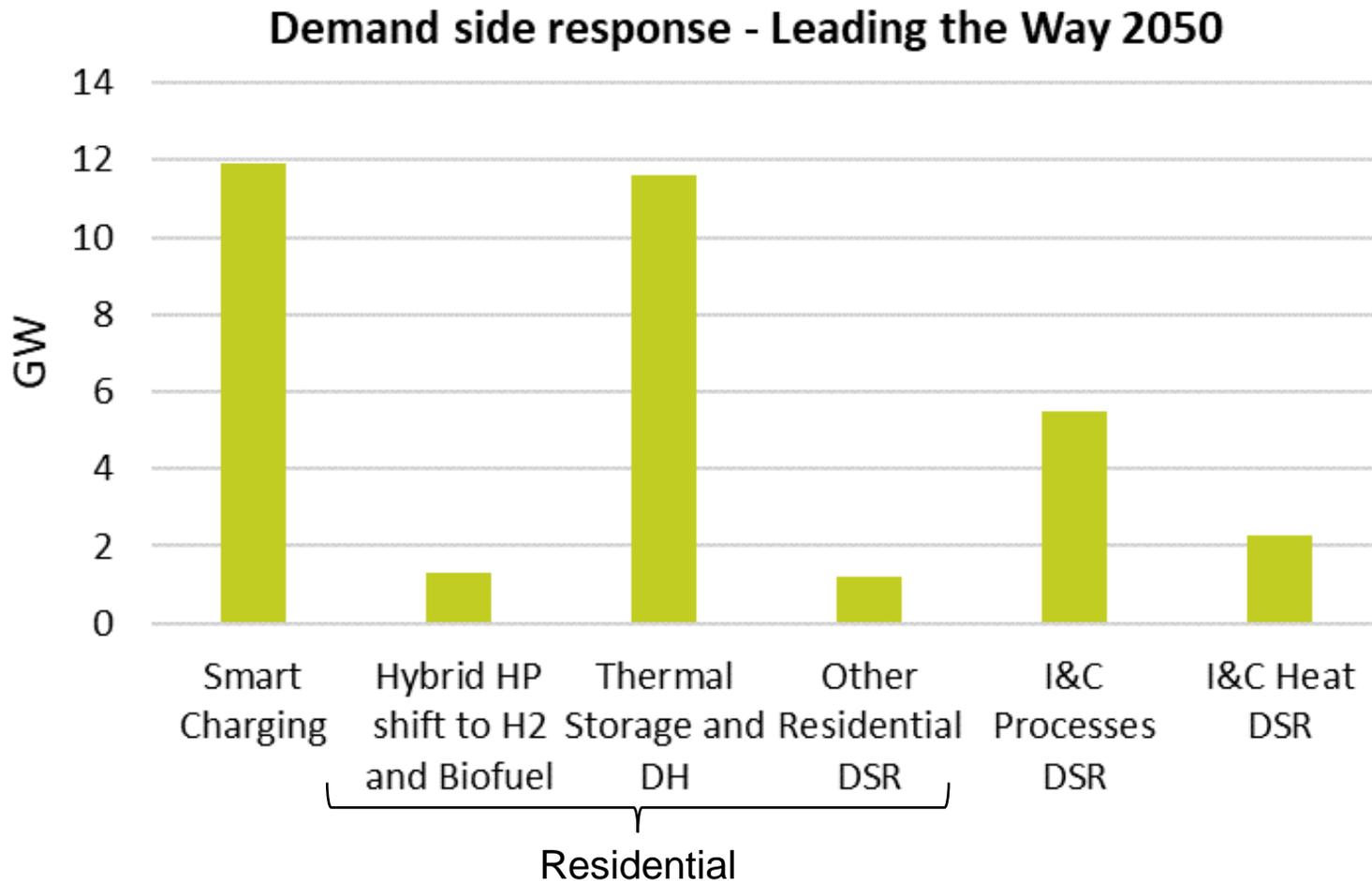
# Both demand side and supply side flexibility will need to increase

Supply and demand side flexibility, 2021, 2035, 2050



- 60 GW of flexibility in 2021
- Up to 220 GW of flexibility by 2050
- LW more demand side than supply side flexibility by 2050
- Requires a market that can harness all of this flexibility potential

# EV smart charging, residential thermal storage and industrial and commercial sectors are the largest providers of demand side response



- Enable and engage consumers by making demand flexibility an integral part of the system.

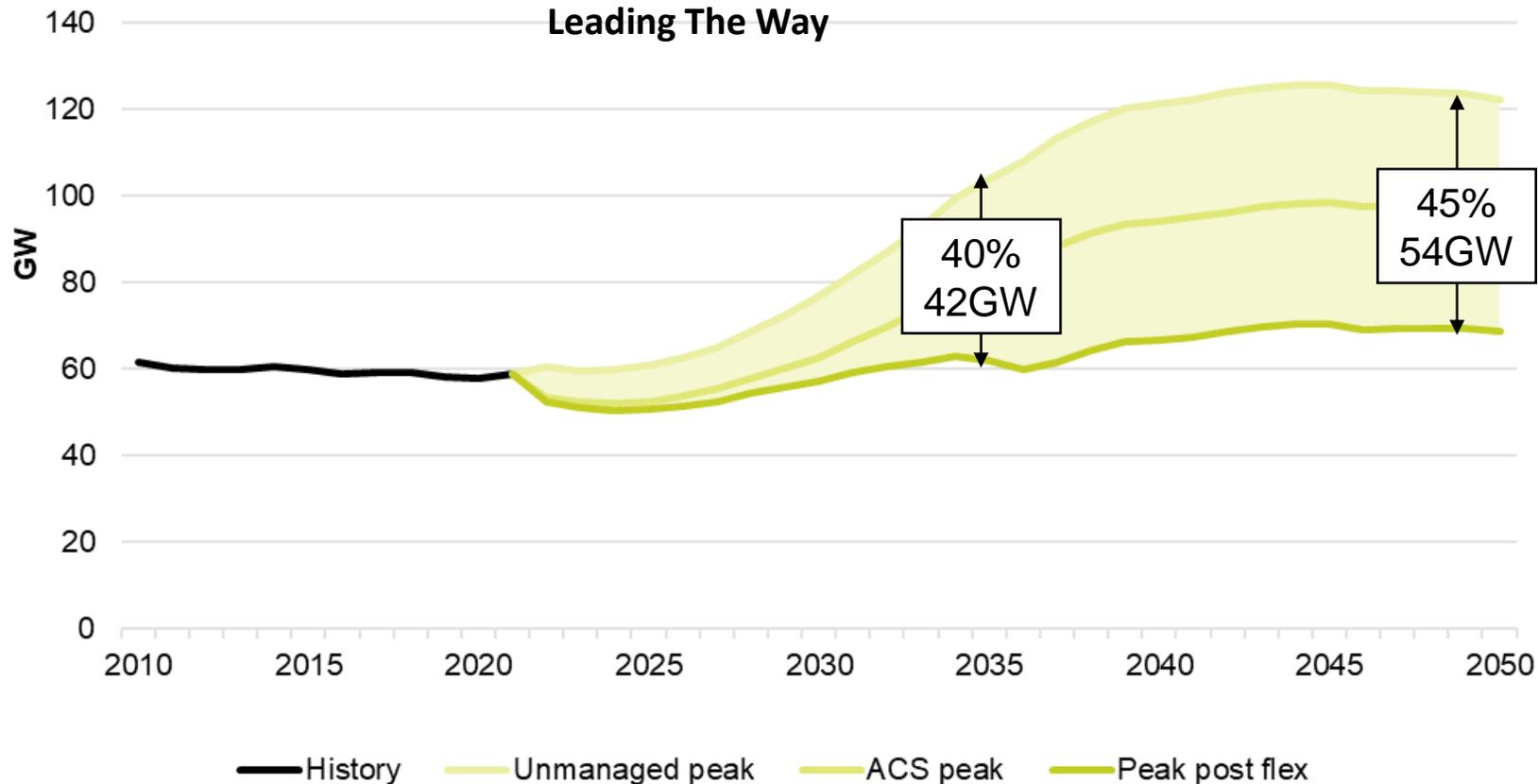


- Market changes must support flexible tariffs and remove barriers to new market participants

# Demand side flexibility can reduce peak demand when renewable supply is low

## Impact of demand side flexibility on peak demand

Leading The Way



- Without demand side flexibility peak demand would increase significantly
- This can reduce network reinforcement and the cost to the consumer
- Crowdflex innovation project aims to establish domestic flexibility as a reliable and cost effective energy and grid management resource

**Unmanaged peak:** Theoretical peak demand if no load management actions are taken.

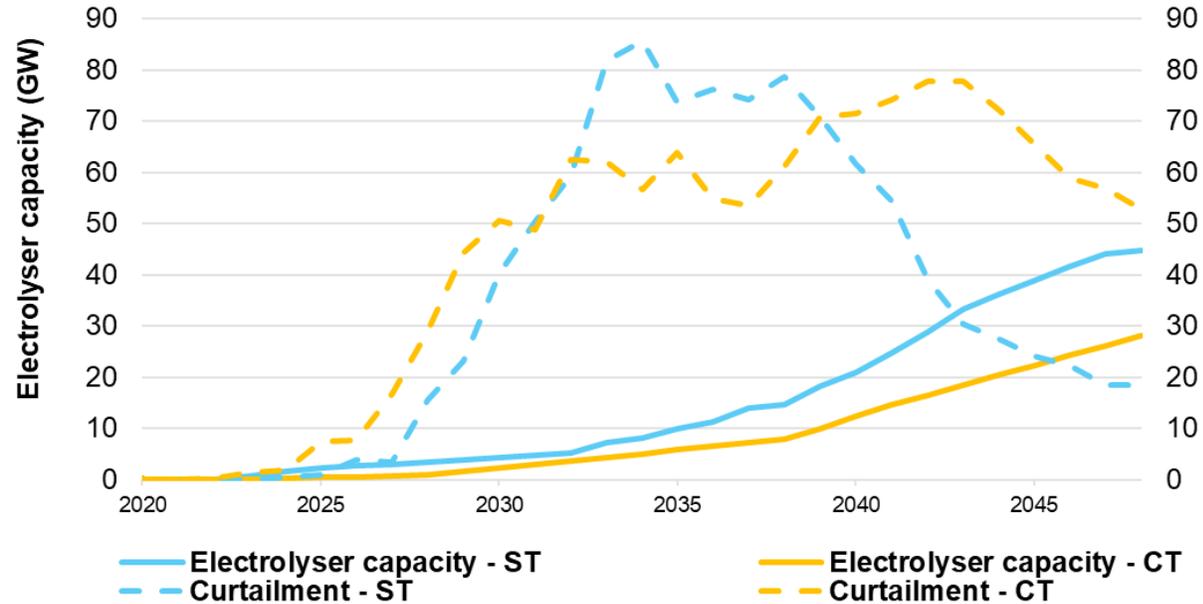
**ACS Peak:** Includes demand reduction from Smart Charging and Residential Heat flexibility.

**Post Flex:** All demand flex including V2G, Non-heat Residential DSR and I&C DSR

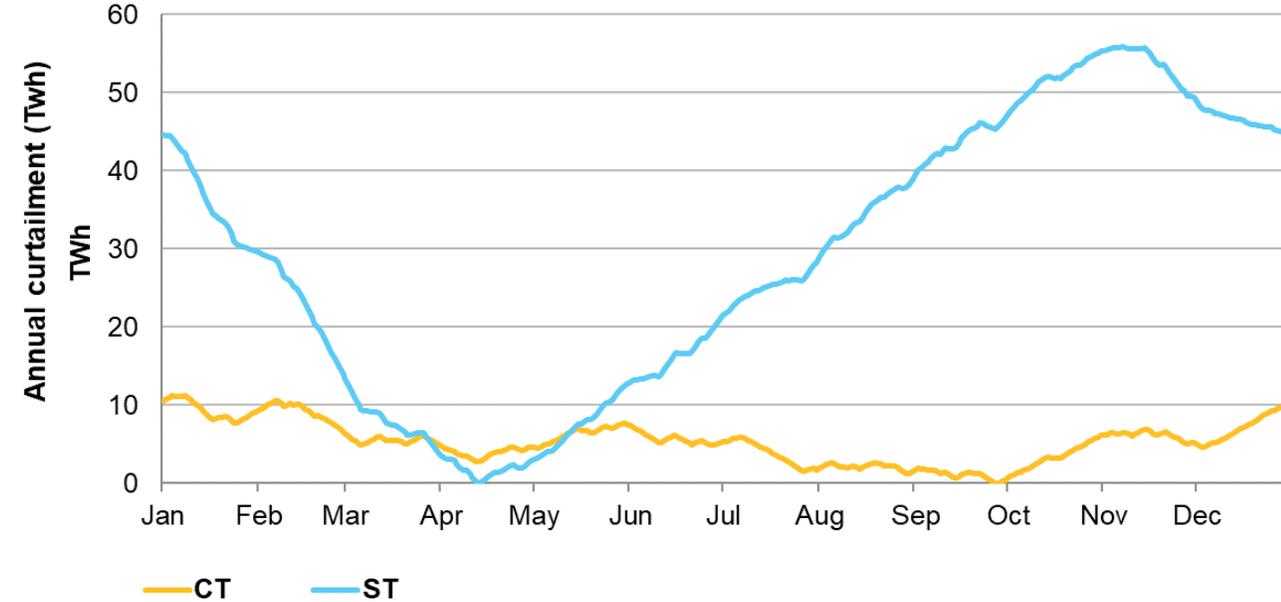
# Electrolysis can significantly reduce energy curtailment. Sli.do #KM3

## But hydrogen storage needed to maximise its value

Electrolyser capacity and curtailment

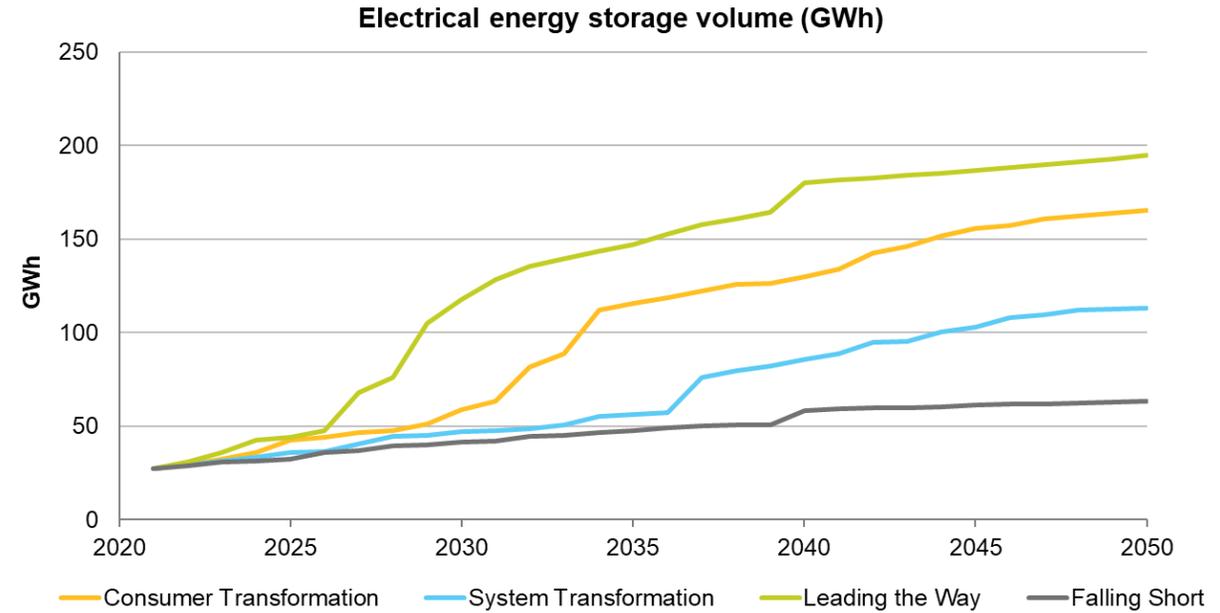
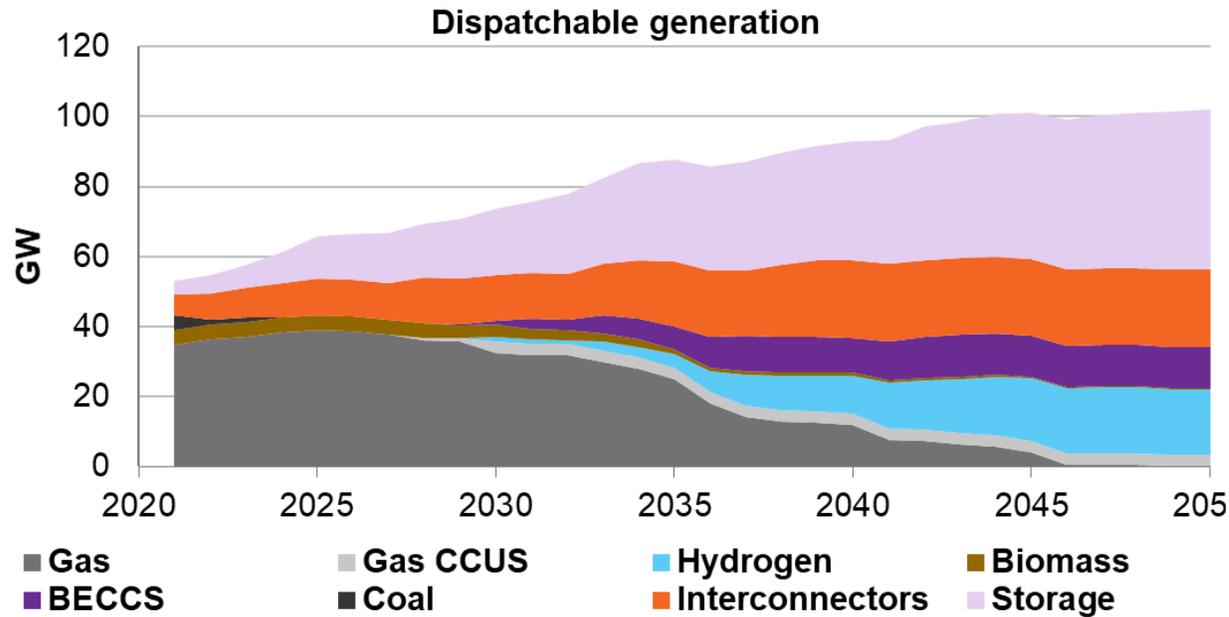


Hydrogen storage levels in 2050



- Electrolysis is used to increase electricity demand by producing hydrogen (whereas most other DSR options are often used to shift demand away from peak). Energy curtailment can be reduced by deploying electrolysis capacity.
- Hydrogen storage is needed to maximise value of electrolysis.
- Hydrogen storage is vital for reaching Net Zero but its scale and role changes by scenario.

# Supply side: new tech needed – market support required Sli.do #KM3

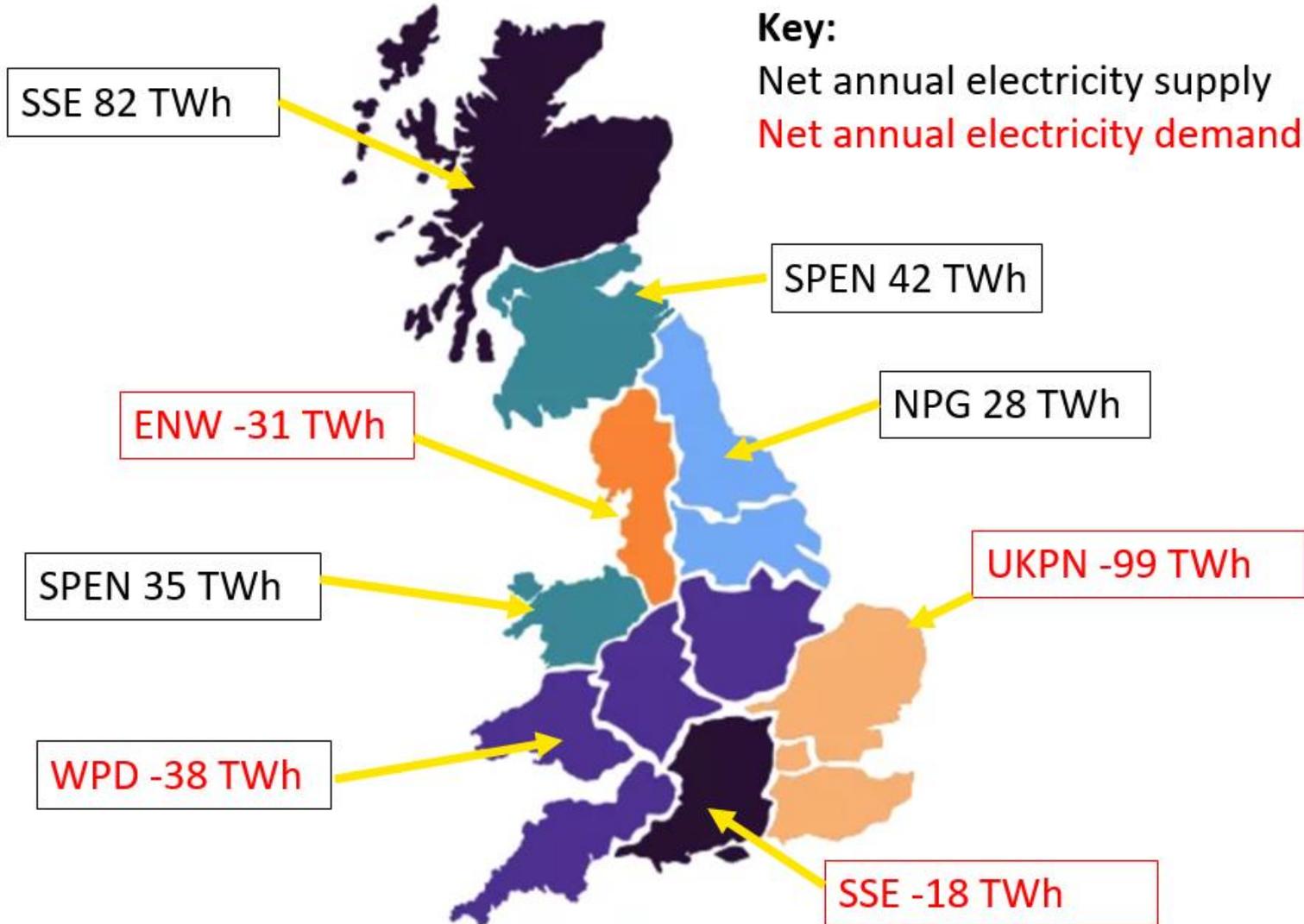


- Unabated gas capacity is phased out long before 2050 in Net Zero scenarios.
- Alternative supply-side options such as energy storage and interconnectors need significant scale-up to replace gas capacity.



Market and policy support is needed to facilitate the required scale-up of these technologies, e.g. to allow greater revenue stacking of different services (for energy storage).

# The need for flexibility changes with time and region



- Flexible capacity needs to be sited in the optimal places.
- It also needs to be dispatching in the right way at the right time.

# The need for flexibility changes with time and region



But markets currently don't reflect this, with a single balancing price across the system and limited access to half hourly prices for smaller customers



- It also needs to be dispatching in the right way at the right time

 Market Reform is needed to unlock the flexibility needed for Net Zero.



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# FES Bridging the Gap update

#KM1

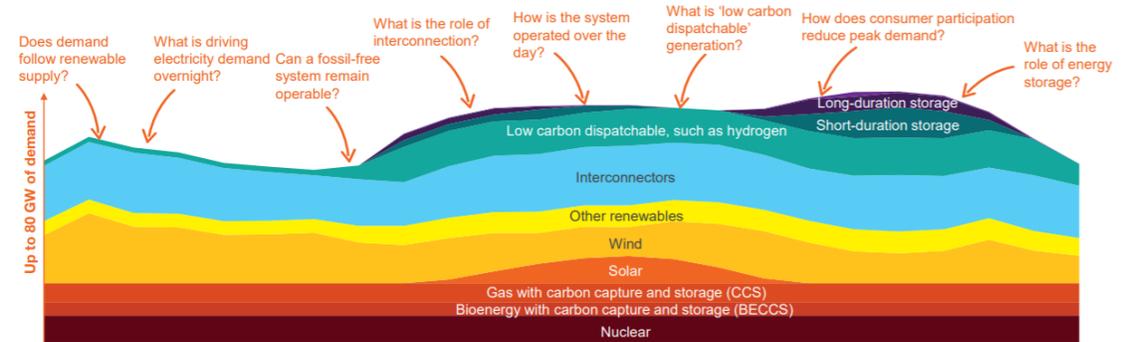


## The Day in the Life

The Day in the Life 2035 takes an illustrative look at how a fully decarbonised electricity system might operate on a cold, cloudy and calm winter day.

The following section goes through the day hour-by-hour, looking at the interaction between various elements of the energy system. Investigate the Day in the Life across the four sections of the day by clicking the tabs below:

- > Overnight
- > Morning
- > Afternoon
- > Evening



- Introduction
- The Day in the Life
- The winter week
- The net zero system



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