Resource Adequacy in the 2030s

Public Webinar

10 July 2025

Security of Supply

NESO
National Energy System Operator

Public

Welcome to resource adequacy in the 2030s

Housekeeping

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Agenda

1. Overview of the study
    - Purpose
    - Key message
    - Modelling approach
    - Modelling insight
    - Next steps
2. Q & A
3. Feedback

Meet the team

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Introduction to our Resource Adequacy study

What do we mean by resource adequacy?

Resource adequacy seeks to assess the potential risk of there being insufficient available supply to meet demand.

The purpose of this study is to:

- identify and understand the potential risks to security of supply in the 2030s as the power system decarbonises
- identify the types of resources needed to maintain reliable and clean supplies in the 2030s, driving actions to achieve this.

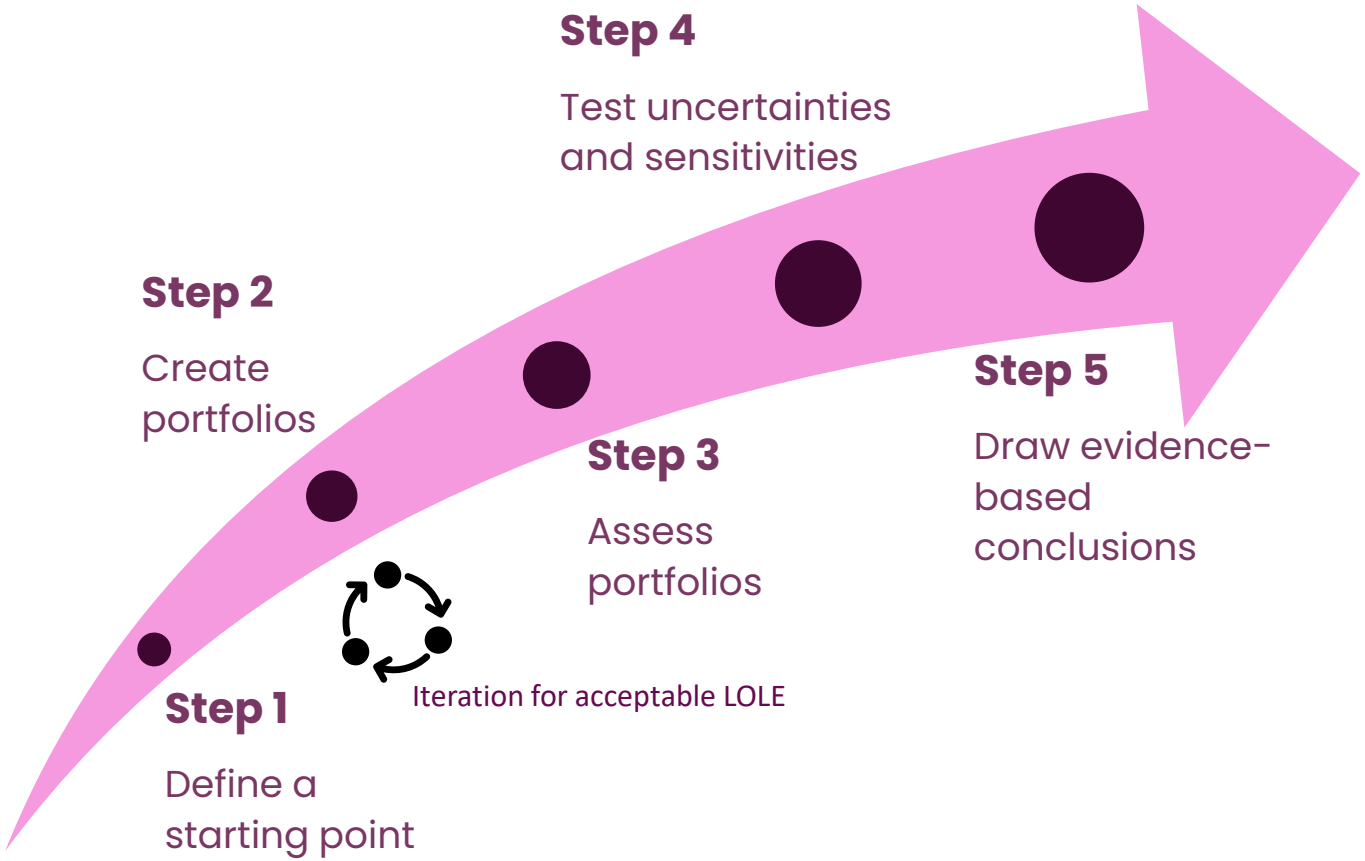
Key Messages

1. There does not need to be a trade-off between adequacy and decarbonising the power system. While investment is coming through, further action is needed to develop a pipeline of new low carbon technology projects ready for large-scale deployment in the 2030s.

2. We expect unabated gas capacity to remain on the power system by 2040, even with deployment of new low carbon technologies. Operating at low running hours, this capacity will remain important for adequacy. A longer-term whole energy system strategy is needed to support the future role of unabated gas in meeting consumer demand when needed.

3. Weather patterns are expected to become the dominant driver of risks in a decarbonised power system. Understanding the nature and impact of these patterns will be critical to long-term system planning that delivers reliable supplies for consumers.

Methodology



Key modelling details

- Used our pan-European market model PLEXOS
- Developed a simplified hourly dispatch model appropriate for resource adequacy studies
- Three future spotlight years: 2030, 2035 and 2040
- Each future year modelled using 34 years' historic weather (1984 – 2018) and 100 different plant outage patterns
- Weather patterns are correlated with Europe, with European countries modelled at 3 hours loss of load expectation (LOLE)
- Created 6 portfolios for Great Britain with a target LOLE of 0.1 – 0.3 hours per year
- Sensitivities used to explore further uncertainties

‘What-if’ Portfolios and Sensitivities

We created 6 portfolios to explore uncertainty in deployment of future supply. Portfolios all used the same ‘starting point’ based on the capacity we assume to be committed for each future spotlight year.

Portfolio 1	Portfolio 2	Portfolio 3
All new technologies available for deployment	Build-out of only batteries, large-scale nuclear, renewables and gas	No new deployment of long-duration energy storage (LDES), including pumped hydro.

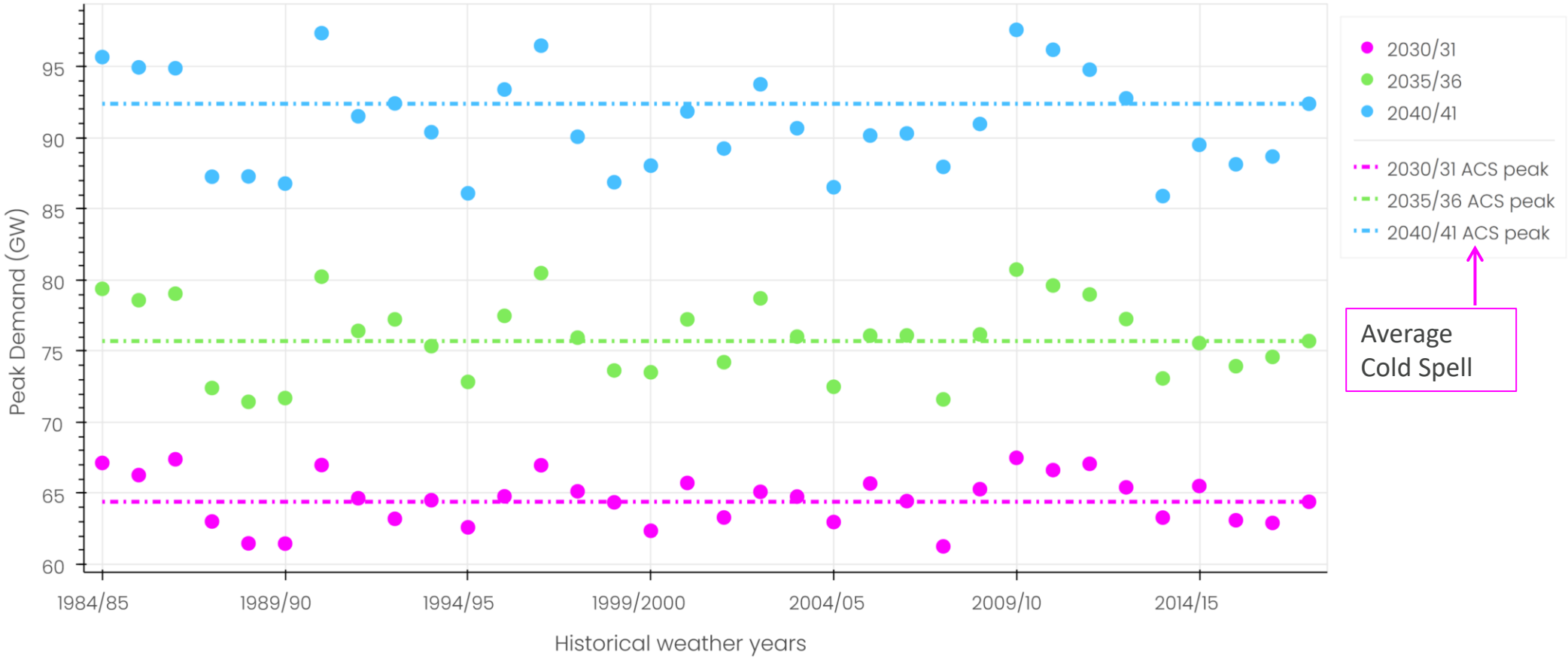
Portfolio 4	Portfolio 5	Portfolio 6
No deployment of nuclear plants beyond assumed committed levels.	No deployment of hydrogen-to-power.	No deployment of interconnection beyond assumed committed levels.

We used sensitivity analysis to explore additional uncertainties around:

- *Unabated gas deployment*
- *Offshore wind deployment*
- *Demand*
- *Plant outage rates*
- *Storage*
- *Interconnection*
- *Demand-side flexibility*

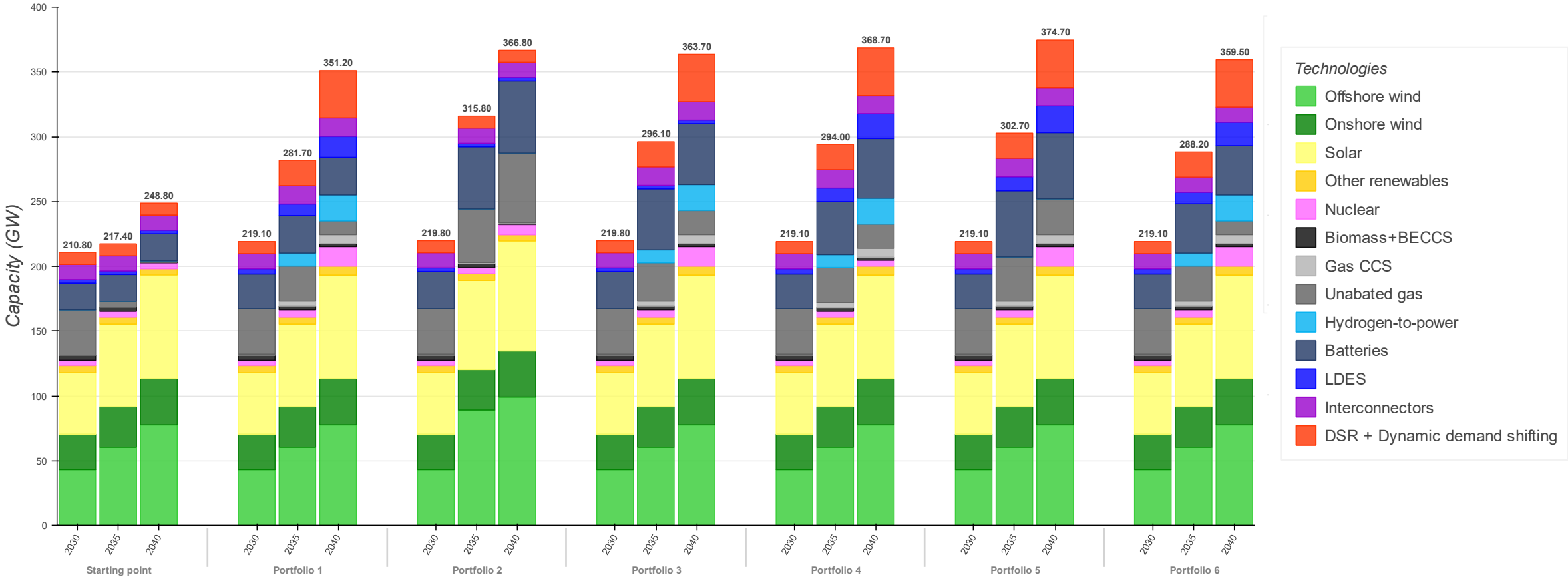
Demand

We created hourly demand influenced by 34 historical weather years for each spotlight year. The demand contains increasing electrification of energy consumption throughout the 2030s.



Key Message 1: Evidence

There does not need to be a trade-off between adequacy and decarbonising the power system. While some investment is coming through, further action is needed to develop a pipeline of new low carbon technology projects ready for large-scale deployment in the 2030s.



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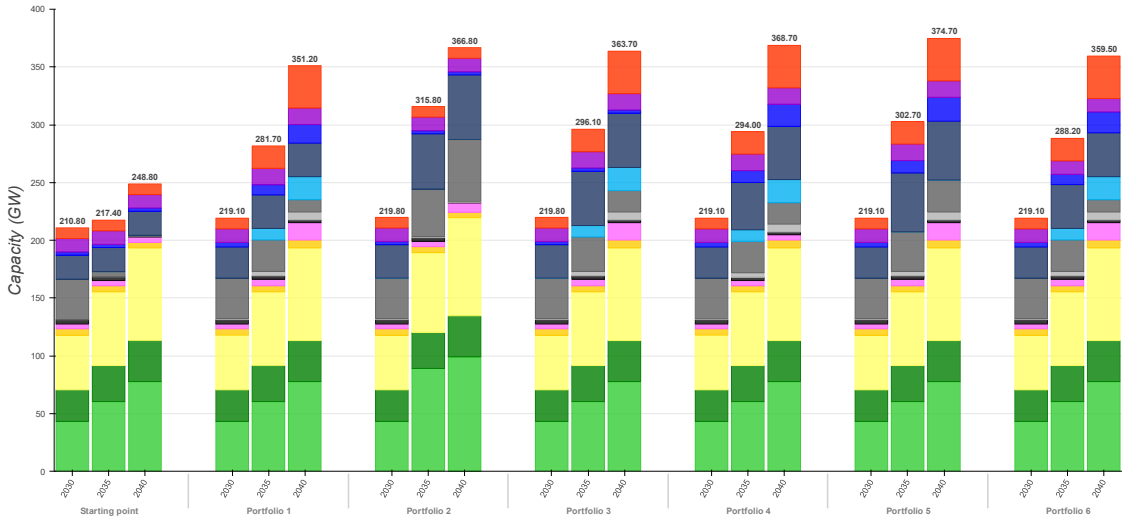

Loss of Load Expectation (LOLE)

Units: hours / year

	2030/31	2035/36	2040/41
Portfolio 1	0.26	0.23	0.18
Portfolio 2	0.26	0.22	0.24
Portfolio 3	0.26	0.17	0.23
Portfolio 4	0.26	0.14	0.22
Portfolio 5	0.26	0.19	0.18
Portfolio 6	0.26	0.20	0.20

Our portfolios show it is possible to maintain secure electricity supplies in the 2030s while aligning with national decarbonisation goals.

Key Message 2: Evidence

We expect unabated gas capacity to remain on the power system by 2040, even with significant deployment of new low carbon technologies. Operating at low running hours, this capacity will remain important for adequacy. A longer-term whole energy system strategy is needed to support the future role of unabated gas in meeting consumer demand when needed.

Unabated Gas Capacity in Portfolios (GW)

	2030/31	2035/36	2040/41
Portfolio 1	35.0	27.2	10.6
Portfolio 2	35.0	41.1	53.6
Portfolio 3	35.0	29.7	18.6
Portfolio 4	35.0	27.2	18.6
Portfolio 5	35.0	34.2	27.6
Portfolio 6	35.0	27.2	10.6

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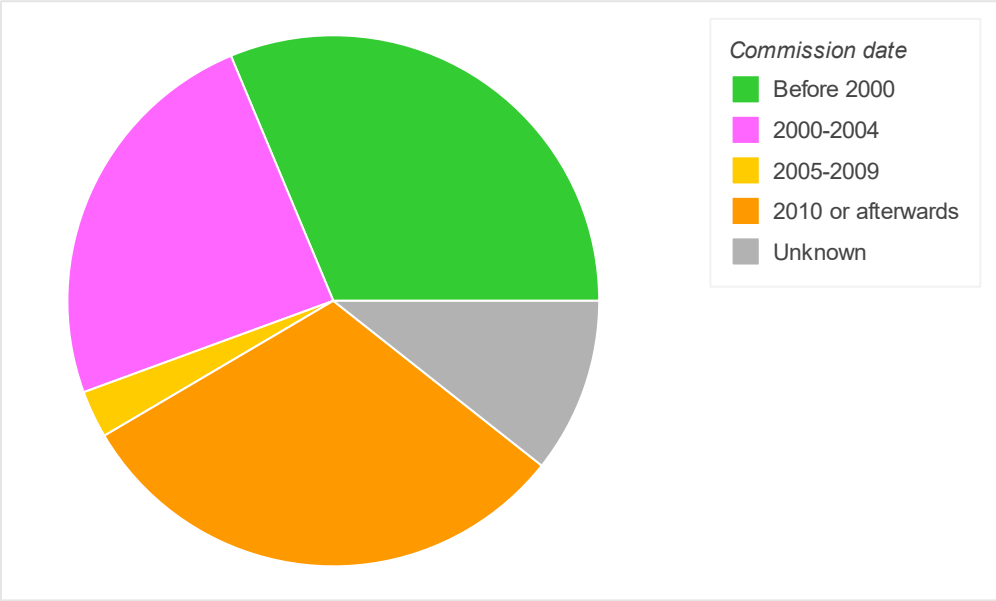
Portfolio 5	35.0	34.2	27.6
Portfolio 6	35.0	27.2	10.6

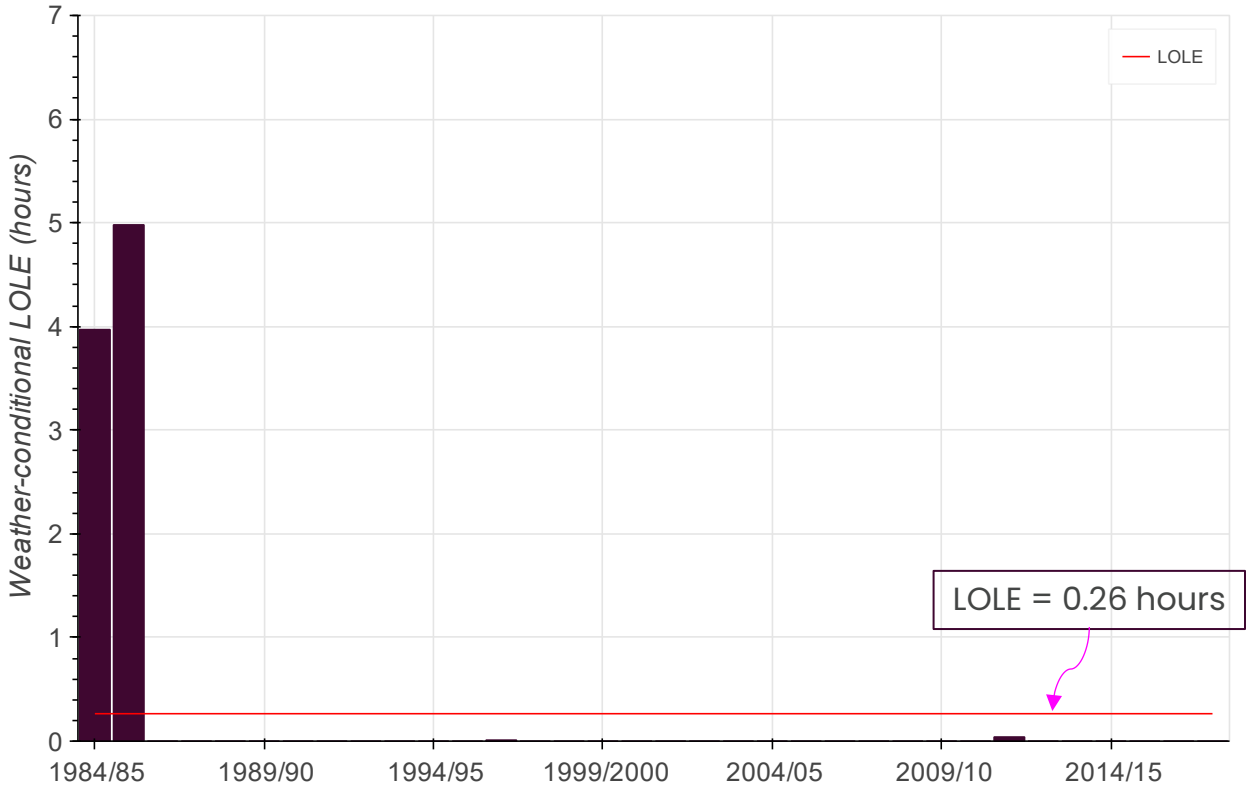


Gas generation for UK grouped by commission date. Data taken from the 2024 Digest of UK Energy Statistics (DUKES).

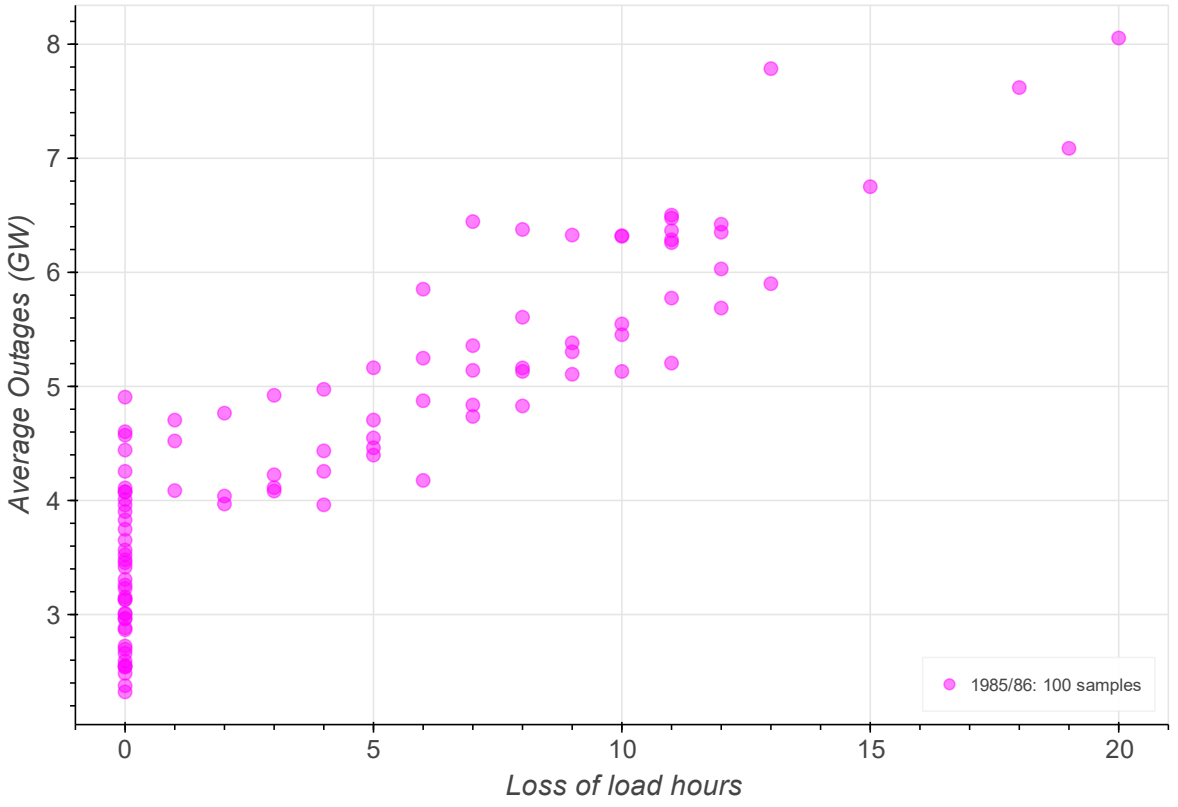
All our portfolios include unabated gas capacity, which we consider necessary to maintain security of supply. Meeting these levels of unabated gas would require decisions on whether to extend the life of existing gas plants or to invest in new ones.

Key Message 3: Evidence

Weather patterns are expected to become the dominant driver of risks in a decarbonised power system. Understanding the nature and impact of these patterns will be critical to long-term system planning that delivers reliable supplies for consumers.



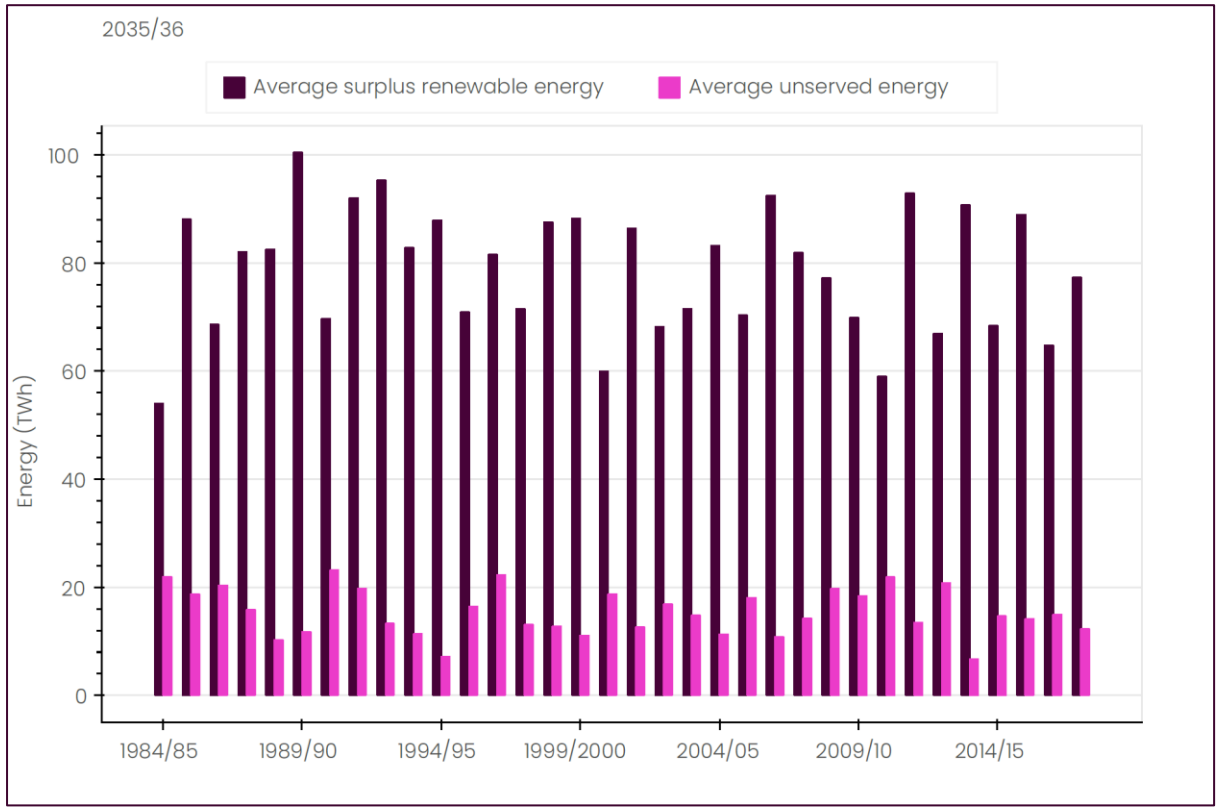
2030/31: The average hours of lost load for Portfolio 1



The relationship between lost load and outages (Portfolio 1, Feb 2031, with the weather of Feb 1986)

Role of flexible resources: Electricity Storage

Sufficient renewable energy to match demand across the year, if it could be shifted to the times of shortfall.



The way electricity storage is dispatched during periods of potential system stress can affect security of supply

Storage Dispatch Strategy	Expected Loss of Load Hours	Expected Unserved Energy (GWh)	Expected Greatest Shortfall Depth (GW)
Immediate Action	6.2	47.1	8.0
Minimising shortfall durations	4.6	47.1	10.6
Minimisng shortfall depths	9.1	47.1	7.0

Role of flexible resources: Demand Side Flexibility

Demand-side flexibility can help improve security of supply, particularly during challenging weather conditions

	LOLE		EEU	
	2035	2040	2035	2040
Portfolio 1	0.23	0.18	1.68	1.79
Sensitivity 11 (Dynamic demand shifting and DSR maintained at 2030 levels)	0.32	0.38	2.71	4.14
Portfolio 1 (1985/86 Weather Year)	6.23	5.63	47.1	57.04
Sensitivity 11 (1985/86 Weather Year)	7.68	9.06	65.16	104

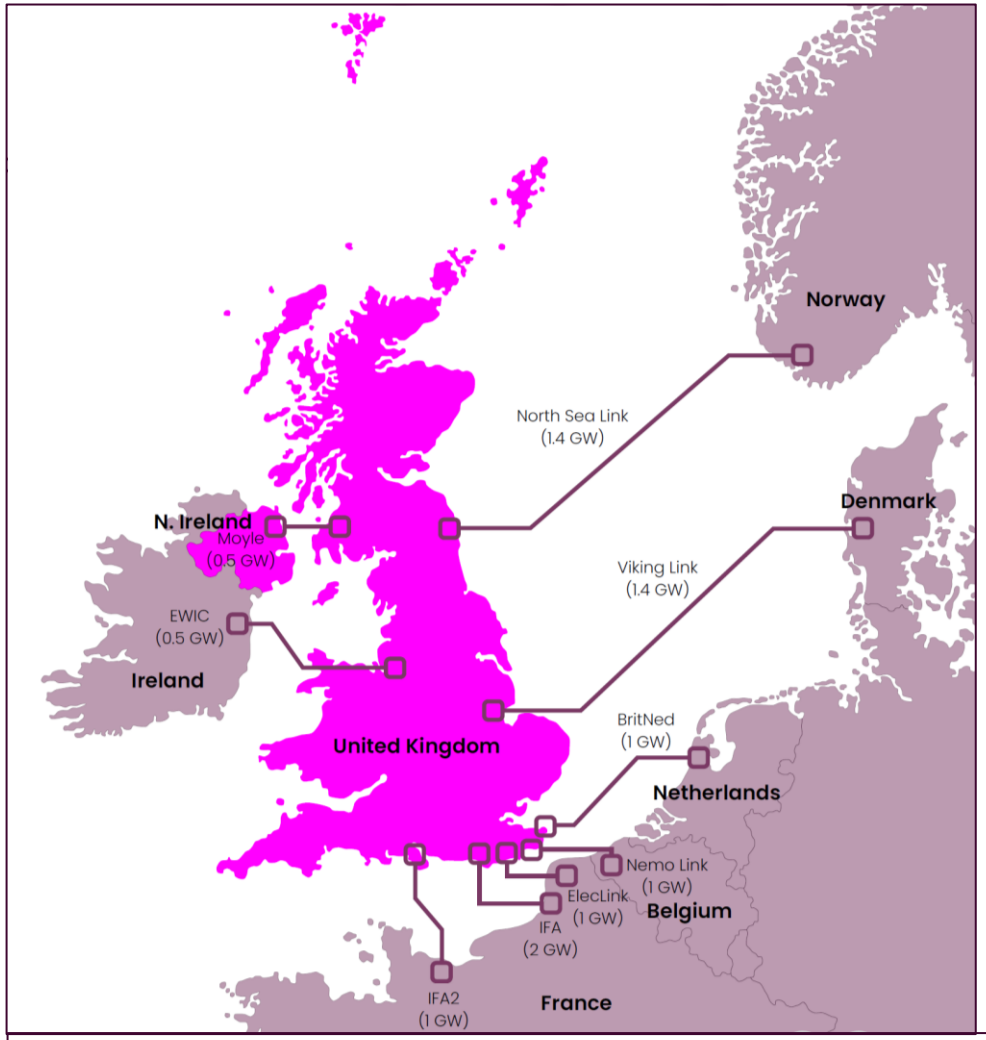
Assumptions regarding characteristics of demand flexibility could have big impact

This was discussed in more detail in our spotlight study on demand side response

Based on the spotlight study, we made certain assumptions in this study which were published in our modelling approach report.

We are open to feedback from stakeholders on these assumptions and collaboration with stakeholders to improve our modelling

Role of flexible resources: Interconnection



Interconnectors operational at the start of winter 2024/25

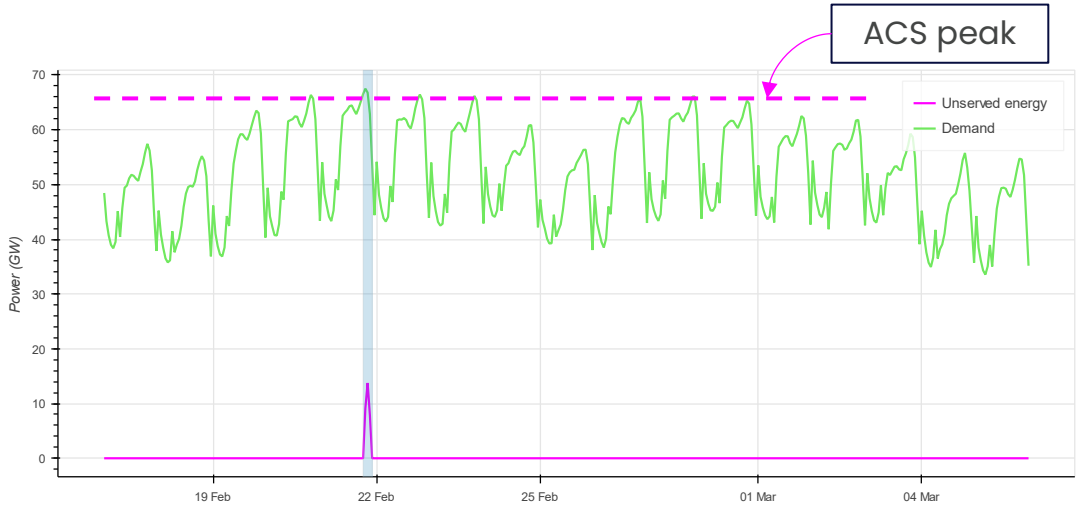
Interconnection will continue to play important role in support security of supply

LOLE	2030	2035	2040
Portfolio 1	0.26	0.23	0.18
Sensitivity 10 (No imports from Europe)	2.79	6.80	9.45

However, low generation in Europe could lead to shortfall challenges in Great Britain

Example of system stress

A scenario from February 2031 with the weather pattern of 1985/86



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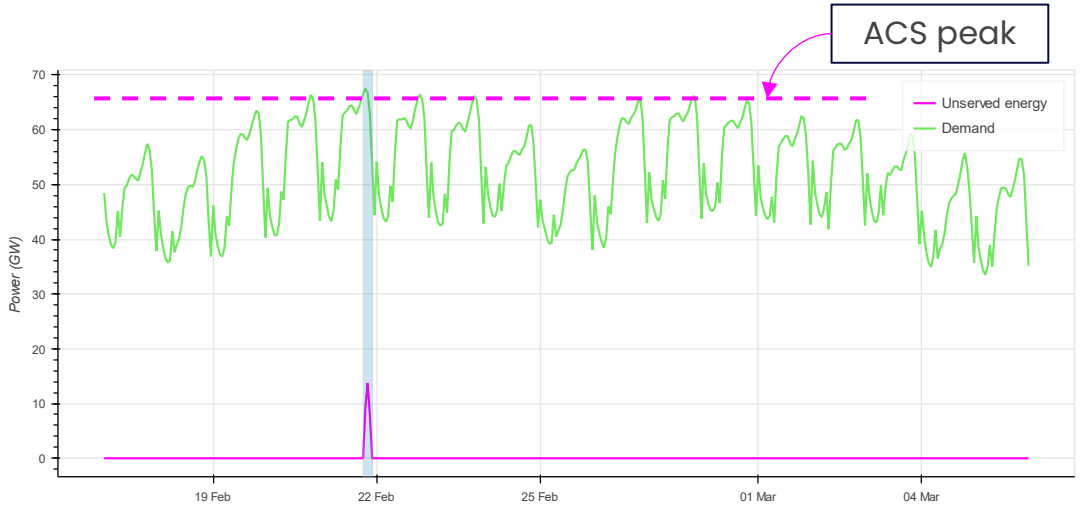

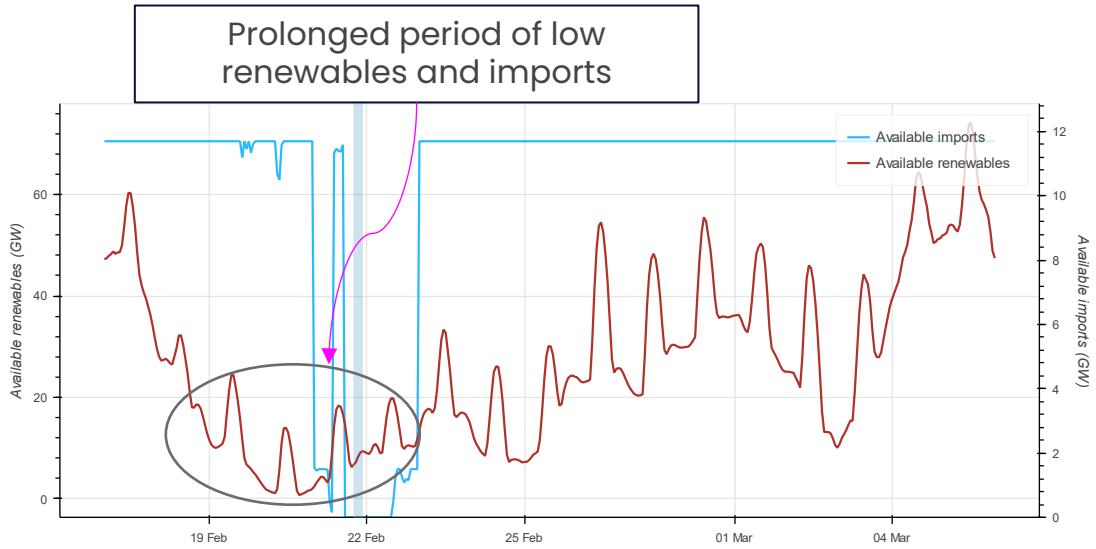

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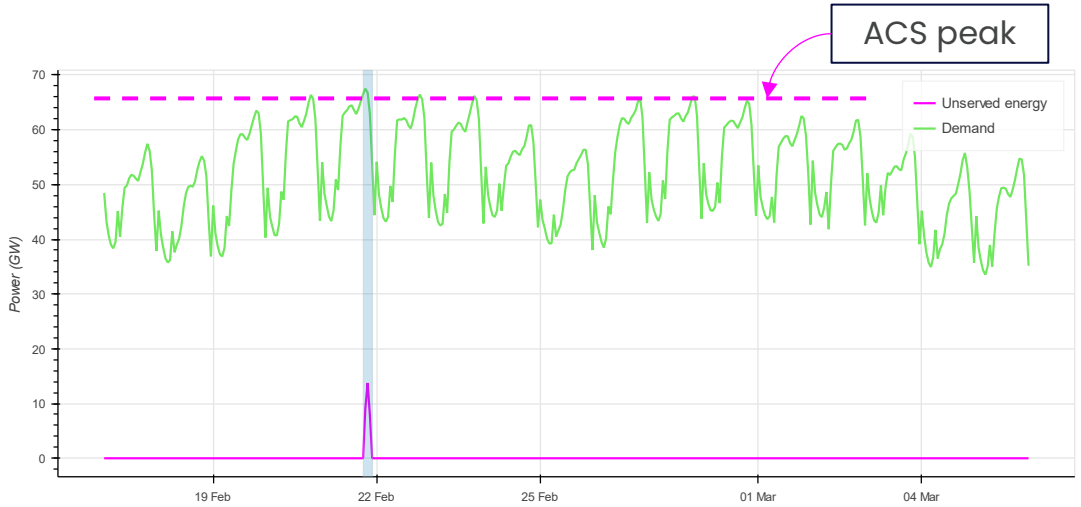

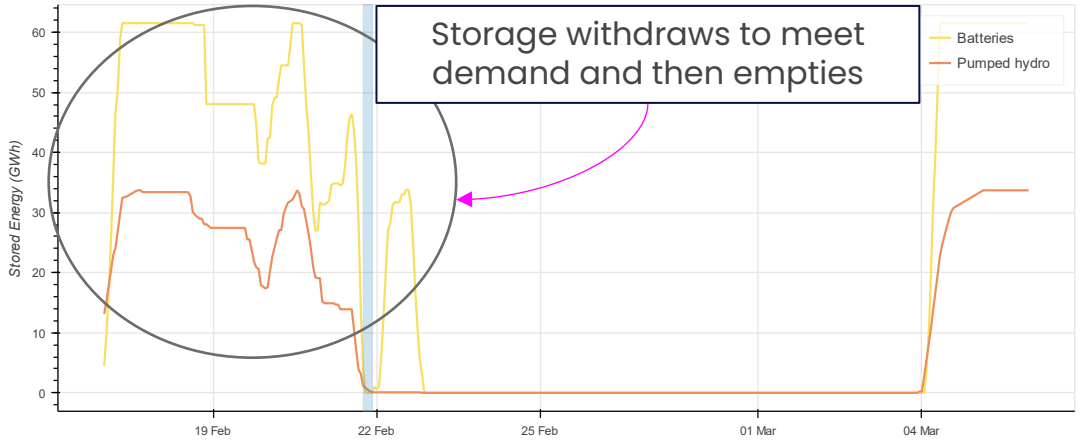

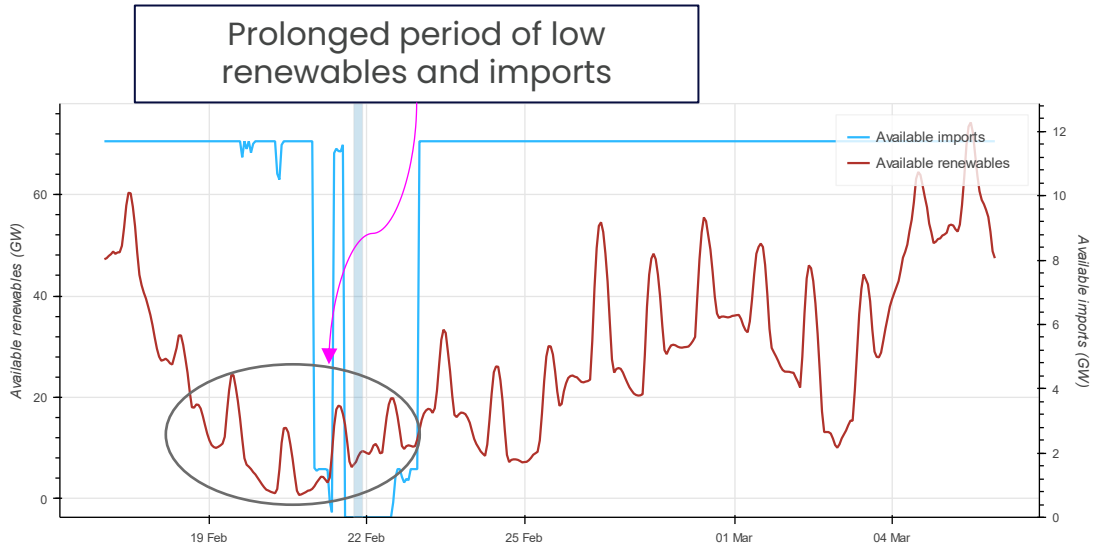

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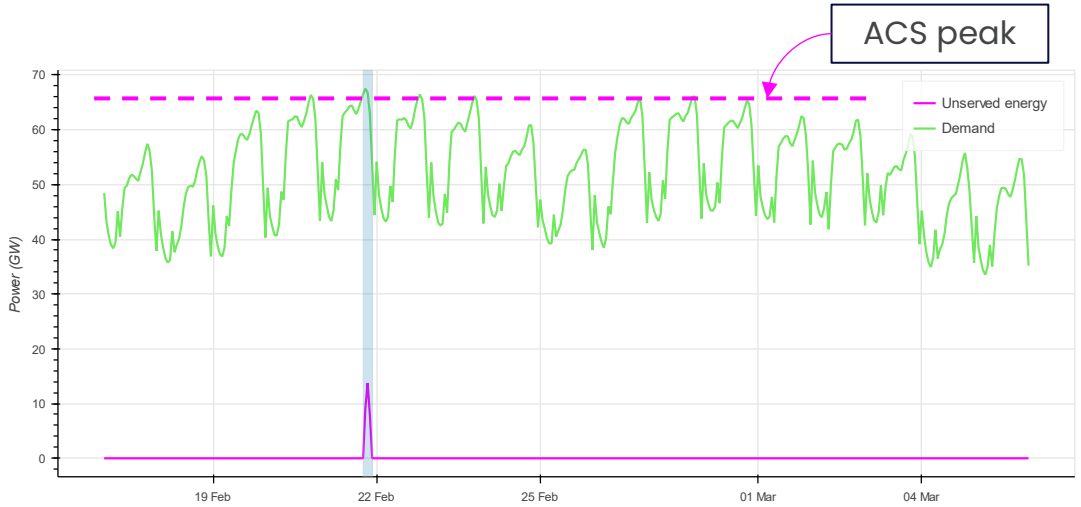

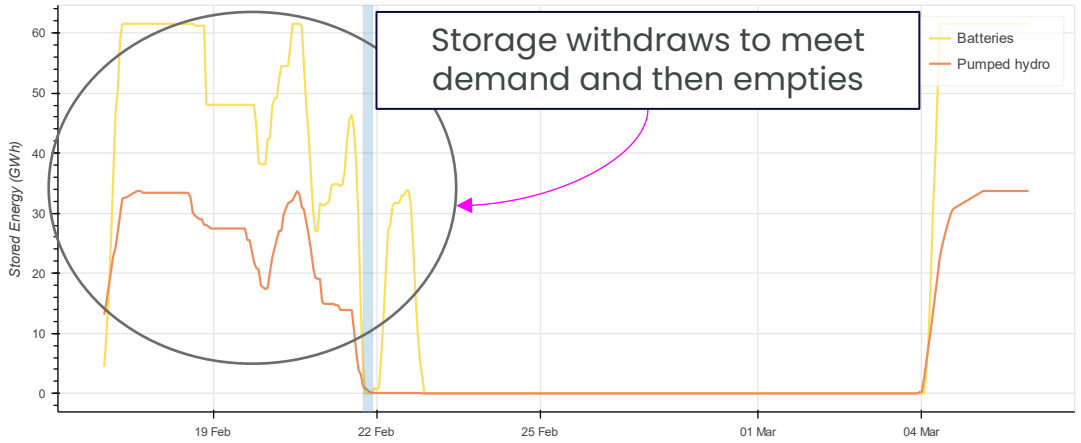

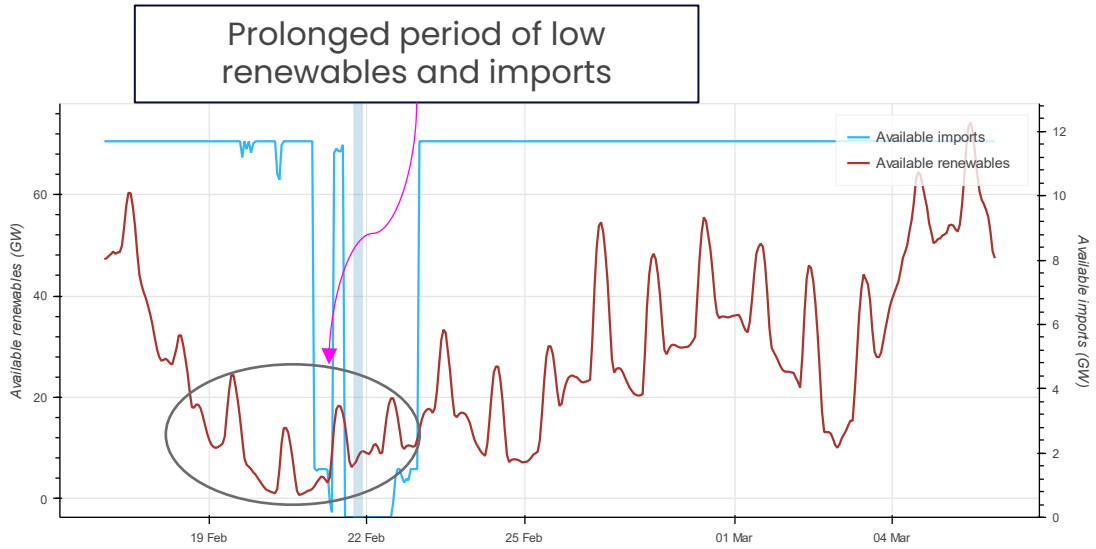

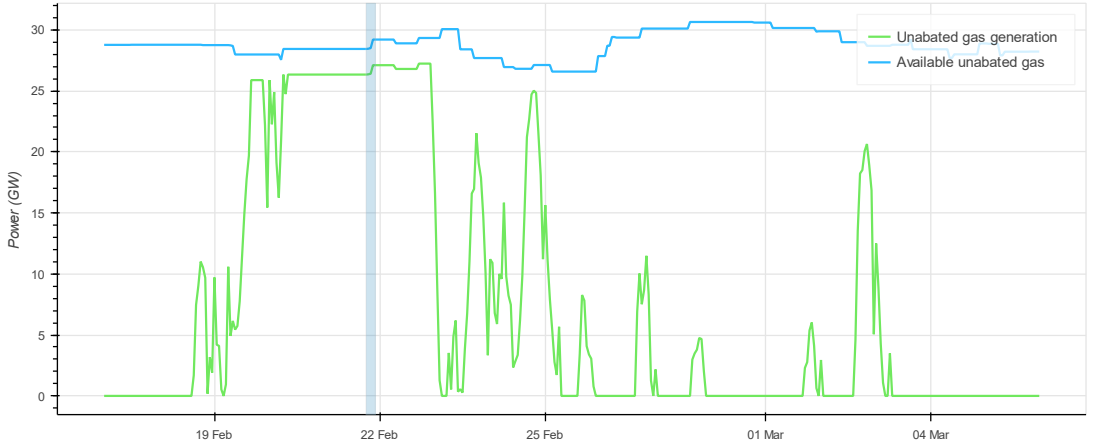

Key Messages Recap

1. There does not need to be a trade-off between adequacy and decarbonising the power system. While some investment is coming through, further action is needed to develop a pipeline of new low carbon technology projects ready for large-scale deployment in the 2030s.

2. We expect unabated gas capacity to remain on the power system by 2040, even with deployment of new low carbon technologies. Operating at low running hours, this capacity will remain important for adequacy. A longer-term whole energy system strategy is needed to support the future role of unabated gas in meeting consumer demand when needed.

3. Weather patterns are expected to become the dominant driver of risks in a decarbonised power system. Understanding the nature and impact of these patterns will be critical to long-term system planning that delivers reliable supplies for consumers.

Future plans

Further engagement

Thanks to the expert group members, both those mentioned in our material and others who have also helped us. We have found it a valuable sounding board for our ideas and plans.

Future work programme

Please provide feedback to us at

box.netzeroadequacy@neso.energy

if there is a particular aspect you would like us to focus on in future publications or in our future work programme.

Questions and Answers

Please submit any new questions in the Q&A function on teams, and upvote your favourite questions, submitted by others.

Feedback

Please take two minutes to provide feedback to help us shape our future activities and the way in which we present our results.

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