Public

8th January Margin

Context

This document acts as an appendix to accompany previously issued statements demonstrating that while 8th January was a day in which overall difference between available generation and demand was low, the power system always remained secure.

At all times the National Energy System Operator (NESO) remained operationally secure under our Security and Quality of Supply obligations and had adequate generation availability. There have been requests to demonstrate this at unit level through public data and therefore this appendix serves to provide additional clarity.

Security and Quality of Supply

The Security and Quality of Supply Standard (SQSS) sets the standards to which NESO will operate the system safely and securely. It establishes what conditions we will protect the network against to maintain voltage and frequency standards but is not an obligation to ensure there is adequate generation available to meet demand.

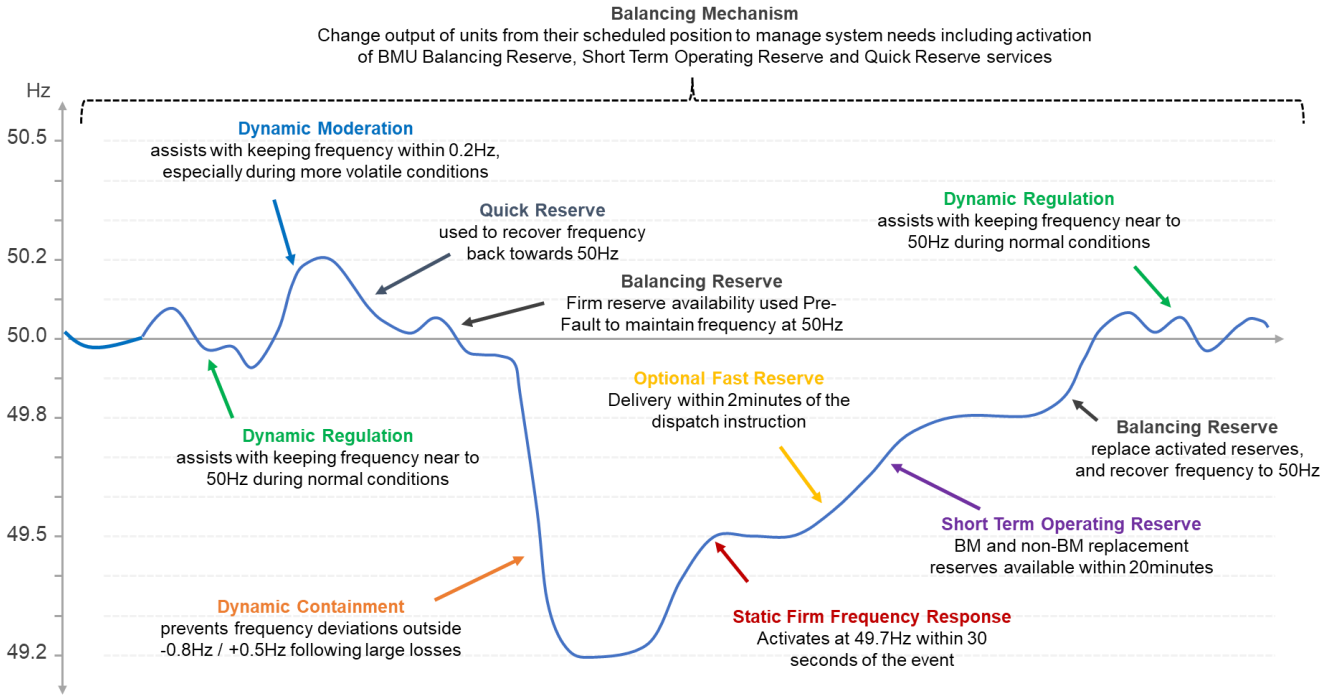
The operational sections of this code apply to the NESO control room operations and the actions the NESO control room takes. The requirement for the NESO to secure for an infeed loss comes from Section 5 of the SQSS, under 5.1.2 and 5.1.3 (Page 28, National Electricity Transmission System Security and Quality of Supply Standard, Version 2.5)

On the 8th of January 2025 the North Sea Link High-Voltage Direct Current interconnector was providing the largest infeed of 1424MW to the system. If this were to experience a technical fault and therefore reduce its generation (energy import to GB) then the identified sections of the SQSS show that we would be required to maintain frequency.

Keeping Frequency stable

When generation and demand are equally balanced on Great Britain's electricity system operates at 50Hz. As more energy is generated on the system than is used the frequency increases, as more energy is used on the system than generated frequency falls. Sudden loss of generation leads to rapid decreases in frequency and response services then act automatically to contain this fall in frequency. Reserve ancillary services and additional generation available to NESO in the Balancing Mechanism are activated to replace the loss of infeed, manage frequency and allow response providers to reduce their output accordingly to respond to a future event. The key distinction between a response and reserve service is that response acts automatically and reserve is activated at operator discretion, this provides greater flexibility but leads to some overlap in how they can support frequency containment as illustrated in figure 1. On the 8th January, sufficient frequency response was procured and instructed in real time to ensure that

SQSS standards were met. Frequency response services (Dynamic Containment, Dynamic Moderation, Dynamic Regulation and Static Firm frequency Response) were under procured by 350MW compared with targets. However, mandatory frequency response was available to be instructed on Balancing Mechanism units in real time as needed with this requirement continually assessed through the System Operating Plan.



Reserve

The words reserve, headroom and margin are used interchangeably to describe the difference between the available supply and demand. Some of this is contracted under ancillary services but is also achieved through the balancing mechanism through instructing units away from their operating schedule (Physical Notification [PN]) to either create space between their maximum possible output (Maximum Export Limit [MEL]) and schedule, or to make a unit that might otherwise be at 0MW available more quickly. These services are business as usual operations for the NESO control room who need to use these tools to be always prepared irrespective of supply availability or demand outturn.

Balancing Mechanism **capacity** available at different timescales can be calculated through looking at the maximum possible output of units (Maximum Export Limit [MEL]), their expected output based on PN and Bid Offer Acceptances (if applicable) and using their dynamic capabilities to understand how quickly each Balancing Mechanism Unit could increase output. The **Margin** available at different timescales can be calculated by reducing the capacity that could respond by the total demand or demand forecast to give you the margin between

available supply and demand (reserve). This data is publicly available on the Elexon Insights platform.

In addition, contracted non- Balancing Mechanism reserve services provide additional margin available in the timescales required by their respective services. This data is publicly available on the NESO data portal page.

Across all control timescales Balancing Mechanism and non- Balancing Mechanism options are considered by the NESO Strategy and Energy control room functions to make decisions on when to use resources available to them to manage the electricity system. This is planned through the system operating plan using pre-gate closure data that is confidential and commercially sensitive and therefore only the output data is public. This allows decision making across different timelines that makes capacity available to NESO for instruction.

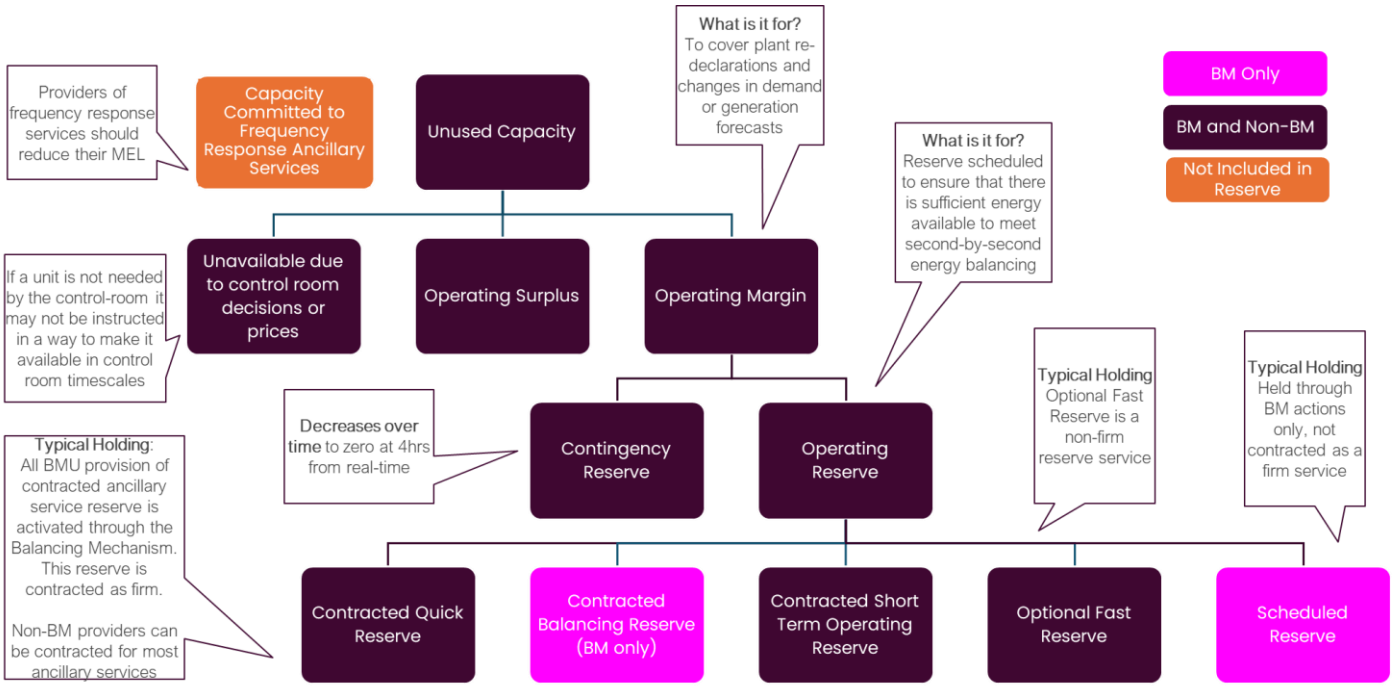
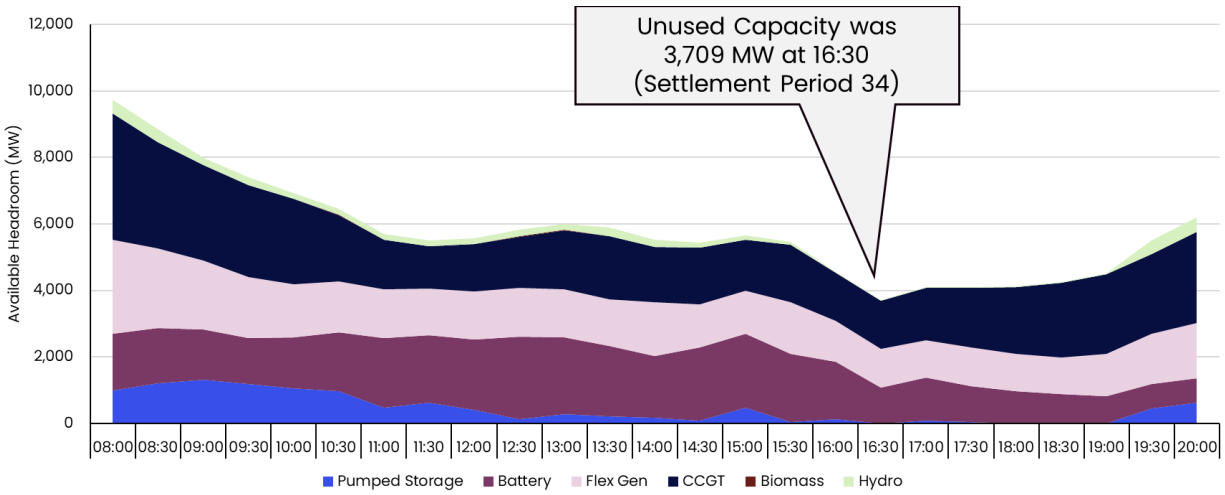


Figure 1: A description of different categories of capacity.. For more information an Operational Transparency Forum deep dive can be found here

Aggregated Margin Analysis

Capacity available to NESO for instruction is a function of time, commercial and technical features of units and changes to operating schedules and forecasts over time. Therefore, post event review of margin is dependent on the decisions made in control time scales rather than representative of real-time reserve holdings which are indicated through the system operating plan.

To represent the options available to NESO in control timescales, analysis showing **unused capacity** is used. This is representative of the total generation available (capacity) in the Balancing Mechanism to minus the Initial National Demand Out-Turn (INDO) to show options that would have been available via GB's biggest balancing market. This excludes frequency response provision and excludes non- Balancing Mechanism reserve providers.



Unit Level Analysis

In Settlement Period 34, a unit level approach shows that 4171MW of capacity was unused in control room timescales across Balancing Mechanism (3549MW) and non- Balancing Mechanism units (622MW).

The aggregated maximum supply compared to demand approach is a valid approach to quantifying the capacity that was not utilised. However, there have been requests to break this down by individual generating unit for further transparency. Therefore, unit by unit level analysis has been completed to show the options available which allowed NESO to maintain adequate supply availability to meet demand even after the loss of the largest possible single power supply (North Sea Link interconnector import) of 1424MW. When reviewing how individual units operated and therefore how they could have been repositioned to provide reserve, INDO is not used and **therefore numbers are different.**

Balancing Mechanism Units

In settlement period 34, unused capacity in the Balancing Mechanism was at its minimum of 3549MW.

The data of every unit which participates in the balancing mechanism was used to understand what the difference was between its expected output based on submitted data and Balancing Mechanism acceptances and its technical capability to deliver energy. This measure of **unused**

capacity shows how each unit contributes individually. While wider unit dynamics such as run up rates, notice to deviate from zero time and minimum zero-time requirements must be respected in control timescales, this, alongside changes from pre-gate closure data creates a **time varying operating margin** for each period and can be altered by changes in the market or by NESO actions. This data uses final outturn numbers only and is a post event snapshot of the capacity available.

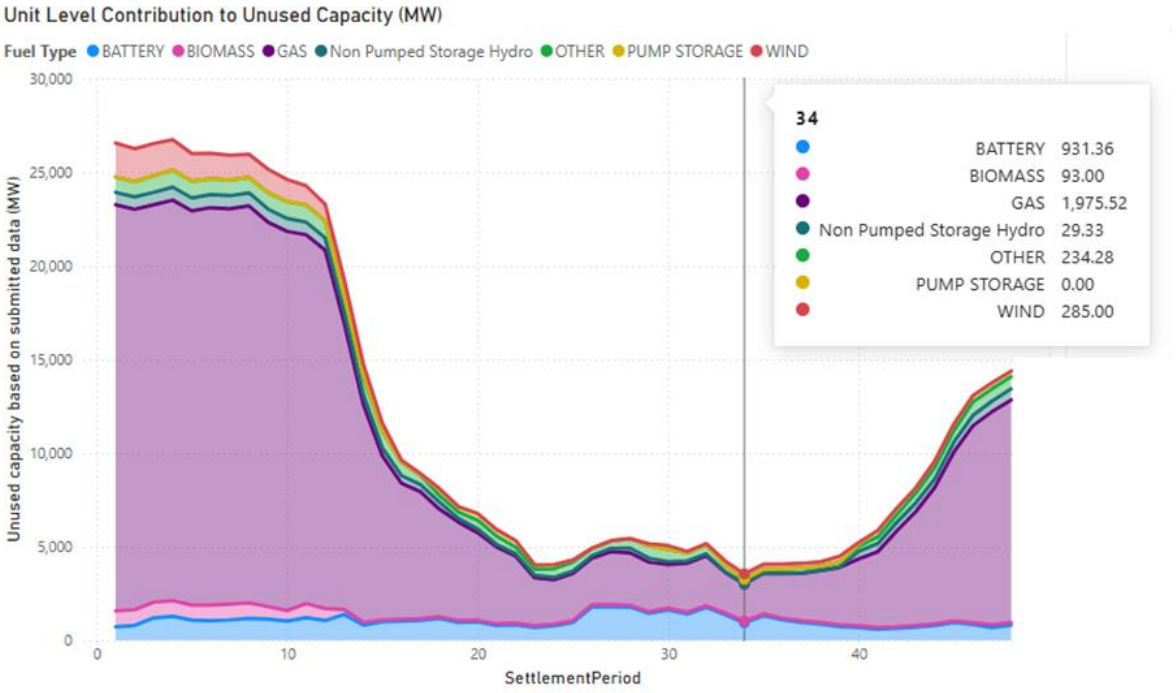


Figure 2: Unit Level contribution towards Unused Capacity (Sum of MEL – Sum of Expected Output or for intermittent resources Bid Volume)

This shows that during the period with lowest unused capacity, a very large part (931MW) of the capacity available was achieved via battery storage units with gas units providing most of the remaining available capacity (1976MW). Other actions such as the System Operator to System Operator trades by NESO and Danish System Operator Energinet on Viking interconnector improved the margin position indirectly by allowing for reduction in output across Balancing Mechanism units to meet the energy position enabling them to be held in reserve, interconnectors cannot provide real time reserve but can be used to provide emergency assistance or instruction if commercial options are exhausted.

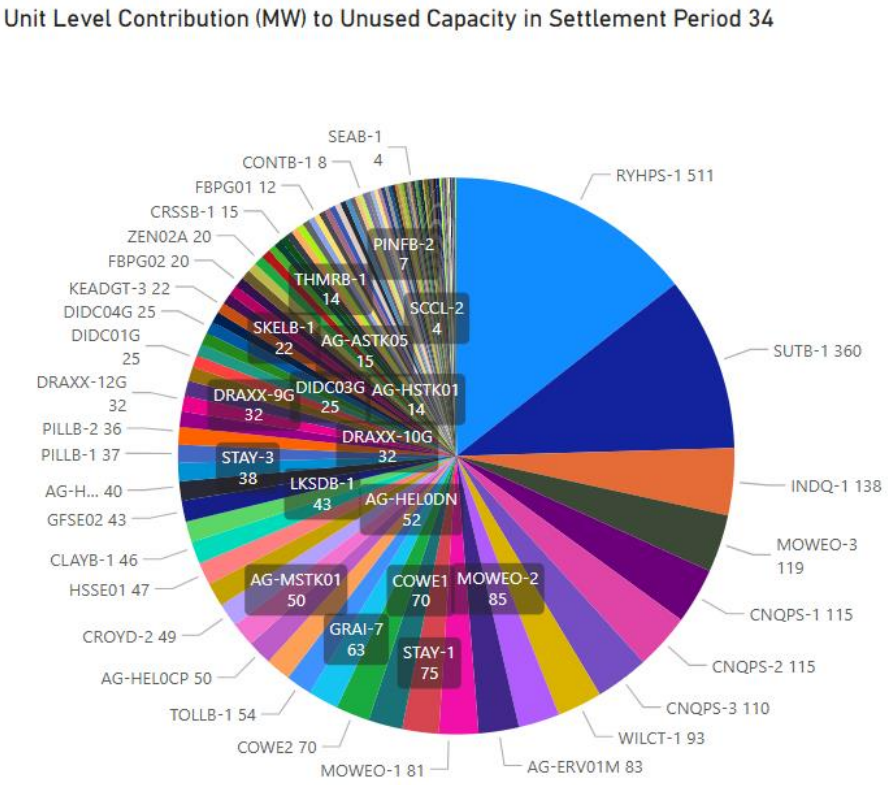


Figure 3: Unit Level contribution towards Unused Capacity (MW) in settlement period 34. BMU ID and individual MW contribution are detailed.

Non-Balancing Mechanism Units

Non-Balancing Mechanism Units contributed 622MW towards operating margin

Not all units available are balancing mechanism participants, for smaller distribution connected resources they are not always included within the balancing mechanism and therefore non balancing mechanism service short term operating reserve and non-balancing mechanism unit optional fast reserve provide market access and additional capabilities, from 16:00 – 18:00 547MW of non-BM STOR was available across 37 different units (details in dataset). A further 80MW of reserve was available through optional fast reserve.

Data

All data required to replicate this analysis is provided at unit level and is entirely derived from public use APIs from Elexon. If used in parallel with unit dynamic data it is possible to see at what time point the control room would be unable to instruct the unit and therefore on final data how a time varying operating margin position was generated. As individual time varying data used to produce the control room view in the SOP contains pre gate closure data that is commercially sensitive to units you may not be able to derive these numbers using post event data only but could reconstruct the real time position.