Public

Demand Flexibility Service

Market Guidance

Introduction

This document has been produced for educational purposes to support industry in the evolution of the Demand Flexibility Service (DFS) to procure bi-directionally through zones. It seeks to provide an overview of what margin is, why NESO needs margin and how we manage the choices and assess any alternative options inclusive of DFS as well as some frequently asked questions. Any commercial figures are used purely for illustrative purposes and should not be interpreted as any forecasted requirements/pricing values.

NESO will be continuing procurement of the Demand Flexibility Service as a merit-based margin tool for positive margin and the most recent developments will expand this to offer negative margin (demand turn up) capability as well.

We may update this material from time to time to further support parties based on feedback and updates. For detailed insights into how the DFS is tendered, delivered, and settled alongside the full view of providers obligations under the service, parties should refer to the DFS Service Terms and Procurement Rules and other supplementary supportive documents published on the DFS webpage.

What is Margin and why does the NESO need it?

Margin or reserve is the ability for the NESO to manually adjust controllable assets in real time, to increase or decrease the amount of power supplied to the system. For the system to be balanced, the controllable assets need to match the country's demand for electricity, and we focus on this at the Transmission System level generally. The graph below shows how our Margins give us some flexibility either side of being able to exactly match the demand forecast.

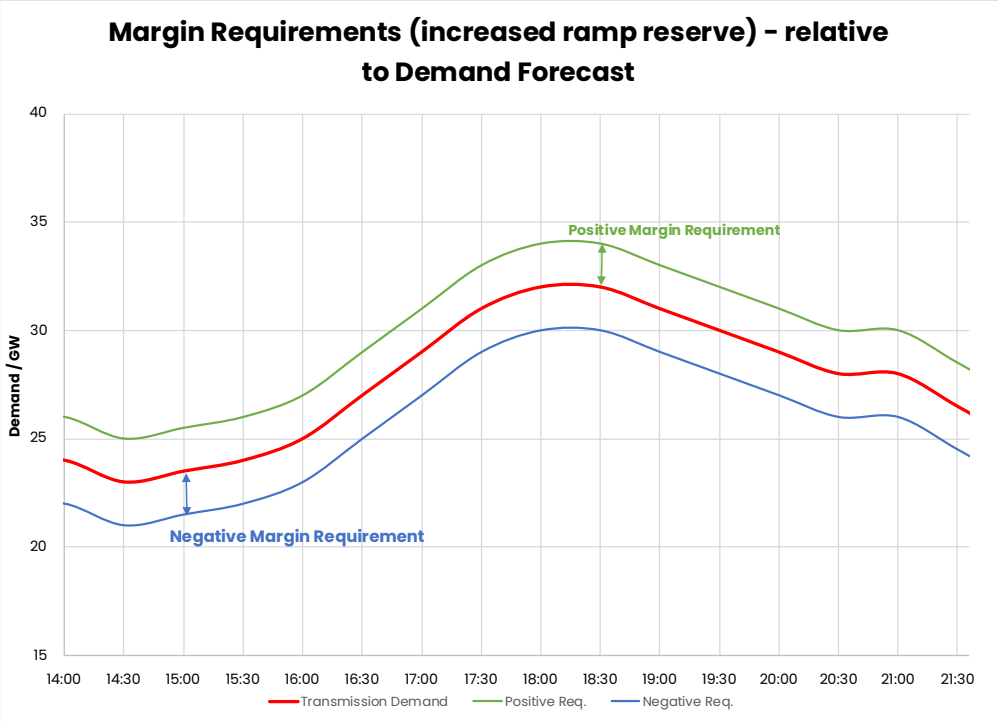
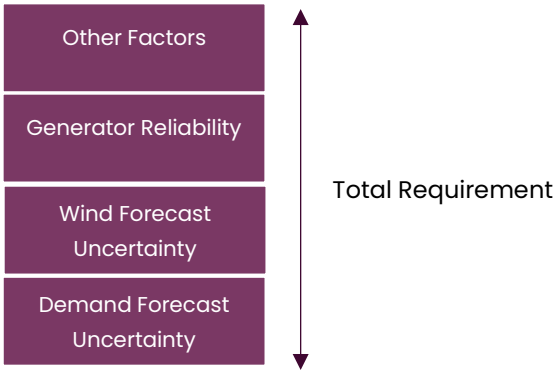


Figure 1

How does the NESO set our Margin Requirements?



Reserve requirements are in place to quantify the need to react to inherent uncertainty. We set our margins to reduce system risk to an acceptable level. For some parts of the requirement, this means looking at historical out turn to measure uncertainty, other parts of the requirement can be dynamic and relate directly to the amount of wind generation forecasted.

How does NESO calculate Margin?

We forecast the National Demand and then look at the market position following the day-ahead wholesale market auction and any Ancillary Services auctions we have run and procured services through. From these, we assess the flexibility of the controllable assets in the Balancing Mechanism from their Physical Notifications (PN's) and dynamic parameters to increase or decrease output if the NESO were to instruct them. We assess this for the whole day and create System Operating Plans (SOPs) for key points in time such as peaks in demand, known as Cardinal Points. We publish our SOPs here: System Operating Plan - Data Table | National Energy System Operator (neso.energy) This flexibility is usually the amount we could reach if every available unit was instructed to its Maximum or Minimum output. Note that the availability of the unit depends on its parameters, and some large inflexible units need to be synchronised to the system to provide this sort of flexibility and so cannot count towards the margin unless they are running themselves, or the NESO plans to instruct them online.

This flexibility gives us our actual operating envelope, and it is then our role to ensure that the envelope covers both our highest positive and lowest negative margin requirements. In the example in the graph below, we have assumed that the wholesale market outturn has exactly matched the demand forecast, and the flexibility provided by the available assets is sufficient to cover both the Positive and Negative Margin Requirements for all time periods. In this case, the NESO does not need to take any actions to increase Margin, and no DFS or trades would be instructed for this purpose.

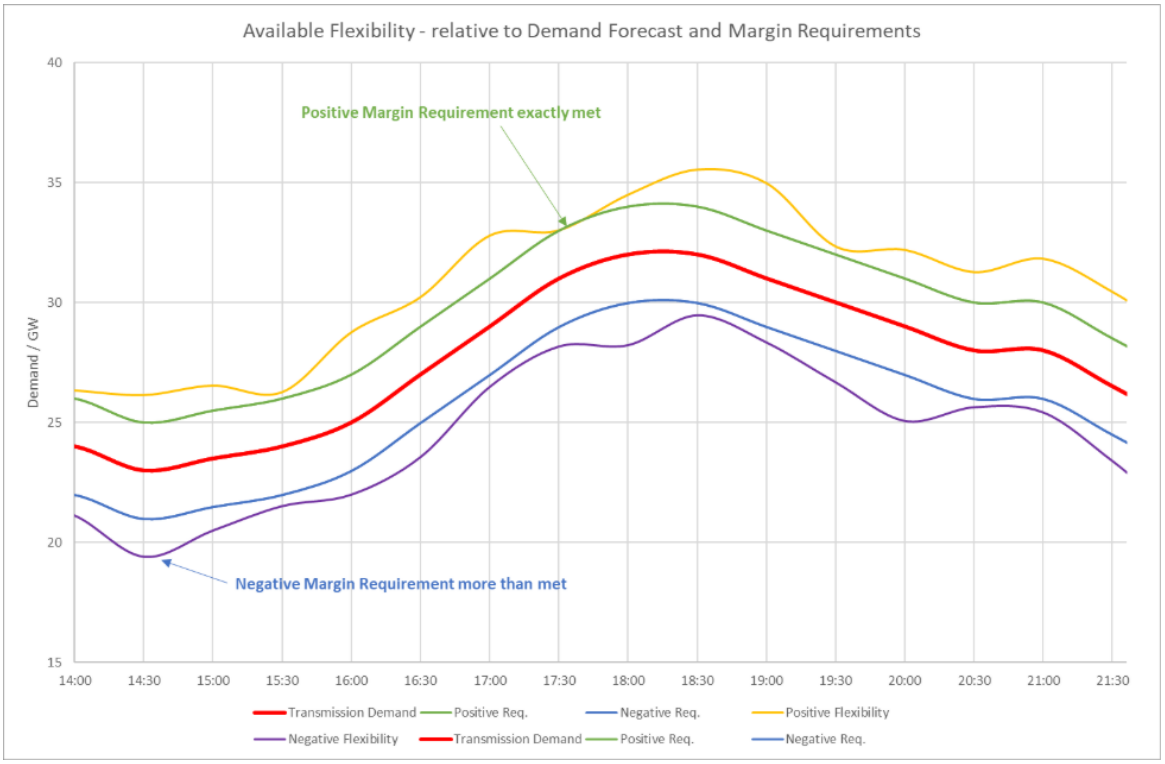


Figure 2

In practice, however there will be times when the market does not exactly match the demand forecast, and where insufficient flexibility is provided by the market. These numbers are then compared with the positive and negative reserve requirements. If the availability is greater than the requirement, then the margins are satisfied as per the last graph. If they are not, then the NESO needs to take action to enhance our margin (widen or move the envelope). Two examples of this are shown in the graph on the following page. Here at 15:30, we have an issue where there is not enough flexibility on the system, the envelope is not wide enough to exceed both the Positive and Negative Margin Requirements. In this case, the NESO needs to take actions to increase flexibility (widen the envelope). DFS can solve the negative margin challenge, as it does provide bi-directional delivery.

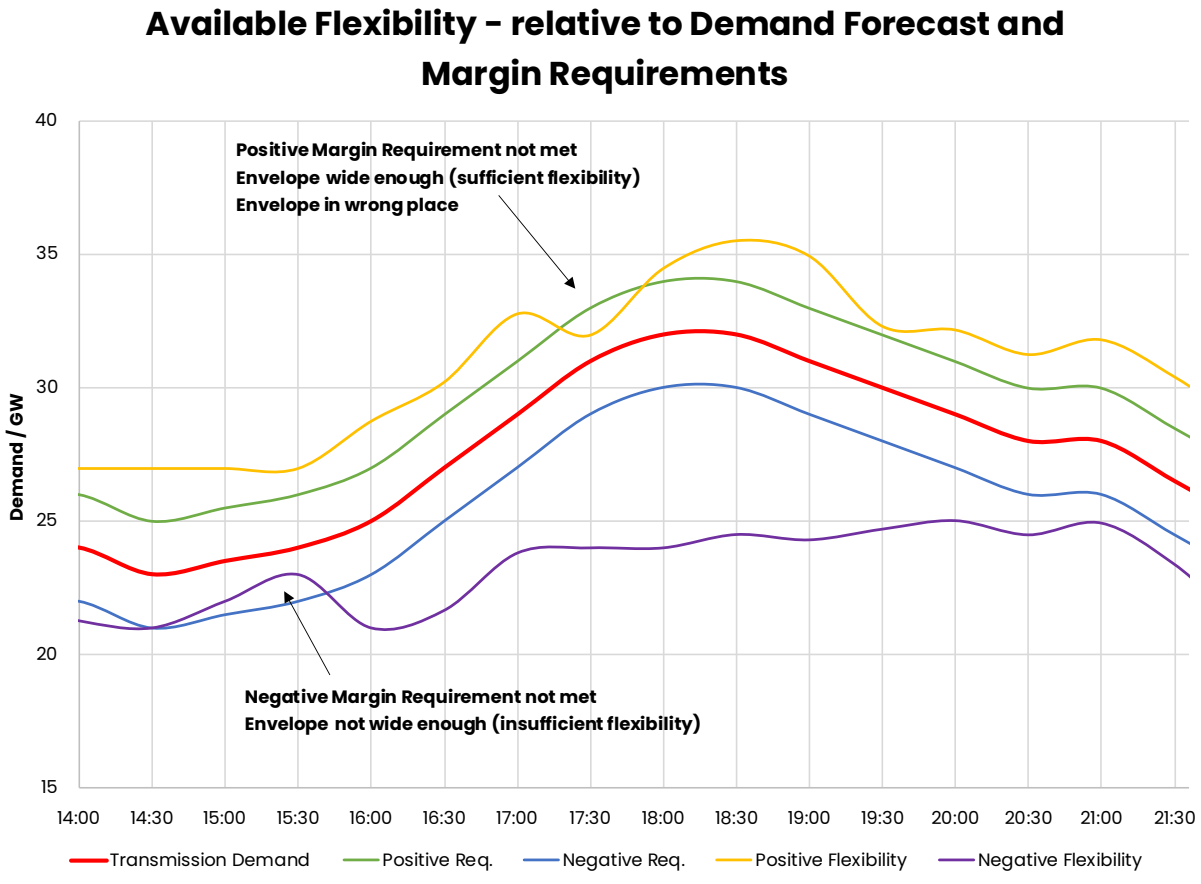


Figure 3

However, there is a second margin issue shown in the graph, which is at 17:30, there is a shortfall against our Positive Margin Requirement, but there is plenty of flexibility available. In this case the problem can be solved by moving the envelope – in this case moving it up relative to demand.

There are two ways of doing this – increasing the output of controllable assets, or by reducing demand for example via DFS.

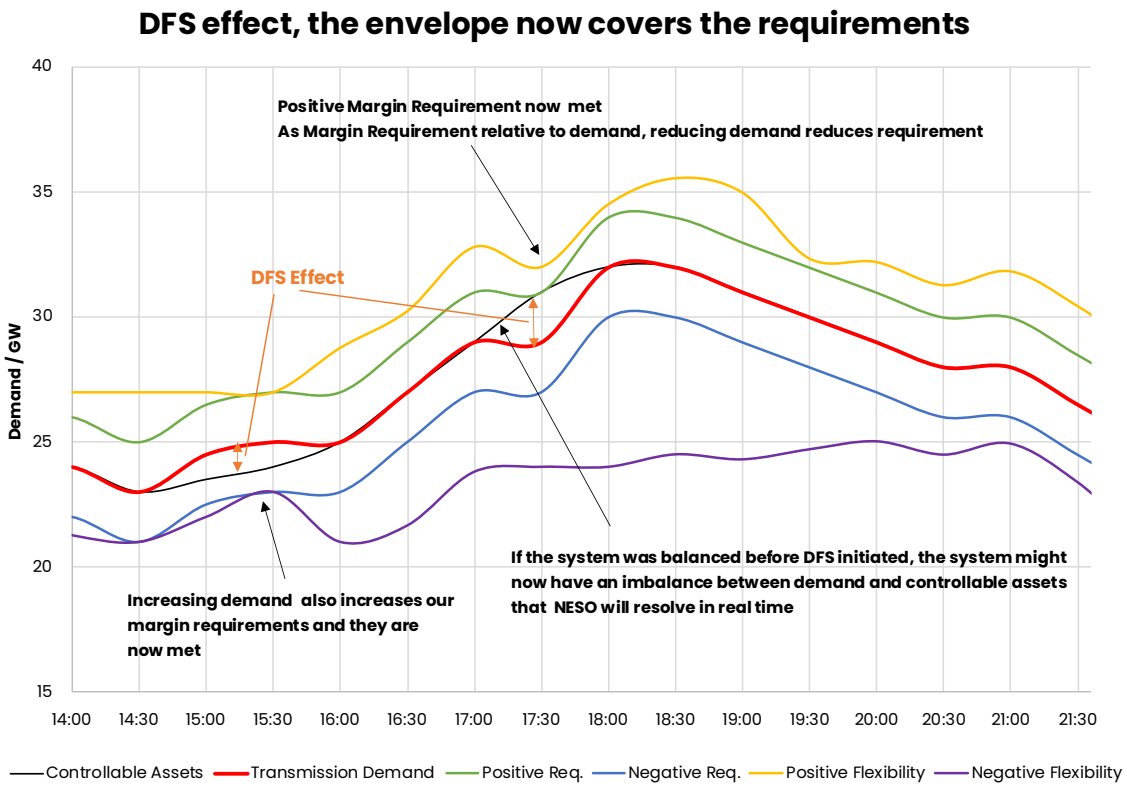


Figure 4

How do we create Margin?

DFS is evolving to a bi-directional service that we anticipate continuing to mainly be beneficial around noon and evening peak. As such, DFS will be used when the NESO is short of positive and negative margin. Reserve requirements differ across the timescales leading up to the evening peak.

Day Ahead:

- Procure Reserve products like Balancing Reserve, Short Term Operating Reserve (STOR) which reserve capacity on a unit to respond flexibly to short notice instructions from the NESO (increase flexibility, widen the envelope)
- Begin scheduling process to assess market positions, forecasts and provided flexibility (look at where the demand, margins and envelope currently are)

Within Day:

- Trade on the Interconnectors to change overall margin position – (moves the envelope up or down)

- Procure DFS (moves the envelope up and down relative to demand)
- Synchronise larger Balancing Mechanism (BM) plant to their minimum output to be able to have positive flexibility (widens the envelope)
- Schedule flexible BM assets to plan to utilise them in real-time if needed (envelope correctly defined)

Within Gate:

- Utilise short notice, BM flexible units as scheduled.
- Utilise pre-contracted reserves e.g., STOR both BM and Non-BM.
- Replace reserves used with short notice options (optional contracts, synchronise more BM options)

How do we compare these options? (Based on total cost)

All BM units need to submit their final PN position and final prices per MWh ahead of gate closure which happens 60 minutes before delivery – e.g., 15:00 for the settlement period 16:00-16:30.

Any actions that the NESO takes ahead of gate closure (pre-gate) are compared against the forecast total cost of the actions planned to be taken within the gate. If the pre-gate actions are more economic, these actions can be used.

It is worth noting that BM prices can be changed up until gate closure, and this means that NESO could decline DFS based on BM prices at the time, and then BM prices increase closer to real time. This means that DFS, as a longer notice service, cannot react to close to real-time price spikes, and providers should be aware of this when analysing any post event data.

In the BM, the total cost is forecast using: the price for the volume of margin, the duration of the instruction and any replacement action(s) required (not purely price). Replacement actions are used where the margin option we have chosen has changed the balance of the system, for example if we synchronise a unit to a minimum output of 250MW on a balanced system, we will need to take 250MW of replacement actions to turn down other unit(s) to keep the system in balance.
Any actions taken ahead of the interconnector final nomination gate are costed based on the duration, price and volume and include the replacement action required – not just the price of the trade. DFS is assessed against actions such as interconnector trades or BM actions. The diagram below aims to show that more flexible options can be targeted to shorter requirements, and it is overall cheaper to buy a slightly more expensive option for a short time, rather than a less flexible but cheaper unit for a much longer period. In this way for short (~30/60 min) requirements, DFS could be more cost effective for the same unit price of energy (£/MWh).

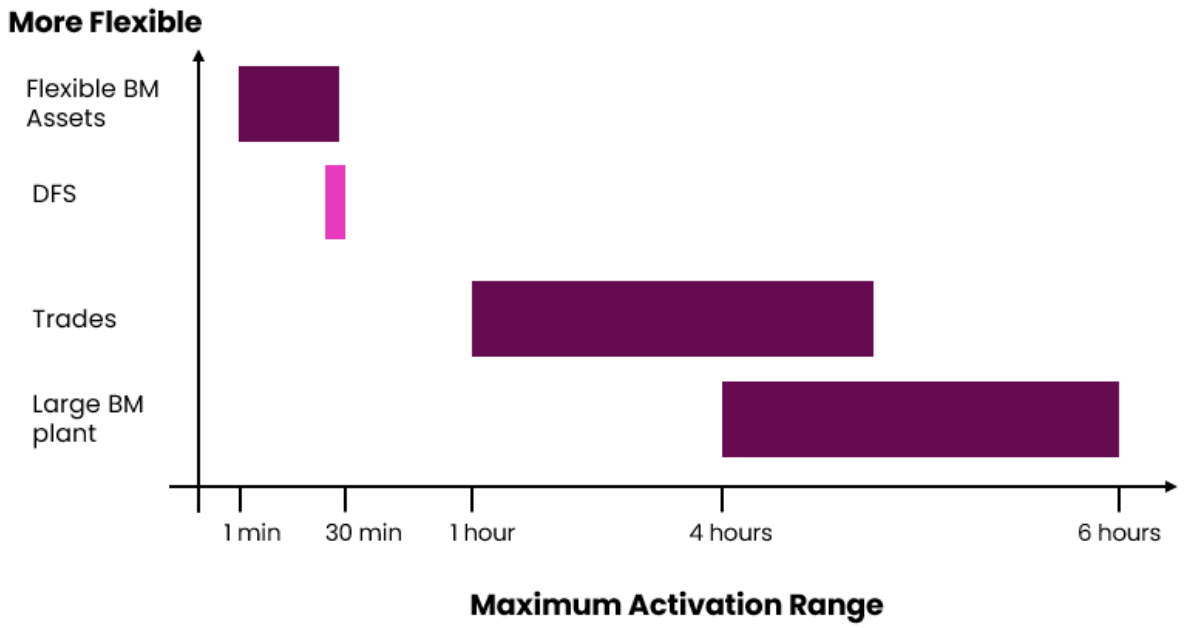


Figure 5

Operational need of DFS

Negative margin

Losing a source of demand leaves the system with excess energy and we need to rebalance by reducing supply or increasing demand. Negative margin is the difference between NESO's expected operation position, and the absolute minimum supply that NESO can achieve. It is also referred to as "footroom" or "downward flexibility".

We need negative margin to manage uncertainty (higher than expected wind output) and demand losses (e.g. an exporting interconnector).

Currently, NESO is paid for negative margin actions across the year. This refers to generators saving fuel, storage assets getting charged and electricity being sold from central system to provider assets. DFS will be seeking to compete additional MW's against the periods where NESO are paying for such actions.

Price Ranges & Windows

We have been paying ~£100/MWh per settlement period in the Balancing Mechanism and Trades for negative margin. Figure 1 shows price thresholds, respective procured volumes and instances to occur in a settlement period. For example: on a weekend, negative margin is usually required between 11:00 am to 4:00 pm. We can conclude that NESO has paid between £100/MWh and £50/MWh, 472 times procuring 17,700 MWh as shown in Table 1.

Price Range	Volume (MWh)	Number of Settlement Periods
Bid price >= £50	-5,250.0	107
£0 <= Bid price < £50	-37,458.0	760
£-50 <= Bid Price < £0	-139,343.0	3,1516
£-100 <= Bid Price < £-50	-17,700.0	472
Bid Price < £-100	-898.0	38

NESO gets paid

NESO pays

Table 1: Price Range for Trade Bids on Weekends between 9:30 and 17:00, Jan 2025-Dec 2025

Between Jan 2025 and Dec 2025:

- Spend on negative margin (BM & Trades): £25.3m
- Absolute Volume of negative margin actions (both paid by and to NESO): 1.43m MWh
- The most expensive Bid price was -£451.24/MWh (paid by NESO)
- The least expensive Bid Price was £456.53/MWh (paid to NESO)
- Negative margin was procured on average more on weekends, as seen in Figure 7 on the following page
- Looking at bid prices for negative margins, NESO usually paid in the afternoon (Figure 8)

Whilst NESO both pays out and gets paid for negative margin, the periods we see there being the most value from DFS competing is outlined below. These are general views and would flag we do have the ability to procure outside these windows but for launch of the developments we anticipate these being the most common period of need:

- across weekends and bank holidays between 11:00 and 16:00
- across weekdays between 13:00 to 15:30

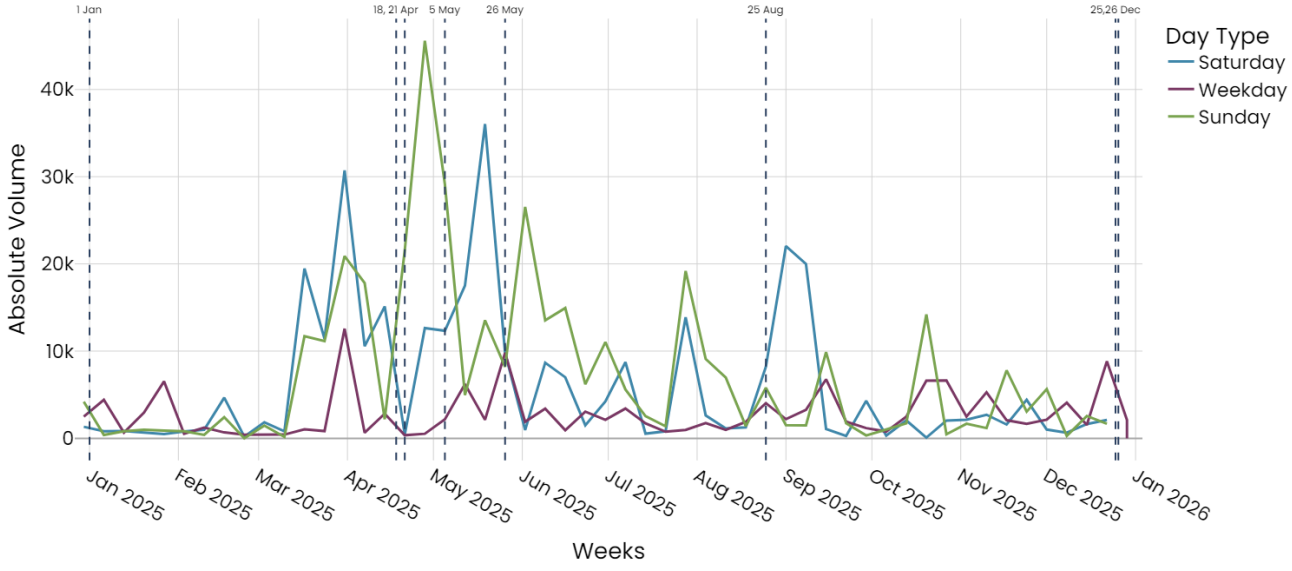


Figure 6: Absolute Volume Procured, averaged by week and day type, Jan 2025-Dec 2025

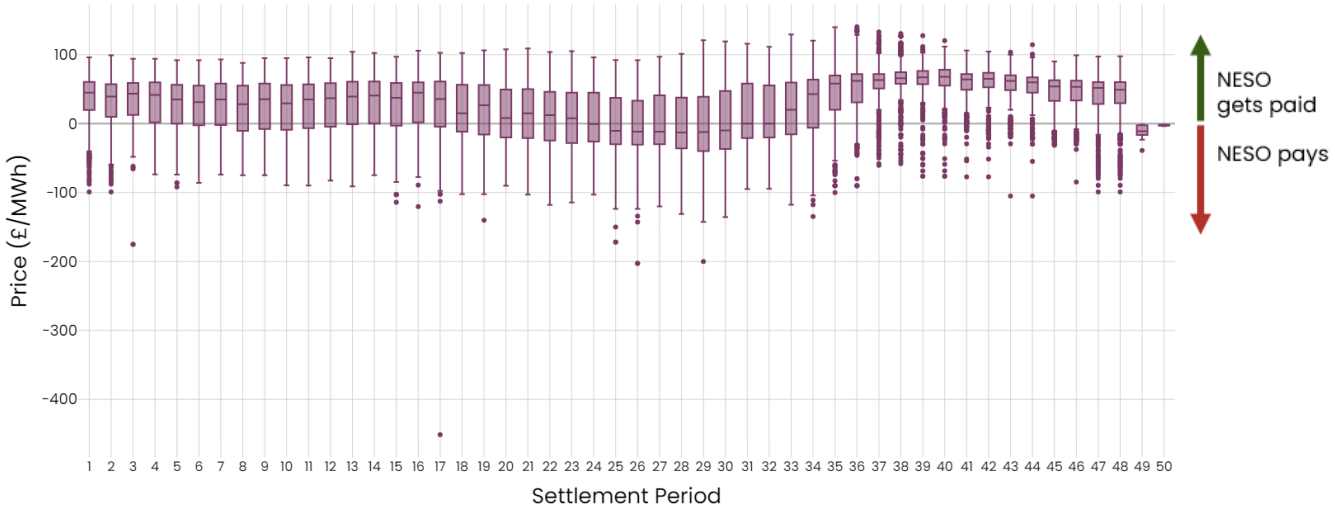


Figure 7: Distribution of bid prices for weekends by Settlement Period, Jan 2025-Dec 2025

Future challenges and ongoing summer requirement

Embedded renewable generation is increasing demand variability and broadening the range of weather patterns that can result in low demand. As such, the lowest demand day could credibly occur on any weekend or bank holiday between late April and late August. Given the increasing role of weather patterns in determining low demand periods, the variability and potential range of minimum demand is also widening. A combination of high solar irradiance, high wind and mild temperatures could lead to very low demand, as observed during the late May Bank holiday weekend in 2025.

The changing nature of low demand periods is expected to increase the number of everyday actions required to balance supply, demand and system needs. We continue to expect periods where inflexible generation, units meeting system requirements and wind output will exceed demand. In these situations, the DFS negative margin service will extend the range of tools at our disposal to balance demand and supply, complementing existing balancing services such as the Balancing Mechanism. The total volume of negative margin required during these periods will vary with prevailing conditions, including system conditions and wider availability of flexible and inflexible generation.

Zonal Procurement

NESO is introducing Zones for DFS to align with key transmission constraints. These zones are shared via a GeoJson file on our DFS webpage but are outlined below for illustrative purposes in Figure 2 and how the different active constraints may impact zonal volume restrictions.

If a constraint is expected to be active in the period and direction required for DFS, then the zones inside that constraint are excluded else full requirement can be procured in the zone.

For example, if FLOWSTH (B9) is forecasted to be active, then DFS for negative margin in zones 8, 9, 10, 11 and 12 of 12-Zone model would be limited in procurement volume.

In general, most active constraints are Export Constraints, and so we would anticipate most restrictions to be for positive margin requirements (Demand Turn-Down/Generation Turn-up).

If you would like to understand more about transmission constraints, this is a topic that is covered at our weekly Operational Transparency Forum.

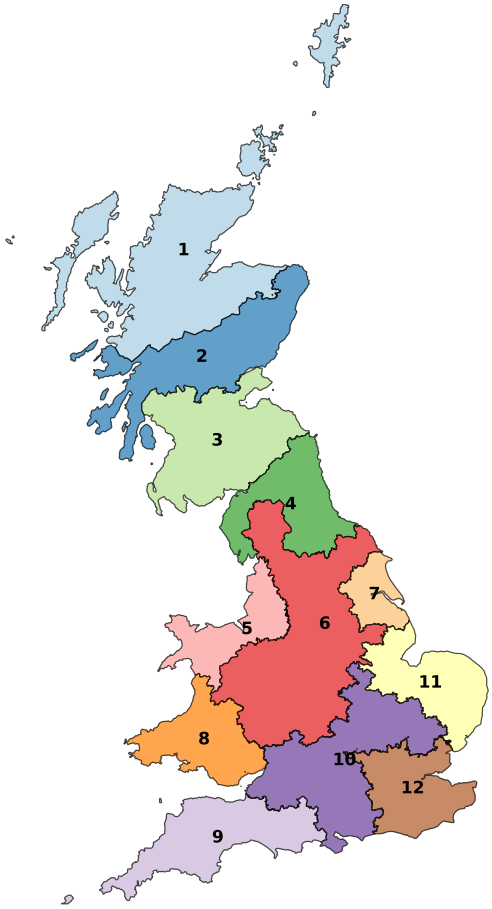


Figure 8: 12 Zone model

Boundary Name	Impacted Procurement Zones
SSENWEX9C (B1a)	Z1
SSE-SP2 (B4)	Z1, Z2
SCOTEX (B6)	Z1, Z2, Z3
SSHARN (B7)	Z1, Z2, Z3, Z4
FLOWSTH (B9)	Z8, Z9, Z10, Z11, Z12
GM+SNOW5A	Z5
DRESHEX1	Z7
SWALEX2 (SW1)	Z8
SWEXP4 (B13)	Z9
BICBRAEX	Z11
SEIMPPR23 (LE1)	Z12

Table 2: Zones limited by transmission boundaries

Tests and GAP

NESO retains the ability to run tests including a Guaranteed Acceptance Price and any planned testing would be communicated to the market through an updated Market Information Report. At the time of publication, we do not have any immediate plans to schedule any tests but this is subject to change.

Frequently Asked Questions

1. What data and market information do NESO publish to support my analysis for DFS?

- NESO webpages on margin, response and reserve may be helpful for broader educational purposes: What are margins? | National Energy System Operator (neso.energy)
- Any actions taken in the BM are reported via BMRS in real time: https://bmrs.elexon.co.uk/balancing-mechanism-market-view
- Any trades taken are published on the data portal. Upcoming trades | National Energy System Operator (neso.energy)
- Alternative historical data on trades via the below. We anticipate filtering specifically for margin reason code would be beneficial. Historic GTMA (Grid Trade Master Agreement) Trades Data | National Energy System Operator (neso.energy)
- The summary of the auction run to assess the trades is available on auction close on the data portal. Interconnector Requirement and Auction Summary Data | National Energy System Operator (neso.energy)
- Available post event in the Disaggregated Balancing Services Adjustment Data (DISBSAD) on BM Reporting Service (BMRS) which is operated by Elexon. https://bmrs.elexon.co.uk/adjustment-actions-disbsad
- System Operating Plan (SOP) produced at key demand peaks or troughs throughout the day, at what we call a Cardinal Point (CP). System Operating Plan - Data Table | National Energy System Operator (neso.energy)

2. How often will NESO publish a Service Requirement and what is the value?

The frequency of NESO publishing a Service Requirement and its corresponding value will be determined by system and market conditions by expert Power System Engineers in collaboration with supporting teams. Factors such as forecast variances, plant outage, weather conditions, interconnector flows, and the capability/pricing of the plant available in the BM all influence margin and subsequently the publication of any Service Requirement to make efficient economic decisions that support the operation of the system and end consumers.

Regarding pricing, the ultimate determination of price will be made by the market and the offers/prices presented to NESO. We believe that it is not appropriate for us to provide speculative pricing forecasts.

3. How can I approach analysis on potential pricing/service requirements?

While we cannot provide specific pricing forecasts, we recognise the value of offering guidance and identifying key data sets that can support your analysis, some of which we have identified at the start of the FAQ section of this document. To gain insights into potential pricing and alternative actions, we recommend familiarising yourself with NESO trading activity and historic data particularly those from interconnectors where the reason code is tagged for margin. These interconnector trades currently act as an alternative option to NESO to support margin actions.

By leveraging this information and conducting thorough analysis we believe parties should be able to build their own assumptions and hypothesis around potential pricing and service requirements.

4. Is DFS automatically dispatched?

DFS will continue to be dispatched through the publication of a Service Requirement and bid assessment. This process is outlined in our contractual documents.

5. I have volume which can be automatically, regularly utilised, what should I do?

If parties have volume that has automated capability and unlikely to experience user fatigue in that it can be dispatched regularly, we anticipate markets such as Reserve, Frequency Response, and the BM are viable alternative options. We acknowledge that these have varying technical requirements and there is ongoing work with industry to further unlock opportunities for participation. DFS can act as a good platform for parties to familiarise themselves with flexibility participation and we can support parties through their journey to progression to our core markets.

If any parties have any questions or queries on this supportive material, please do reach out to your account manager or demandflexibility@neso.energy.