

Demand Flexibility Service (DFS)

Market Guidance v.1 August 2024

This document has been produced for educational purposes to support industry in the evolution of the Demand Flexibility Service (DFS) to a commercial merit-based margin tool. It seeks to provide an overview of what margin is, why ESO 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.

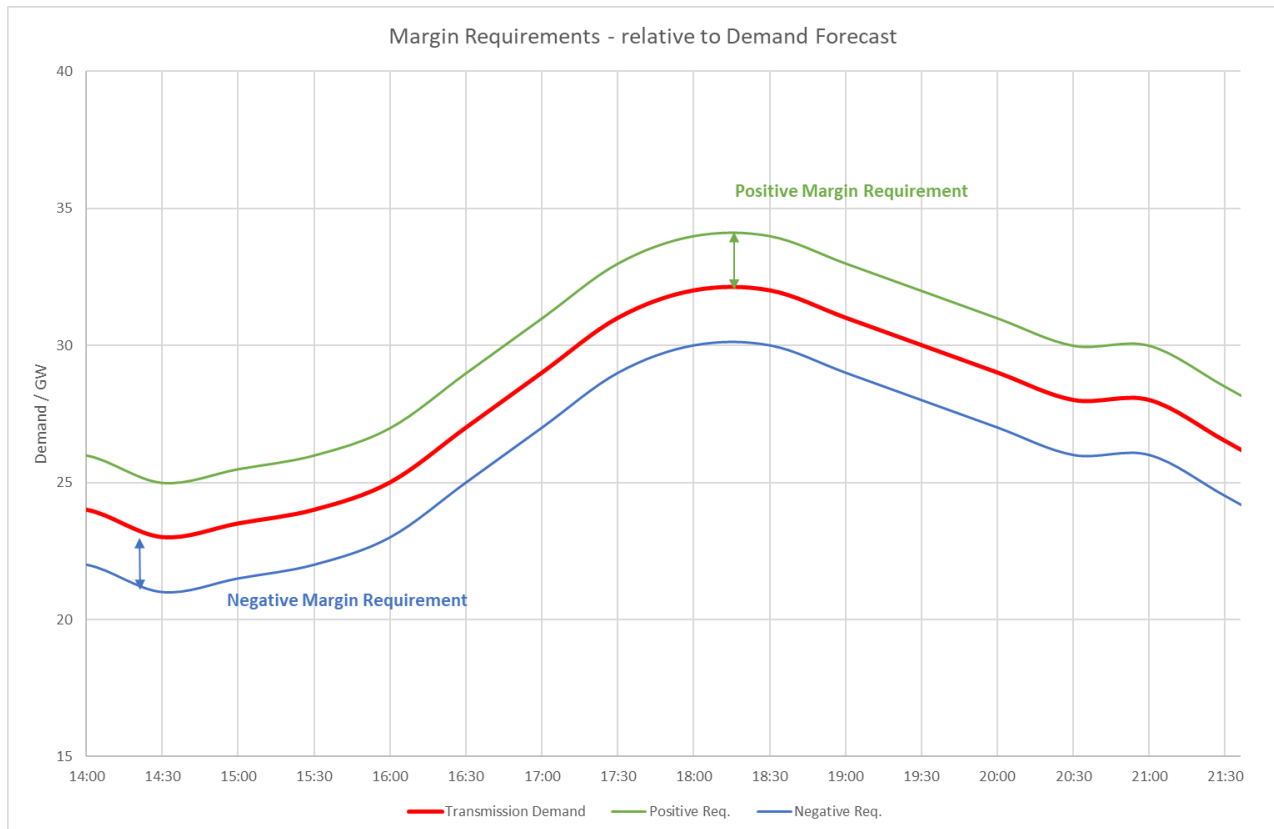
We may update this material from time to time to further support parties based on feedback and updates.

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.

What is Margin and why does the ESO need it? (An operating envelope)

Margin or reserve is the ability for the ESO to manually adjust controllable assets in real time (e.g., generators/ demand), to increase or decrease the amount of power supplied to the system. It is vital as this is how the ESO has the flexibility to react to inherent uncertainty – for example, the wholesale market not clearing exactly balanced, a generator or demand trip and renewable generation/national demand being different from a forecast.

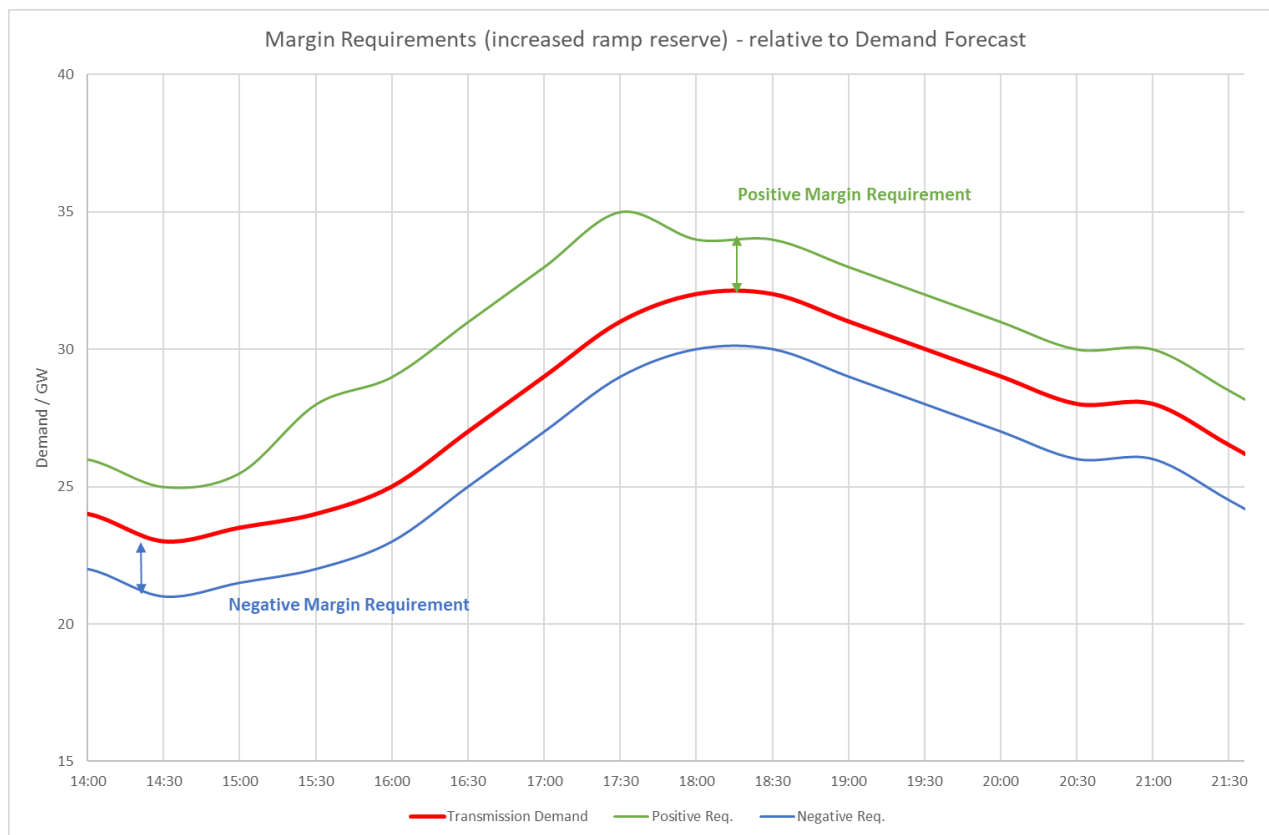
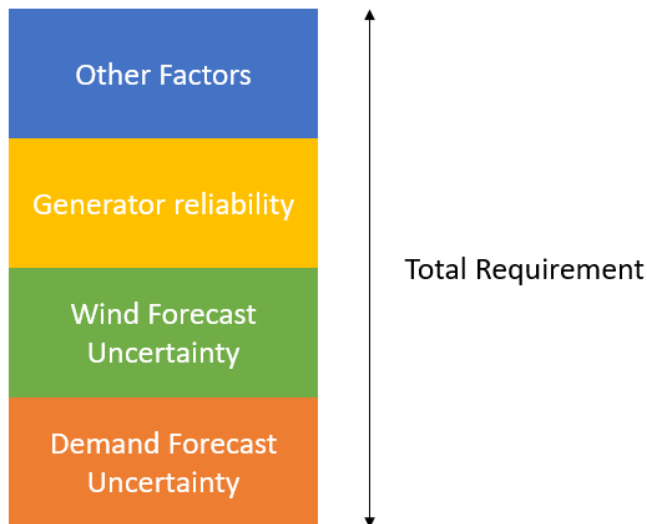
For the system to be balanced, the controllable assets need to match the country’s demand for electricity, and we focus on this at the Transmission System level generally. The graph below shows how our Margins give us some flexibility either side of being able to exactly match the demand forecast.



How does the ESO set our Margin Requirements? (How big the envelope should be)

Reserve requirements are in place to quantify the need to react to inherent uncertainty. They consist of several components, each of which covers a different aspect of such uncertainty and varies with different timescales. 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 for example. We are currently working on a Dynamic Reserve Setting project to incorporate around fifty different factors into our requirement setting as we continue to evolve our operations to the more dynamic and volatile power system brought about by wider market changes.

These requirements set out how much flexibility we need to operate the system. The graph below shows how an increased positive margin requirement on the ramp up to peak demand would look. The wider the gap, the greater the requirement:

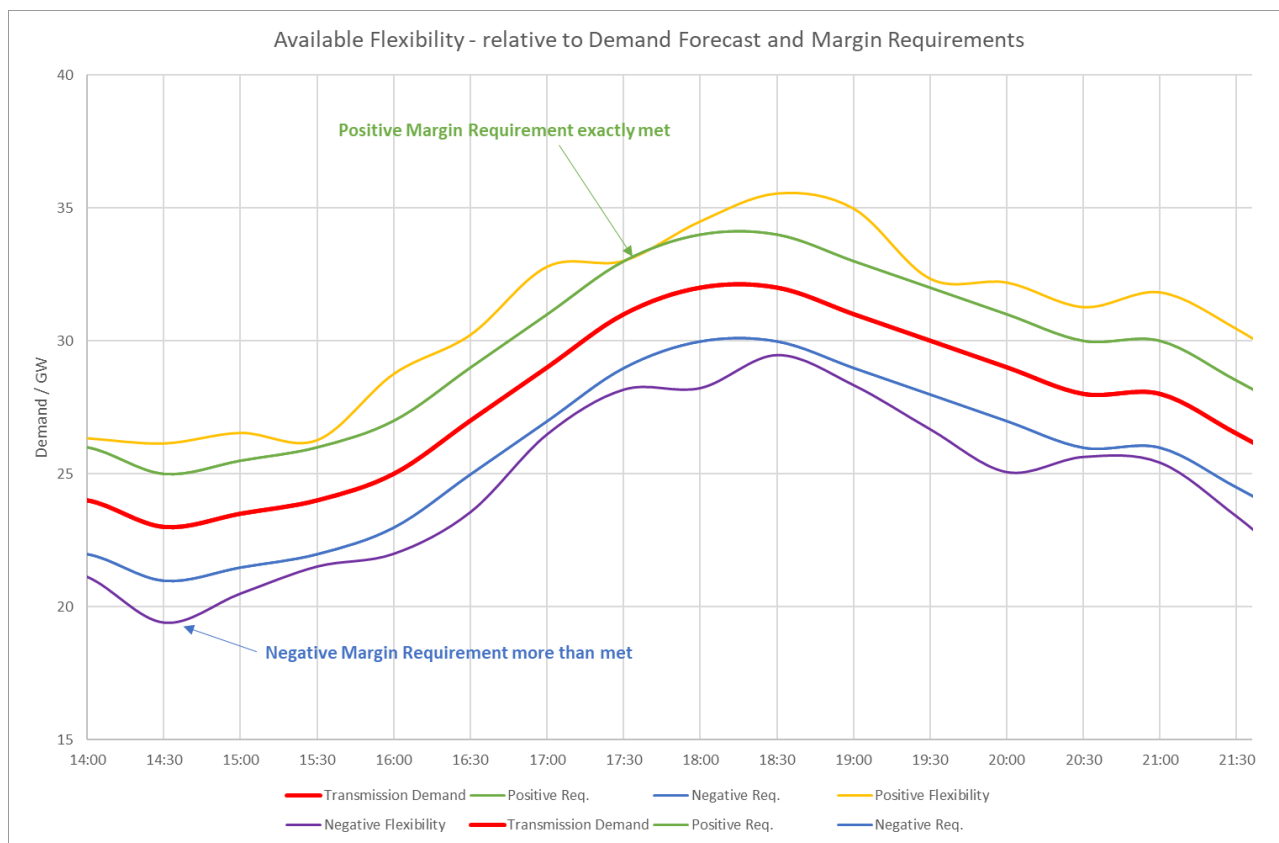


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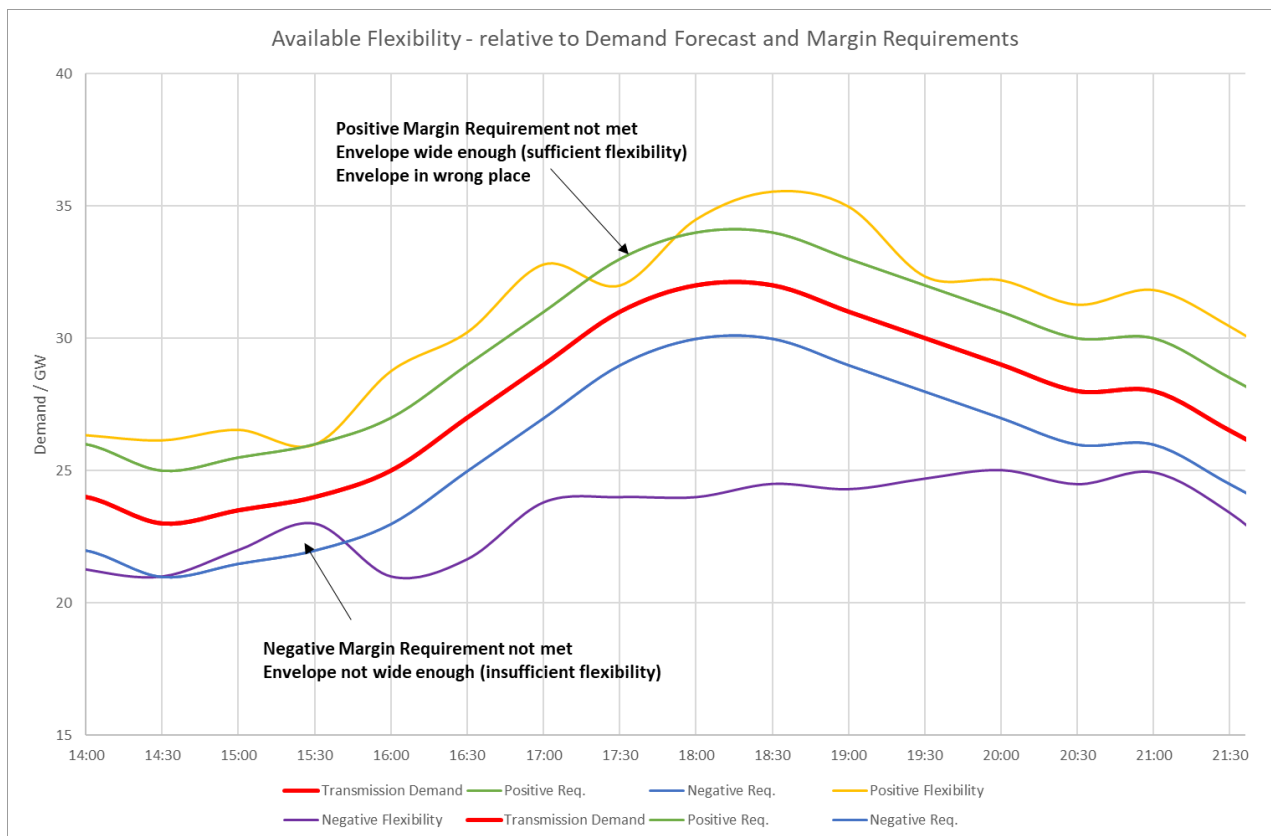
How does ESO calculate Margin? (How big the envelope is)

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 from their PN's and dynamic parameters to increase or decrease output if the ESO 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 | ESO \(nationalgrideso.com\)](#). 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 it unless they are running themselves, or the ESO plans to instruct them online.

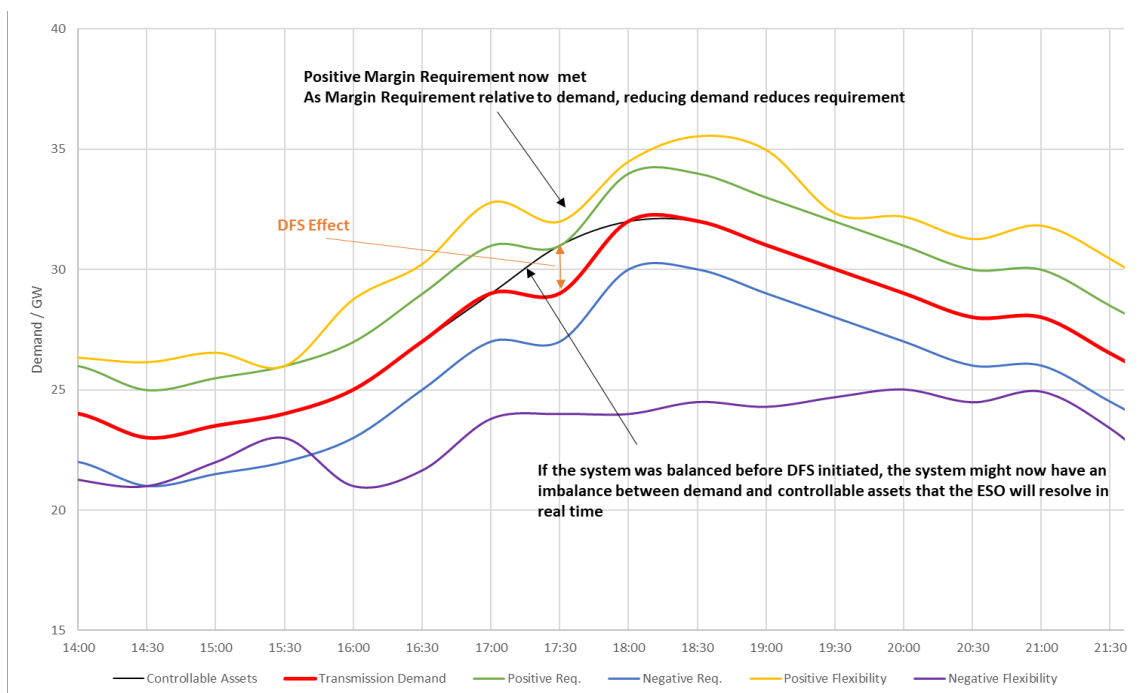
This flexibility gives us our actual operating envelope, and it is then our role to ensure that the envelope covers both our highest positive and lowest negative margin requirements. In the example in the graph below, we have assumed that the wholesale market outturn has exactly matched the demand forecast,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



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 ESO 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 ESO needs to take actions to increase flexibility (widen the envelope). DFS cannot solve the negative margin challenge, as it does not add additional flexibility in real time, it simply gives the ESO an option to change the demand profile. This could be achieved through DFS expanding to a bidirectional delivery which we have committed to review as part of our roadmap activities.



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:



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How do we create Margin? (The envelope is big enough and in the right place)

DFS is a demand turn-down service that we anticipate continuing to mainly be beneficial during the evening peak. As such, DFS will be used when the ESO is short of positive margin. In this instance, we tend to procure services that help with low frequency response, positive reserve, and positive energy. Reserve requirements differ across the timescales leading up to the evening peak. As such operational decisions are made depending on the timescales of each requirement and associated product.

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 ESO (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 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? (Not just price per MWh but total cost)

All BM units need to submit their final Physical Notification (PN) position and final prices per MWhr 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 ESO 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. Where prices ahead of time are the same as the prices forecast in the BM (BM), the action will be left to the BM to maximise the flexibility that making the decision in real time brings. Where there is a forecasted saving, the actions that provide that saving will be taken.

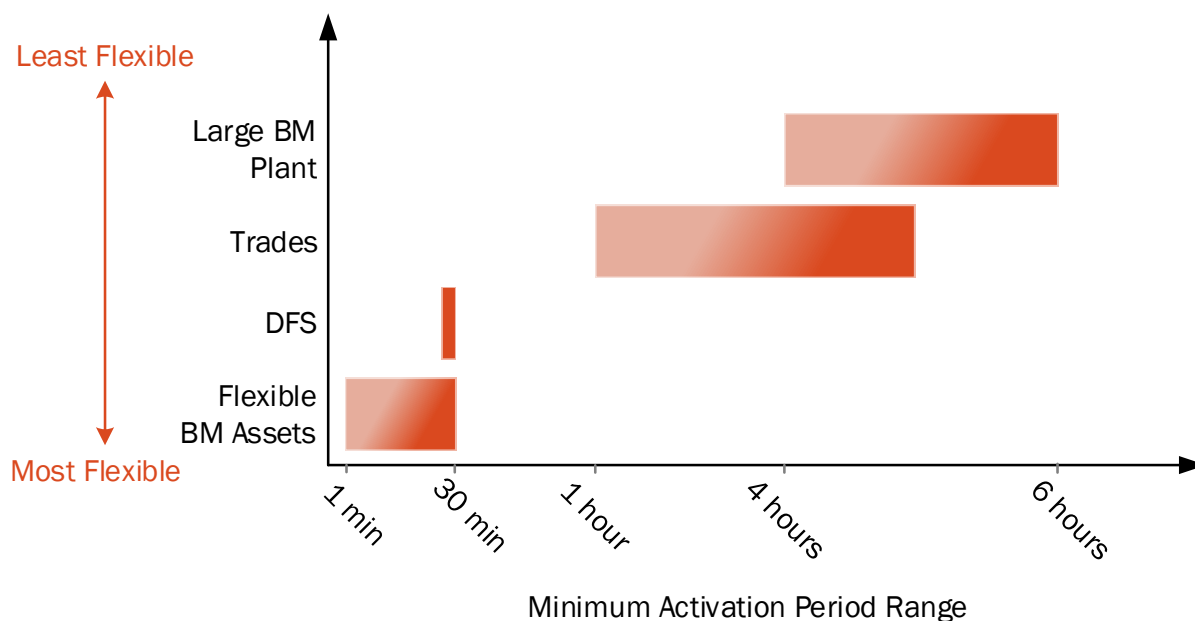
It is worth noting that BM prices can be changed up until gate closure, and this means that ESO could decline DFS based on BM prices at the time, and then prices increase closer to real time. ESO does not speculate on how prices will change in the future and instruct services (trades/DFS) on that basis. Regulations require that instructions are not taken before gate-closure, therefore we are requesting a derogation from the regulator to reflect that the process of communicating predominantly manual activations and the subsequent households/business opt-in process has logistical restrictions given this immature market. This means that

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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 required (not purely price).

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 will be compared on the same basis to any interconnector trades. 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).



This illustrative example helps provide an insight into the type of options and processes that ESO will be considering when assessing bids or a Service Requirement. We anticipate that there will be a period whereby both ESO and the market are learning around this new positioning of DFS and how the wider market dynamics will impact the likelihood and competitiveness of the DFS activations/Service Requirements.

As the ESO starts to build an understanding of the marginal cost for this type of flexibility, we will have greater confidence and data to support identifying periods whereby the DFS alongside other options can provide additional margin/economic benefit.

In line with other new/immature markets, we will seek to share appropriate insights and data through our usual engagement channels such as the Data Platform, Operational Transparency Forum (OTF) and Market Information Reports. If any parties have any questions or queries on this educational material, please do reach out to your account manager or demandflexibility@nationalgrideso.com.

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Frequently Asked Questions

What data and market information do ESO publish to support my analysis for DFS?

- ESO webpages on margin, response and reserve may be helpful for broader educational purposes. <https://www.nationalgrideso.com/electricity-explained/how-do-we-balance-grid/what-are-margins>
- 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 as soon traded on the data portal. <https://www.nationalgrideso.com/data-portal/upcoming-trades-0>
- Alternative historical data on trades via the below. We anticipate filtering specifically for margin reason code would be beneficial. <https://www.nationalgrideso.com/data-portal/historic-gtma-grid-trade-master-agreement-trades-data>
- The summary of the auction run to assess the trades is available on auction close on the data portal. <https://www.nationalgrideso.com/data-portal/interconnector-requirement-and-auction-summary-data>
- 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 | ESO \(nationalgrideso.com\)](#)

How often will ESO publish a Service Requirement and what is the value?

In moving to a merit-based margin tool, we understand the apprehension providers may have about pricing and number of events. We recognise the challenges and uncertainties that arise from this transition, impacting parties' commercial strategies and risk assessment in response to market conditions. We empathise with the challenges this brings and the learning which takes place as markets are formed and established under commercial structures.

The frequency of ESO publishing a Service Requirement and its corresponding value will be determined by system and market conditions. This approach allows us to make efficient economic decisions that support the operation of the system and end consumers. 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.

Given the wide range of factors that impact margin positions, it is not appropriate for ESO to forecast a specific number of times a Service Requirement will be issued. However, we believe there is a good range of market data available for parties to undertake analysis in determining potential avenues.

Integrating the DFS alongside established control room processes ensures that the service complements other margin options, such as interconnector trades. The decision to issue a Service Requirement is made by expert Power System Engineers in collaboration with supporting teams.

We acknowledge that transitioning DFS away from a set number of events presents a challenge for parties in their analysis. ESO is open to supporting parties with additional requests to assist in this space as all stakeholders involved with DFS continue to learn during this transition.

Regarding the pricing of the merit-based margin tool, the ultimate determination of price will be made by the market and the offers/prices presented to ESO. We believe that it is not appropriate for us to provide speculative pricing forecasts. Additionally, parties will have their own commercial strategies and approach to risk/market conditions. Moving to a commercial market will require providers to conduct greater analysis in forming their commercial strategies compared to the previously set guaranteed acceptance pricing.

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

When approaching analysis on potential pricing and service requirements, it is important to consider the transition to a commercial market. We understand that parties' commercial teams and market fundamentals play a crucial role in their competitiveness within a market, and we are mindful of this.

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 ESO 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 ESO to support margin actions. Paying attention to the timing of these trades in relation to peak periods may also be beneficial as well as understanding the trends and dynamics around full imports, outages etc.

During periods of full import for interconnectors, it is likely that the direct alternative options will be dominated by the BM offers. In addition to reviewing the £/MW offers accepted, analysing aspects such as minimum run times and total action costs can provide further insights into comparable expensive periods. This information is widely available in BMRS.

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.

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. This is broadly the same process by which we also ascertain other options outside the BM such as trades.

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

As a commercial merit-based margin tool, we anticipate DFS is still best placed to support evening peak demand or volatile periods. The structure of the terms allows us to publish Service Requirements at other times, but we anticipate these to be aligned with more acute challenging margin conditions.

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 STOR, Fast/Quick 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.

Our reserve products are currently going through reform with our new Quick Reserve (BM) product recently concluding its EBR Article 18 consultation period. If there are opportunities to unlock additional volume for these new products, we welcome parties to engage in these reform activities to help shape the future of our services.

To provide some further support based on feedback ESO has extracted some summary statistics from publicly available data sets for Interconnector trading actions for margin from 2023-2024 over the winter season. Please acknowledge the volume of trading is dependent on system conditions at the point in time and this is a snapshot of some of the data sets we suspect that will be of interest to parties in any analysis. This data can be found via the link below.

<https://www.nationalgrideso.com/data-portal/historic-gtma-grid-trade-master-agreement-trades-data>



Between October and March 2023-2024:

- There were 330 hours that the interconnectors were traded for margin.
 - Of these instances 207 were between 15:00 and 20:00
 - These hours were spread across 69 days.
- The average volume traded was 1164MW.
- The max volume traded was 3700MW.
- The min volume traded was 50MW.
- The maximum traded price on any given day was between £24.08MWh and £712.49MWh with an average (of the maximums over all the days) of £139.15MWh. There were 14 hours with trades priced greater than £250MWh over 5 days. (16 Oct, 28 Nov, 29 Nov, 1 Dec, 6 Dec)
- ESO caveat that these are the traded prices for margin for a specific point in time under specific system conditions and this should be a consideration and flag that these do not indicate the benefit against alternative BM actions. Parties can undertake analysis for periods when interconnectors were at full import or other BM margin actions were taken.

If you have any questions or would like to speak to the team, please contact your account manager or demandflexibility@nationalgrideso.com