FASS Programme

Day-Ahead System Services Auction (DASSA) Product Review & Locational Methodology Recommendation Paper

August 2024

EirGrid SONI

Executive Summary

In line with commitments to deliver 2030 Renewable Energy Source (RES) targets and to align with EU requirements, the SEM Committee (SEMC) outlined in its High Level Design Decision on the System Services Future Arrangements[1] the need to move to a day-ahead auction-based procurement of appropriate system services. In this decision paper, the SEMC also outlined the need to review the products to be procured in such an auction, and the development of a locational methodology that would support these RES-E (electricity from renewable generation sources) objectives.

EirGrid and SONI published the Day-Ahead System Services Auction (DASSA) Product Review and Locational Methodology consultation paper in June 2024, which outlined our proposals on product definitions and jurisdictional requirements for certain system services to be procured in Day Ahead auctions to address anticipated operational challenges as the All-Island energy system transitions to a decarbonised future. As agreed with the SEM Committee, these products are a sub-set of the existing DS3 System Services, namely Fast Frequency Response (FFR), Primary Operating Reserve (POR), Secondary Operating Reserve (SOR), Tertiary Operating Reserves (TOR1 and TOR2), Replacement Reserve Synchronised (RRS) and Replacement Reserve Desynchronised (RRD).

The TSOs received 17 responses to the consultation from a cross section of the All-Island energy industry, and all non-confidential responses have been published alongside this recommendations paper.

As outlined in the consultation paper, the All-Island system is anticipating increased levels of non-synchronous generation (wind, solar and HVDC imports) which will continue to displace synchronous generation leading to a reduction in system inertia. Larger infeeds onto, and outfeeds from, the power system have the potential to drive larger frequency deviations (lower nadirs, higher zeniths) and higher Rates of Change of Frequency (RoCoF) under these lower inertia conditions.

The responses received from industry have indicated majority support for some of the proposals e.g. the procurement of downward reserves for over-frequency support, and mixed support for other proposals e.g. the removal of the distinction between synchronised and desynchronised replacement reserve, the reduction of the minimum FFR response speed from 2 seconds to 1 second, and the generic (and technology agnostic) requirements for deadbands and trajectories.

Following the detailed responses received and engagement at the Industry webinar (held on 19th June 2024), the TSOs have re-examined the original proposals in light of the varied responses received. This recommendation paper highlights the final proposals that will be considered by the SEM Committee in its decision on final products to be auctioned in the initial DASSA arrangements.

The key recommendations are:

- To introduce the procurement of 'downward' reserve products in the DASSA auction. Downward response means a reduction in generated output or an increase in power consumption. Accordingly, the products of FFR, POR, SOR, TOR1, TOR2 & Replacement reserve are defined and to be procured in both upward and downward direction.
- To reduce the current standard Full Activation Time (FAT) of FFR from 2 seconds to 1 second, to deliver faster response capability.

[1] System Services Future Arrangements High Level Design Decision Paper.pdf (semcommittee.com)

- To procure FFR in three activation time sub-categories as the TSOs consider that very fast FFR provision remains essential for system operation:

FFR subcategory	Full Activation Time
FFR Enhanced subcategory 1	150 ms & sustainable up to 10s
FFR Enhanced subcategory 2	150 ms ≤ FFR FAT <300 ms & sustainable up to 10s
FFR Enhanced subcategory 3	300 ms ≤ FFR FAT<1s & sustainable up to 10s

- To introduce generic and technology agnostic minimum capability requirements on frequency deadbands, trajectories, reserve step sizes and reserve step triggers, that will remain configurable by the TSOs in line with requirements that will be specified in the Grid Code / System Services Code. The minimum capability requirements include:
    - A deadband capability for dynamic FFR, POR, SOR, TOR1 and TOR2 that is configurable between +/-15 mHz and +/-500 mHz, and a trajectory capability of at least 200 mHz.
    - A deadband capability for static FFR, POR, SOR, TOR1 and TOR2 that is configurable between +/-200 mHz and +/-700 mHz.
- Replacement reserve will no longer encompass RRS and RRD but will become one Replacement Reserve (RR) product to be procured and dimensioned separately in upward and downward directions.
- To retain locational requirements for reserve services driven by operational security standards and the potential for a 'system split' event which would result in the electrical separation of the Ireland and Northern Ireland power systems. Minimum reserve requirements are proposed to be held within each jurisdiction to ensure the security of each power system in such an event.
- To remove the Temporal Scarcity Scalar, Faster Response of FFR Scalar, Enhanced Delivery Scalar, Continuous Provision Scalar and Regional Scarcity Scalar.
- To introduce an Availability performance scalar and an Event performance scalar, which will be further detailed and subject to separate consultations.
- To develop a future-proof process by which implicit bundles of reserve services can be defined in a flexible way, with the objective to support efficient auction outcomes.

Glossary of terms

Acronym	Meaning
BESS	Battery Energy Storage Systems
DASSA	Day-Ahead System Services Auction
DRR	Dynamic Reactive Response
DSO	Distribution System Operator
DSU	Demand Side Unit. One of more individual demand sites
DS3	Delivering a Secure, Sustainable Electricity System
FASS	Future Arrangements for System Services
FAT	Full Activation Time
FFR	Fast Frequency Response
LEU	Large Energy User
LFCBOA	Load Frequency Control Block Operational Agreement
LPF	Layered Procurement Framework
LSI	Largest Single Infeed
LSO	Largest Single Outfeed
MEC	Maximum Export Capacity
MIC	Maximum Import Capacity
MUON	Minimum Units Online
MO	Market Operator
OFGSS	Over Frequency Generation Shedding Schedule
OSS	Operating Security Standards
PIR	Phased Implementation Roadmap
POR	Primary Operating Reserve
RA	Regulatory Authority
RES	Renewable Energy Sources
RoCoF	Rate of Change of Frequency
RRD	Replacement Reserve Desynchronised
RRS	Replacement Reserve Synchronised
SAOA	Synchronous Area Operational Agreement
SEM	Single Electricity Market
SEMC	SEM Committee
SEMO	Single Electricity Market Operator
SIR	Synchronous Inertia response
SNSP	System Non-Synchronous Penetration
SOR	Secondary Operating Reserve
SSFA	System Services Future Arrangements
TES	Tomorrow Energy Scenarios

TOR	Tertiary Operating Reserve
TSO	Transmission System Operator. (SONI for Northern Ireland and EirGrid for Ireland)
TSS	Temporal Scarcity Scalar
VFM	Volume Forecasting Methodology

Table 1 Glossary of terms

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Disclaimer & Copyright

1. Introduction

1.1. Background

EirGrid plc is the licenced electricity Transmission System Operator (TSO) in Ireland, and SONI Ltd is the licensed TSO in Northern Ireland.

It is our job as TSOs to manage the high voltage transmission system and the flow of power from generators to consumers. Electricity is generated from gas, coal and renewable sources (such as wind, solar and hydro power) at sites across the island. Our high voltage transmission network then transports electricity to high demand centres, such as cities, towns and industrial sites.

We have a responsibility to facilitate connections to the transmission power system including increased levels of renewable sources to generate on the power system while continuing to ensure that the system operates securely and efficiently. This includes procuring sufficient system services to manage operational complexity, maintain frequency and voltage stability and ensure security of supply.

Both organisations also hold Market Operator (MO) licences for their respective regions. Together, they operate as the Single Electricity Market Operator (SEMO), which operates the Single Electricity Market (SEM) on the island of Ireland.

Currently, procurement of system services is based on technical qualification and availability-based tariff arrangements. In enabling a transition to a low carbon energy system and ensuring efficient procurement of relevant services while enabling compliance with EU requirements there is a need to move to a more competitive procurement process.

1.2. Future Arrangement for System Services and Roadmap

In the SEM-22-012 High Level Design Decision on the System Services Future Arrangements[2], the SEMC specified a framework for the competitive procurement of system services. This framework consists of the following elements:

- A daily auction for the procurement of System Services (DASSA) within one day of energy dispatch;
- A Layered Procurement Framework for longer-term contracts; and
- The already established Fixed Contract Framework to remove barriers for new technologies.

The SEMC also outlined in its High Level Design Decision the need for the TSOs to review the products to be procured in such a competitive framework, and the development of a locational methodology to address operational needs as required.

During June and July 2024, the TSOs consulted on our proposed product definitions and locational considerations for procurement through the DASSA from 2026. The consultation paper provided detailed proposals on amendments to some of the existing System Services and jurisdictional considerations for procurement. The consultation paper was set within the framework of the overall DASSA developments and sits within the overall framework of TSO development of the Auction Design and Governance arrangements. While the Product Review and Locational Methodology Consultation paper was a separate consultation to the Auction Design consultation, the two workstreams are aligned.

This paper sets out the TSOs' recommendations on the reserve product definitions and locational considerations for procurement through the DASSA from 2026.

[2] System Services Future Arrangements High Level Design Decision Paper.pdf (semcommittee.com)

In line with the FASS Phased Implementation Roadmap (PIR)[3] and the SEMC decision paper on the PIR[4] the focus of this recommendation paper is on the following services i.e. the Reserve services. The FASS requirements and implementation for other System Service products will be examined at a future date.

Services covered in this paper	Services not covered in this paper
FFR - Fast Frequency Response	RM1 - Ramping Margin 1
POR - Primary Operating Reserve	RM3 - Ramping Margin 3
SOR – Secondary Operating Reserve	RM8 - Ramping Margin 8
TOR1 – Tertiary Operating Reserve 1	FPFAPR - Fast Post Fault Active Power recovery
TOR2 - Tertiary Operating Reserve 2	SSRP- Steady State Reactive Power
RRS - Replacement Reserve - Synchronised	DRR - Dynamic Reactive Response
RRD – Replacement Reserve - Desynchronised	SIR - Synchronous Inertial Response

Table 2 Services covered by this paper and services not covered by this paper

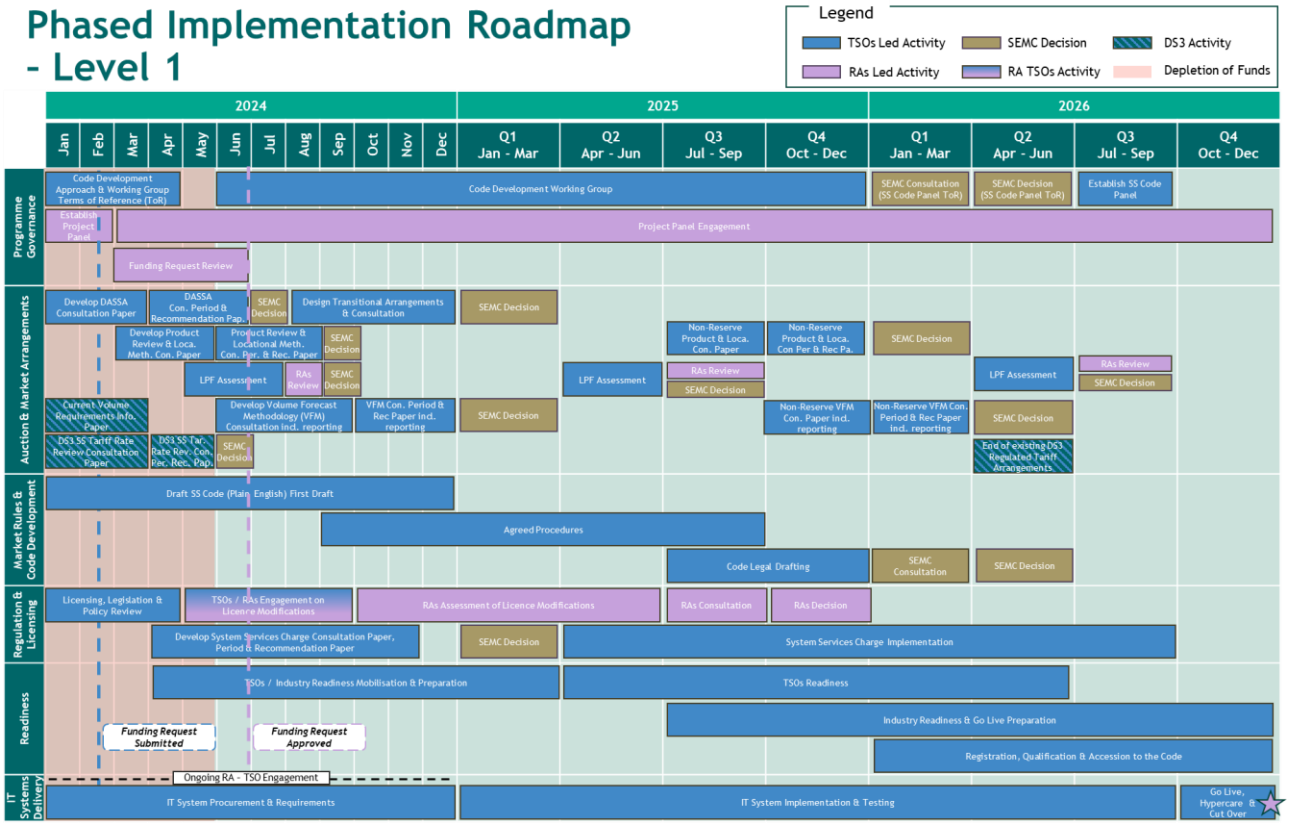


Figure 1 Level 1 Phased implementation Roadmap showing Product Reviews in 2024 and 2025

In line with the agreed roadmap timeline, later in 2024, the TSOs will issue a consultation on the Volumes Forecasting Methodology to be used to determine the procurement quantities of reserve services.

The TSOs facilitated an Industry Webinar during the consultation period (19 June 2024) to provide further information and facilitate a question and answer session. The TSOs have reviewed the industry feedback and this paper now sets out the final recommendations the TSOs have made to the SEMC on the system services product definitions and scalars. These recommendations will be subject to SEMC approval, in line with the regulatory responsibility to approve any changes to terms and conditions relating to the

[3] FASS-TSOs-PIR-March-2024-EirGrid.pdf
[4] SEM-23-103 - SSFA Phase III - Phased Implementation Roadmap - Decision Paper.pdf (semcommittee.com)

procurement of ancillary services under the Electricity Balancing Guideline EU Regulation 2017/2195[5] and the EU Clean Energy Package[6].

As previously outlined, the consultation paper and this recommendation paper sit within the wider framework of the Future Arrangements for System Services and also considers aspects of the existing DS3 System Services arrangements. The publications listed in Table 3 may provide additional context to the reader in their considerations of the topics covered in this paper and on the recommended products outlined.

These contextual publications include the following:

Publication	Key points of relevance
DASSA Auction Design recommendations paper[7]	Proposed auction design recommendations for the Reserve services, submitted to the SEM Committee following industry consultation on initial proposals. This paper outlines recommendations for how the auction would function, secondary trading opportunities, associated commitment obligations and the settlement of service provision and obligations.
Current Volumes Information paper [8]	This Information Paper provides additional detail on the temporal impacts which alter both System Service requirements (e.g. as the Largest Single Infeed (LSI) varies) and the providers who can deliver those requirements (e.g. the market scheduled position of generators and Interconnectors).
DS3 System Services Tariffs[9] Consultation paper	This Tariffs consultation includes a breakdown of the contracted volume growth in System Services for each service procured (see Table 5 of the consultation paper), a breakdown of expenditure across technology types and the impact of the Temporal Scarcity Scalar (TSS).
System Services Indicative 2030 Volumes [10]	This paper provided a summary of a case study, the assumptions made (e.g. significant volumes of fast acting reserves from Demand Response available, gas turbines flexible enough to provide ramping services from a cold state), and analysis that examined three illustrative 2030 portfolios: • Gas Turbines-Led; • Mix; • Demand-Led. (the three considered 2030 portfolios were consistent in terms of estimated new BESS, Interconnectors, Renewable generation and some conventional assets). The analysis undertaken for the case study demonstrated that the Available Volume for each portfolio would be sufficient to meet the real-time Requirements assumed. The portfolios on which this analysis is based are also likely to be different based on market forces and the TSOs are committed to a technology neutral stance.

Table 3 Published papers that are relevant to this topic of product design and locational methodology.

[5] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R2195
[6] Clean Energy package Internal Electricity Market Regulation (EU/2019/943 and EU/2019/944)
[7] DASSA Auction Design recommendations paper
[8] DS3_System_Services_Current_System_Services_Volume_Requirements_Information_Paper.pdf (eirgrid.ie)
[9] DS3-System-Services-Tariffs-Consultation-27-March-2024.pdf (eirgrid.ie)
[10] System-Services-Indicative-2030-Volumes.pdf (eirgrid.ie)

1.3. Structure of this Paper

This recommendations paper is structured as follows:

Chapter 2 provides an overview of responses received that were not specific to individual consultation questions and outlines some of the common themes that have emerged from the industry respondents. Chapters 3 to 9 address the comments received to the consultation questions and outline the TSOs' considerations and final recommendations on these topics.

These chapters address 'system needs' (Chapter 3), 'capabilities of providers' (Chapter 4), 'EU alignment' (Chapter 5), 'Reserve Product definitions' (Chapter 6), 'Locational Requirements' (Chapter 7) and 'Product Scalars' (Chapter 8) with additional considerations outlined in Chapter 9. Chapter 10 outlines our plans for future work on the services and topics to be investigated further to ensure the TSOs can effectively operate the system in a low carbon future energy system.

2. Consultation Overview

2.1. Responses to the Consultation

The System Services Auction Product Review and Locational Methodology consultation paper closed for comments on 18th July 2024. In total, 17 responses were received to the consultation. The 15 non-confidential responses were from the following stakeholders:

- Bord Gáis Energy
- Bord Na Mona
- Demand Response Association of Ireland (DRAI)
- Electricity Association or Ireland (EAI)
- Enel X
- Energia
- EP UK Investments
- ESB Generation
- FERA (federation of Energy Response Aggregators)
- iPower
- Irish Energy Storage Association (IESA)
- Lumcloon Energy
- RWE Renewables Ltd
- Wind energy Ireland
- SSE

Note that all non-confidential responses have been published together with this recommendations paper.

2.2. General Consultation Feedback

The responses received to the Consultation are quite detailed and the TSOs appreciate the time and effort industry participants have committed to reviewing the proposals and providing very helpful feedback. We have assessed the responses and have provided further information in this paper where possible to aid clarification on some issues. In preparation for the DASSA go live, there will be further detail developed on some aspects that have been highlighted by industry as important considerations related to product design and product procurement. This includes future engagement with industry on our forthcoming Volume Forecasting Methodology (VFM) proposals, Grid Code alignment workstreams, System Service code development, and further consultation on the design of Performance Scalars.

In addition to the questions asked in the Consultation paper many respondents provided feedback on wider aspects of the DASSA and FASS arrangements. These are valuable to capture, and in the below sections we outline the views received and will aim to address them where possible.

2.2.1. Multiple Interdependent Workstreams

Several respondents commented that this consultation and the separate consultation on Auction Design represented a siloed approach from different teams within the TSOs and that a more holistic approach should be taken:

- *'It appears that the TSO's have taken an approach of looking at proposals through the singular lens of technical requirements, rather than outlining their holistic vision for how these proposals may apply to service providers throughout the auction process. This creates the appearance of a potentially disjointed development process, and it prevents stakeholders from effectively assessing proposals in the consultation paper, placing service providers in a position whereby they are required to speculate how proposals may work in practice. For example, how does the introduction of Downward Reserve products, which translates into negative volumes in the DASSA, would be procured or service providers would be remunerated.'*
- *'Following the two recent consultations there is a need for alignment of Auction and Product design – a holistic & consistent approach is required to ensure that the future market can incentivise investment and deliver programme objectives.'*
- *'There are various elements, and milestones to the development of the new FASS arrangements as outlined in the Implementation Plan published last year by the RA's. It is vitally important that the new market elements are well-coordinated, methodologically designed with reference to the needs of the service providers as well as the procurer. It is also important that clear, transparent and active oversight is in place from the regulator. There are many interlinked parts in the design of the future market, and consultation proposals often refer to future papers (e.g. DASSA Design refers to a future product consultation on performance and availability scalars and then this present DASSA product consultation also refers to another consultation, yet industry are being asked to agree to positions in which the scalar for example could impact materially).'*
- *'Full transparency in the working of the FASS for the market participants is essential. Similar to the recent CRU decision in the ESBN Demand Flexibility Product Procurement Decision paper, which requests ESBN to provide examples of a ""day in the life" of an asset that receive a contract", we call on the TSO's to provide additional transparency on the working of the FASS with specific working day in the life examples for the market participants (and how the system service provider will operate in all of the markets).'*

TSOs' response

The TSOs acknowledge the need to ensure cohesion between the DASSA Auction Design and Product Recommendations, and wish to reassure industry participants that there is strong coordination and collaboration within the TSOs in terms of the development of all of the DASSA and FASS arrangements.

We will continue to provide updates on progress, and in line with previously shared information at our monthly Future Power Market workshops[11] we intend to expand on worked examples of DASSA and ex ante market participation through this forum.

2.2.2. Transition arrangements

Respondents have indicated that a more cohesive outline of the procurement of all system services across the various mechanisms, including the DASSA, layered procurement framework (LPF) and fixed contracts, is required to provide certainty to service providers and enable investment in new assets. Clarity on the procurement of reserve services in the transition period between the end of the DS3 System Services Regulated Arrangements in April 2026 and the implementation of the DASSA (currently scheduled for December 2026) was also requested.

[11] Electricity Markets Future Power Market workshops| Shaping Our Electricity Future | EirGrid

TSOs' response:

The TSOs acknowledge the concerns raised by industry regarding these matters and are committed to collaborating with the Regulatory Authorities to ensure clarity for service providers on the transition period and various procurement mechanisms as part of the DASSA Arrangements in a timely manner.

As per section 6.12 of the System Services Future Arrangements High Level Design Decision Paper (SEM-22-012), the intention of the LPF is to provide a means of procuring System Services ahead of the short-term energy and balancing capacity markets, as provided for under Regulation (EU) 2019/943. As per the HLD, the LPF applies to the procurement of System Services for periods greater than one day ahead, up to 12 months ahead of provision of the capacity. Beyond 12 months the Fixed Contract framework will apply, and the daily auction will apply to day-ahead procurement.

In accordance with the timelines outlined in the PIR and the SEMC decision on the same (SEM-23-103), the TSOs have undertaken the first annual LPF Assessment. Per the SEMC decision, this assessment specifically covered the transition from the DS3 System Services Regulated Arrangements tariffs to the DASSA. The LPF assessment has been submitted to the Regulatory Authorities for consideration in July and is expected to be subject to a September SEM Committee decision. The outcome of this decision will inform the next steps for the transitional period from the end of the current DS3 System Services Tariff Arrangements to the Go-Live of the DASSA Arrangements.

The TSOs understand the uncertainty faced by service providers concerning the procurement of non-reserve services and will begin developing a proposal for procuring these services, which we will consult upon. The timeline and high-level description for this workstream is detailed in the second iteration of the PIR. The TSOs will continue to provide updates on the development of the relevant workstreams and engage with industry through the Future Power Markets monthly industry workshop and through the System Services Future Arrangements (SSFA) Project Panel.

2.2.3. Role of demand side response

Several industry responses focused on aspects related to the facilitation of demand side response.

One respondent provided their view that:

- *'The consideration of demand side response is not detailed enough to ensure alignment with the development under the National Energy Demand Strategy (NEDS), being developed by the CRU. The development of clear market signals across the demand side workstreams requires progression and evidence of performance and effect, before it could be realistically considered a significant provider of system services'.*

A demand response provider indicated that the demand sector was not fully represented in the technology considerations and that:

- *'Product Design for FASSA proposes parameters and requirements which will not be possible for Demand Side customers, and will lead to a reduction in Demand Side participation. For reasons of Sustainability and affordability, it is prudent to accommodate the Demand Side sector in the design of products for DASSA.*
- *The proposal that all providers of Dynamic response must be capable and willing to provide at 49.985hz will result in the loss of a considerable segment of Demand Side service providers which will impact on the competitiveness of the DASSA. .. Demand Sites provide Demand Flexibility as a secondary or peripheral service to their primary business, and these sites are conservative in sharing and safeguarding their assets.. If Demand Sites cannot provide their assets for Dynamic Regulation at (49.985hz), does this mean that they are of no value to the system?'*

A representative organisation for the demand response sector indicated:

- *'We believe that the characteristics shown for load providers is not in line with the reality. In practice DSU providers could allow the TSO to set different frequency set points for each resource/site in their portfolio, leading to a stepped response rather than the single step change*

as shown in the consultation document, which would be more representative of the response of a single asset.'

TSOs' response

The TSOs defined the evolving system needs in chapter 3 of the consultation document which were the basis of defining the required reserve products as defined in chapter 5 of the consultation document. In principle, and in line with the requirements of Article 6 of Regulation 2019/943 on the internal market for Electricity '*The procurement of balancing capacity shall be market-based and organised in such a way as to be non-discriminatory between market participants in the prequalification process in accordance with Article 40(4) of Directive (EU) 2019/944 whether market participants participate individually or through aggregation.'*. Our aim is to ensure that all reserve products are designed as technology agnostic.

However, the TSOs acknowledge that not all service providers may be able to provide all services currently, considering that characteristics like response time, sustainability of the response, and the ability to provide a dynamic response differ between technologies, which is discussed further in chapter 4. Hence, certain technologies may be better suited for certain products and other technologies for other products. As the products are specified for TSO system operation requirements in a future system with high levels of renewable generation, interconnection and more flexible demand we are not placing specific requirements on certain technologies and consider that technology agnostic products better facilitate competition and accordingly provide more appropriate investment incentives.

2.2.4. Information gaps and interaction with Grid Code

Several respondents commented that there was insufficient information available from both the Product Review consultation paper and the Auction Design consultation paper to enable a clear understanding of what the opportunity for provision of system services would be in 2026. Respondents raised the following points:

- *'Designing DASSA for 2030 RES targets is a challenging task that requires a well thought-out breakdown of the overall workstream into manageable individual consultations while maintaining the coherence of the overall workstream. Considering the above, it is unclear how the decisions made in this product consultation will tie into the final DASSA design. Participants are answering many aspects of this consultation without full sight of how their responses may influence the scope of subsequent workstreams, making it difficult to be definitive and necessitating a more circumspect approach. To ensure a coherent overall workstream and clear understanding by participants at every step, effective and proactive coordination from RAs is crucial. We would welcome a greater presence from the regulators presence at industry forums and workgroups'.*
- *'Uncertainty in the DS3 market influences other segments of the market and can undermine investor confidence overall. Several information gaps have emerged between the already published consultations. These make it difficult to give a definitive answer on whether the products described in this consultation can help maintain investment in existing assets and support investment in new capacity. The most important areas where we need more detail are:*
    - *bundled products and continuous provision*
    - *how the FFR subcategories will be procured and remunerated*
    - *how quality requirements will be implemented*
    - *the operation of any performance scalers, and*
    - *the qualification and testing regime'*
- *'It is difficult to comment fully on the product review without knowing how products are expected to be procured and the minimum volumes associated with each product and subcategory'.*
- A number of respondents commented on Grid Code issues and suggested that changes *'may entail that units are still obliged to provide FFR under grid code- albeit at the 2 second activation*

speed – without having been scheduled via the DASSA.' and would welcome clarity *'that where a service provider is obliged by Grid Code to provide a response but incapable of meeting the strict requirements to participate in the DASSA, that the unit will ultimately be remunerated and the methodology by which this remuneration is calculated.'*

TSOs' response

The TSOs acknowledge that there are multiple individual consultation and recommendation papers, as required by the FASS Phased Implementation Roadmap. Despite this, the TSOs strive to maintain the coherence of the overall programme and to provide a holistic view. In addition, we want to ensure that the industry is made aware of developments and interactions between the different consultations as soon as we have additional information and through the Future Power Markets focused industry workshops and industry engagement sessions.

The TSOs welcome the feedback provided and recognise that once the final product definitions are determined by the regulators (due for September 2024) a detailed review of the Grid Code in terms of DASSA product definition alignment will begin as outlined in Milestone 15 of the Phased Implementation Roadmap[12].

2.2.5. Incentives and investment risk

Several respondents have commented that the consultation paper does not take cognisance of wider energy system supports, incentives and developments and they are unclear on the overall investment incentives, required Grid Code compliance requirements, and revenue stream availability to enable the investment in new assets. Some respondents noted that there is a need for the TSOs to map the products to existing Grid Code definitions and indicate where Grid Code changes might be required, and that it is difficult for industry to fully understand the implications for current investment plans and plants undergoing commissioning.

For example one respondent commented: *'The forecast in this paper favours a focus on the system need and system technical objectives, i.e. increased SNSP, without considering the broader context including support/other mechanisms such as CRM and RESS, which will directly incentivise the construction or retention of the expected fuel mix. .. Once these units are constructed, their lifetime on the system will outlive the forecast timeframe. This scenario is unlikely to change given the drivers for the price caps in these auctions is still based on conventional technology being the most cost efficient despite the need for decarbonisation of the SEM. The (Irish) government in their security of supply programme also expects 2GW of gas fired generation to be delivered which does not appear to be considered Figure 9's predicted fuel mix of service providers in the DASSA….Both future and existing conventional units are facing a reduced load factor as SNSP continues to increase. Therefore, their revenue will rely more heavily on system services and the capacity market, and they will still represent a significant volume on the system. By 2026, there will be large volumes of newly constructed or existing capacity that have been commissioned on the basis of existing Grid Code parameters which govern the activation times of FFR services currently. This consultation provides no clarity as to the outcome for these units, whether they would still be eligible to provide their existing FFR services in the DASSA. None of this is considered, and this impacts the revenues of existing units that already face revenue erosion due to load factor decreases, and it also affects the likelihood of participation in the DASSA.*

In addition, there is an indication that the TSO expects that BESS/storage, demand side response and LCIS to provide the bulk of reserve services (top part of the "wedge" in Figure 9). This points to an expectation of future fuel mix which is unlikely to be delivered because of lack of regulatory and investment signals.'

One respondent noted: *'A comprehensive and holistic approach is needed giving due consideration to revenue adequacy by taking account of the energy market, capacity and system services together. Many participants rely on DS3 revenue as a vital source of income, alongside the energy market and CRM.*

[12] FASS-TSOs-PIR-March-2024-EirGrid.pdf

Uncertainty in the DS3 market influences other segments of the market and can undermine investor confidence overall.'

TSOs' response

The TSOs understand the concerns raised by industry participants and the wish to ensure that across all available revenue streams (energy, capacity and system services) investment signals are cohesive and appropriate, and that they do not conflict with the transition to a low carbon energy system.

Existing renewable targets and decarbonisation policies in both Ireland and Northern Ireland, anticipated EU market re-integration and detailed in-house analysis on power system operations (as referred to in Section 3.2.1) inform the work we undertake. We consider therefore that we will require the system to be able to operate with high levels of non-synchronous generation and at the same time have access to essential system services from non-synchronous providers.

As outlined in Section 2.2.3 the products are specified for TSO system operation requirements in a changing environment and we consider that technology agnostic products better facilitate competition and accordingly provide more appropriate investment incentives.

As outlined in Section 2.2.2 we will continue to provide updates to industry on evolving considerations for market participants at our Future Power Market workshops.

In relation to Grid Code changes, the TSOs welcome the feedback provided and recognise that once the final product definitions are approved by the regulators a comprehensive assessment of potential Grid Code changes will be required. This work is already anticipated as work on required Grid Code updates will start in September 2024, as outlined in Section 2.2.4.

3. Review of comments received on Future System Needs

3.1. Summary of proposals

In the consultation paper, the TSOs outlined in detail the frequency support products and processes currently utilised to manage different types of risks to system stability and our assessments of future frequency support considerations. This was discussed in terms of both:

- 'Normal' frequency regulation, i.e. keeping the **system frequency** within the **standard frequency range**: 49.8 to 50.2 Hz[13] (Section 3.1 of the consultation paper).
- Mitigating large disturbances to avoid a **maximum instantaneous frequency deviation** larger than 1000 mHz from the nominal frequency of 50 Hz (i.e. the system frequency shall not go below 49.0 Hz or above 51.0 Hz) and maintain RoCoF within +/- 1 Hz/s (Section 3.2 of the consultation paper).

Figure 2 shows an illustrative example of both, including the relationship with existing reserves. Chapter 3 of the consultation paper provides a more detailed description.

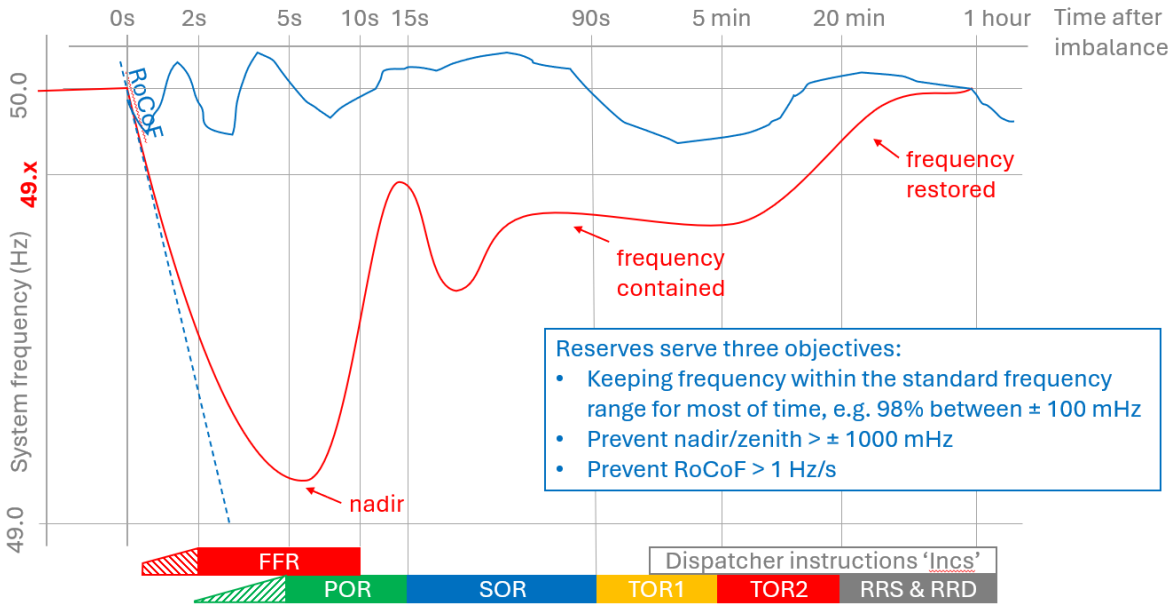


Figure 2: Illustrative example of frequency response to large system incident (in red) and normal frequency variation (in blue) and related reserves.

The TSOs outlined that maintaining frequency stability will face challenges as the system moves towards a system mix of at least 80% electricity from renewable generation sources (RES-E) by 2030, because of

- *Reducing inertia*, as numbers of synchronised conventional units on the system reduce due to market and operational requirements. As inertia helps in absorbing imbalances in the system, a lower level of inertia will likely result in a more volatile system frequency, requiring faster acting and a greater volume of balancing actions.
- *More intermittent generation* (e.g. particularly wind and solar generation) and demand, may provide larger momentary imbalances, requiring a greater volume of balancing actions.

[13] As per System Operations Guideline and Synchronous Area Operational Agreement.

- *Increased levels of HVDC interconnection* which may ramp (rate of change of import or export) at greater speeds than today.
- *Greater number of events, larger RoCoFs and forecasted events where the frequency nadir will occur in a sub 5 second timeframe due to less system inertia,* which has resulted in changes to performance assessment timeframes for system services provision.
- *Fast acting response of service providers (FFR)* will not only have arrested the fall in frequency before the 5 seconds POR assessment period but will also have returned system frequency to a nominal state.

In the consultation paper, the TSOs discussed a range of different processes, products and operational tools utilised to manage the system that cover both the frequency regulation and event mitigation requirements that sit within the wider framework of tools and operational practices to ensure the system remains balanced at all times.

The TSOs indicated that the power system requires continued provision of dynamic frequency regulation both now and in the future to address emerging challenges. A new frequency regulation product was not proposed as it would require additional investigation and further detailed analysis. However, the TSOs ensured that the proposed product definitions & technical requirements (e.g. deadband capability of +/- 15 mHz) could enable a similar dynamic response capability to be procured through the auction format. The TSOs will consider further such capability, and the minimum volumes of each product as part of ongoing work on the DASSA Volume Forecast Methodology and future DASSA product reviews as outlined in the PIR.

To ensure the TSOs can manage the anticipated increased risk to the system of faster frequency disturbances (e.g. a frequency deviation of +/-1000 mHz which could be reached within 1 second) the consultation paper outlined the TSOs' proposal to require a fast acting FFR product (minimum speed of response of 1 second with subcategories of 150 ms and 300 ms) to meet future operational requirements and ensure there are sufficient fast responding reserves that can act within 1 second to mitigate a rapid frequency deviation.

Additionally, the TSOs outlined the need for downward reserve services as the risk of over-frequency events increases with additional interconnection on the island.

3.2. Consultation responses

The questions asked in relation to the system needs are summarised below.

Q.1 Do you agree with our assessments of the evolving system complexity, the likelihood of faster nadir and zenith occurrences and evolving risk of over-frequency events?

Q.2 Are there additional considerations that you believe have not been fully explained or examined yet? Please elaborate on what you consider needs more detailed information.

Q.3 Do you agree with our conclusions that we need increased capabilities in FFR speed of response?

Q.4 Do you agree with our assessment of the need for downward reserve product definitions as part of the DASSA procurement process and to align with EU requirements?

Q.5 Do you agree with the quality aspects that we have outlined? Are there additional system need based quality aspects you believe are worthy of further consideration?

The sections below provide an overview of the answers of respondents to the consultation, directly related to the specific topic of 'System needs'. The TSOs note that the respondents' answers to the questions also include comments that indirectly relate to this topic. These answers are discussed in the relevant chapters on General Consultation Feedback (section 2.2), Capabilities of Reserve providers (chapter 4), EU alignment (chapter 5), Product Definitions (chapter 6), Locational requirements (chapter

7) and Product scalars (chapter 8). Remaining considerations are addressed in chapter 9. The focus of this section is related to the system needs specifically.

3.2.1. Question 1&2: Do you agree with our assessments of the evolving system complexity, the likelihood of faster nadir and zenith occurrences and evolving risk of over-frequency events? Are there additional considerations that you believe have not been fully explained or examined yet?

The responses received to Question 1 & 2 indicated that while 4 respondents indicated full support for the TSOs' assessment of increasing complexity, the majority of the respondents had some concerns with the information provided and 14 of the 17 respondents commented that additional aspects needed to be considered and greater information provided.

For example, one respondent noted that '*while it is possible that the system will see faster nadir and zenith occurrences at certain times, due to lower inertia and larger in-feeds/out-feeds. However, in certain system conditions, the time to nadir/zenith may be considerably longer (e.g. when the system is inertially "heavy", during high demand and low RES).*'

Another respondent noted that *'The assessment of the evolution of the system ..does not fully appreciate or consider some of the realities that perhaps it should encompass. Figure 9 in the consultation paper underestimates the scale of the challenge in bringing large scale storage into the SEM market within the forecast period. It is a necessary fuel mix component, but very much optimistic to have storage as a component in this manner. This figure also underestimates the uncertainty for LCIS projects in this landscape given currently they have only a short-term contract available to them.'*

Many respondents queried why the system needs assessments were only detailed on a 2025 timeline – noting that this appears short sighted for an auction designed for go-live in 2026, and that system requirements could change with the Celtic Interconnector due to go-live in late 2026 and the building of new North South interconnector.

A respondent indicated '*substantial concerns that the TSO's appear to be taking a short-term view of future system requirements when developing the DASSA framework. It would be welcomed for greater clarification to be provided immediately and within future publications, it would be beneficial if the TSO's set out: 1. A full assessment of the divergent ways the system may develop in the future and the ways in which DASSA will be resilient and flexible in order to ensure system security. This could be undertaken by utilising the Tomorrow Energy Scenarios (TES).'*

TSOs' response

For the start of DASSA, the main focus of the TSOs is on the period until 2030. During this period, it is expected that both RES and the level of interconnection will increase significantly. Accordingly, the TSOs consider that the power system will need to be ready to operate close to the specified minimum inertia and maximum RoCoF limits. As a respondent stated, this may not always be the case, but it may happen more often so the TSOs need to be prepared for this.

Note that while the simulations for 2025 were the main input to inform the FFR product (e.g., see Figure 3 below), the TSOs utilised other relevant detailed simulations/analysis carried out in the past such as, for example, those for LCIS Phase 1 (2026) to create a long-term view of future system requirements. For example, the results of LCIS Phase 1 already demonstrated that Nadir/Zenith would occur in less than 2 seconds and therefore the need for faster FAT for FFR (see Figure 4 below). While not directly related, it is worth mentioning that other TSOs worldwide such as in Great Britain and Australia have identified and introduced an FFR product with FAT of 1 second in response to system frequency moving away from 50 Hz more rapidly following (large) imbalances (see also section 6.2.2). The TSOs shared these observations with industry and ENTSO-E[14] and consider the assessment of current proposed reserve products future proofing. In addition, the TSOs consider that – under the assumption that the limits for minimum specified inertia and the maximum RoCoF will not change – the results of simulations with 2025 models show trends

[14] Stability Management in Power Electronics Dominated Systems

towards the future which is as accurate as possible. Of course, if in the future the TSOs consider that there is a need to review the reserve (system) services, we will do so and consult with industry and the regulatory authorities.

Some respondents refer to the TES, which provides several scenarios for the period after 2030. While the TSOs agree that in some scenarios the need for faster reserves may be less or less often apparent, the TSOs consider that the HVDC interconnectors and RES that are planned to be commissioned before 2030 will result also after 2030 in periods at which both the minimum system inertia and the maximum RoCoF will be close to the specified limits – regardless of the scenario in TES. Accordingly, the recommended requirements for reserve product are required for meeting system needs up to 2030 and beyond.

3.2.2. Question 3: Do you agree with our conclusions that we need increased capabilities in FFR speed of response?

The responses received to Question 3 indicated that while several respondents agree and some disagree with the TSOs' recommendations on increased capabilities in FFR speed of response, several respondents consider it unclear why the FFR FAT is being reduced to 1 second from 2 seconds. For example, one respondent indicates that the consultation paper *'presents only limited evidence supporting volume needs for these faster levels of FFR.'* and suggest that *'it is unclear why the Full Activation Time (FAT) of Fast Frequency Response (FFR) is being reduced to 1 second, from 2 seconds.'*. This respondent *'believe[s] that 2 seconds is entirely satisfactory and does not need change. The requirement for a FAT of 2 seconds has been successful in delivering the services required throughout the lifetime of the DS3 framework and no evidence has been provided to showcase that this should have been altered in the past to this extent or that it will create additional benefit by being changed within the future DASSA auction.'*

One respondent refers to the TSOs' Tomorrow's Energy System scenarios which consider possible scenarios for the 2030 – 2050 system. The respondent considers that the paper *'TSO's modelling within Figure 9 does not consider the introduction of alternative energy sources such as hydrogen or biomethane. Thus, ESB GT does not believe that any evidence has been provided to justify the FFR FAT to be reduced to 1 second as a minimum standard and therefore does not support the reduction of the FFR FAT from 2 second to 1 second.'*

Another respondent stated that it would be of benefit to industry to '*understand the alternative options at the TSOs disposal and how each was weighed against a change in the product definition, e.g. in terms of cost, impact on competition, etc.'*

Furthermore, some respondents noted that the consultation does not provide the volumes of different FFR speeds, which would make *'it hard to say if there is justification for cutting the maximum FAT for FFR to 1s'*.

Some respondents suggested that '*the need for increasing FFR speed can be mitigated by holding more inertia.'* Another alternative that is suggested '*is to secure these enhanced FFR Sub-category services from a limited range of technologies only.'*.

TSOs' response

While the TSOs agree with the respondents that a FAT of 2 seconds has been successful throughout the lifetime of the DS3 framework, it should be noted that in 2017 the TSOs identified a need for faster FAT for FFR and incentivised (through a scalar) service providers to provide an FFR service with a FAT of up to 150 ms (i.e., critical to frequency stability). In addition, as discussed in chapter 3 of the consultation document, the power system is changing rapidly. Resulting from these developments, decreasing inertia levels, increasing RoCoFs and faster Nadir/Zenith increase the need for faster FFR in future, which is also supported by the studies referred to under Question 1&2.

As an example, Figure 3 below from the 2025 detailed dynamic studies illustrates that Zenith would happen within 1 second following the contingency, and therefore has driven the need for a minimum FFR FAT of 1 second.

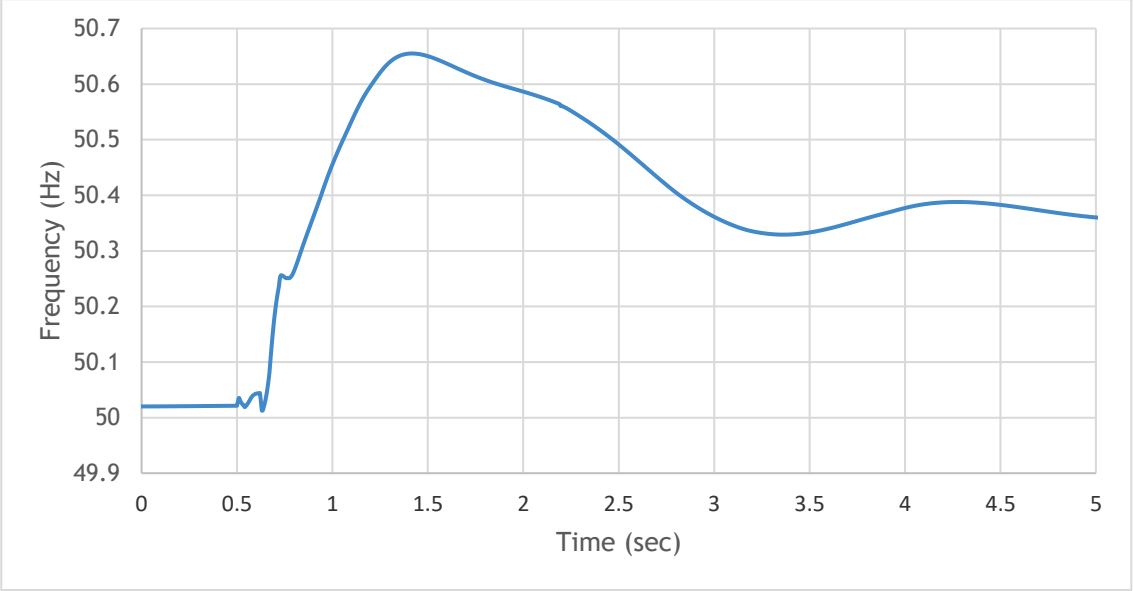


Figure 3: Example supporting the need to reduce FFR FAT from 2 seconds to 1 second (based on 2025 studies).

Considering existing DS3 capabilities which indicate that over 70% (1200 MW) of the contracted capacity of FFR providers is capable of providing FFR with a FAT of less than 1 second, the TSOs consider that the increased speed requirements are not excessive. The TSOs note that the volume requirements will be further discussed in the VFM consultation paper, which will provide a methodology for forecasting the volume need for reserves in different timeframes, including 10 years ahead.

Some respondents suggest alternatives, including that the need for increasing FFR speed can alternatively be mitigated by holding more inertia. While this is true in principle, the LCIS Phase 1 detailed dynamic studies indicated that even with the addition of LCIS the future power system will experience faster Nadir and Zenith. For instance, Figure 4 below shows that while LCIS will help move Nadir occurrences to the right, there will still be a lot of instances when Nadir will happen quicker than 2 seconds. In other words, elapsed time between incident (fault and/or loss) and frequency nadir/zenith is expected to be significantly shorter in the future. For this reason, the TSOs believe that the proposed FAT of 1 second of FFR is not a short-term view but rather a necessity to ensure stable operation of the All-Island power system.

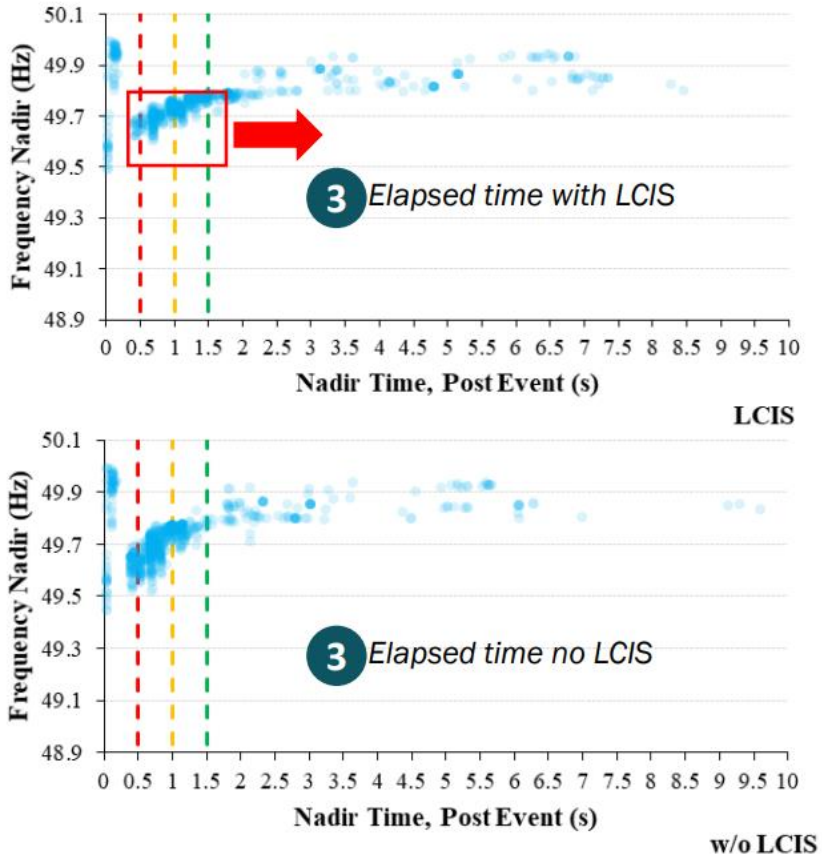


Figure 4: Evolution of frequency nadir in 2026 with and without LCIS[15]

Another alternative that is suggested '*is to secure these enhanced FFR Sub-category services from a limited range of technologies only.*' while other respondents suggest that '*the approach to providing these system services must be as technology agnostic as possible.*' As stated, chapter 3 in the consultation document addresses the system need without consideration of which technologies could provide the service. Moreover, the TSOs explicitly invite all technologies to provide the service, but also recognise (in chapter 4 of the consultation document) that not all technologies may be able to fulfil all system needs.

3.2.3. Question 4: Do you agree with our assessment of the need for downward reserve product definitions as part of the DASSA procurement process and to align with EU requirements?

The responses received to Question 4 indicated that although several respondents do not have strong views on this issue, most respondents support or technically appreciate the proposal in principle and recognise both the system need and the requirement in Article 6 of the Clean Energy package Electricity Regulation 2019/943.

Several respondents request more information on the forecasted level of demand for the proposed downward products, '*for example will this include near term (DASSA) and long-term system service forecast requirements (FTC/LPF). This would aid in supporting transparency and support the business case for investment decisions prior to the launch of the DASSA.*'

There are several concerns expressed about the introduction of downward reserves. Firstly, one respondent commented that the introduction '*could lead to an unnecessary amount of testing to be required, especially of existing wind units.*' Furthermore, a respondent commented that currently Battery Energy Storage Systems (BESS) are '*designed for upward reserve and have low MICs (typically 15%). Before*

[15] ENTSO-E 2050 Vision 221123_ENTSO-E Webinar Stability Management

downward reserves can be introduced the TSOs will have to facilitate changes to MIC to be closer to MECs'.

TSOs' response

The TSOs acknowledge the recognition by most respondents that the introduction of downward reserves is both required for the power system and in compliance with the EU regulation. The TSOs understand that the respondents require more information on the forecasted level of demand for the proposed downward products, and how this will include near term (DASSA) and long-term system service forecast requirements, as this would aid in supporting transparency and support the business case for investment decisions prior to the launch of the DASSA. For this, the TSOs refer stakeholders to the VFM consultation paper that is targeted for publication by the end of September.

With respect to the concerns related to the limited MIC of BESS, the TSOs refer to Section 4.2.1. In relation to concerns on testing, further detail on testing requirements will be provided within the System Services Code.

3.2.4. Question 5: Do you agree with the quality aspects that we have outlined? Are there additional system need based quality aspects you believe are worthy of further consideration?

Several respondents agree with the proposals and do not believe there are additional system needs based quality aspects to be considered. However, other respondents consider that insufficient information is available to make the assessment. One respondent mentions that *'the concept of quality was only briefly discussed in the DASSA design consultation, and therefore it is unclear how the quality aspects introduced in this paper will be incorporated in the DASSA arrangements.* Another respondent suggests that *'Consideration of additional aspects such as bundling, scalability, technological neutrality, economic efficiency, etc the system can be further refined to meet evolving grid needs and ensure a stable, reliable, and efficient electricity market.'.*

One respondent considers *'there to be a need to assess and address the issue of system oscillations caused by FFR products and consideration should be given to how these oscillations can be avoided, or their impacts mitigated. For example, a product that ignores oscillations and responds to the underlying frequency (hence slower than some of the FFR product categories) could be considered to be higher value…'*

There are also several comments about remuneration, bundling, differences between technologies, scalars, which are outside the scope of this chapter, but will be addressed in other chapters.

TSOs' response

The TSOs conclude that the need for the proposal is generally acknowledged.

With respect to the comment on system oscillations, the TSOs agree that this is an important issue to consider. As part of ongoing workstreams, the TSOs currently undertake detailed studies on many aspects of power system interactions, including on the dynamic response of the different providers. These studies will inform the TSOs' application of configurable deadbands and trajectories to prevent system oscillations. The required size of the deadband will depend on the needs of the power system and shall therefore be configurable within a certain range (e.g. +/-15 – 500 mHz).

As with current standard operating practice, the TSOs will monitor any potential emerging new phenomena (e.g., oscillations) and mitigate those in a timely manner.

3.3. Recommendations

To be able to keep the frequency within the standard frequency range and mitigate large disturbances, several updates of the reserve requirements are recommended. These include:

- **Response time:** As discussed in Section 3.2 of the consultation document, the faster time to frequency nadir/zenith necessitates faster responding FFR. In Chapter 6 the TSOs propose that the full activation time for FFR should be no greater than 1 second.
- **Dynamic vs. static reserves:** Conventional units and controllable inverter-based power/consumption sources can continuously adapt generation/demand to the actual frequency; this is termed dynamic response. DSUs typically respond by reducing load in blocks at specified frequency triggers and restoring this demand once frequency recovers to a frequency threshold; this is termed static response. These different response characteristics have different impacts on frequency control and stability.
- **Deadband:** Different deadband settings combined with speed of response considerations can help deliver different capabilities to the TSOs, e.g. for continuous regulation of minor frequency deviations narrow deadbands (+/-15 mHz) are required, while for containing larger event driven frequency deviations (contingency response) a response with a wider deadband may be preferable. The required size of the deadband depends on the system needs and type of reserve product and shall therefore be configurable:
    - Dynamic response provision can be tailored to provide response to provide both frequency regulation and mitigate larger frequency excursions, with a deadband range of +/- 15 – 500 mHz.
    - Static response provision can be tailored to provide response to mitigate larger frequency excursions, with a deadband range of +/- 200 – 700 mHz to ensure demand/generation response is outside the standard frequency range.
- **Droop or Trajectory:** The response of reserves shall preferably depend on the actual frequency deviation which is traditionally specified as droop on conventional generation and RES, and as a frequency trajectory for BESS. The required droop or trajectory may change depending on system needs, and we propose that it is configurable within a certain range (e.g. 200 to 500 mHz for frequency trajectory).

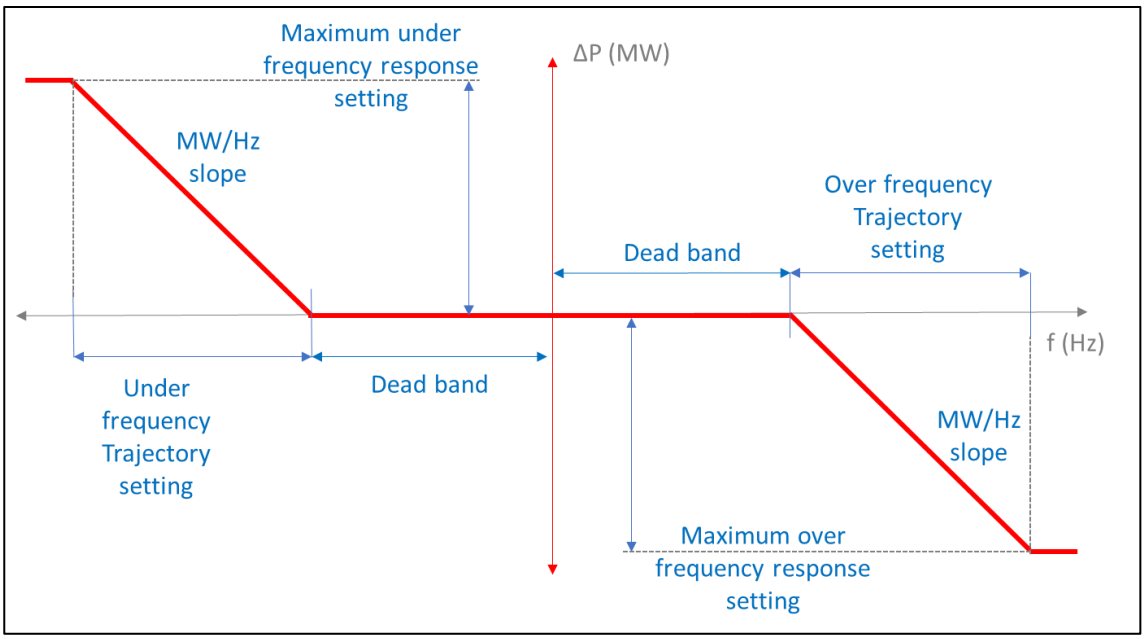


Figure 5 Quality aspects explained

- **Continuous provision**: The TSOs currently incentivise providers of FFR to continue to maintain, at the end of the FFR timeframe of 10 seconds following a frequency event, a MW response sustained beyond the FFR timeframe for the duration of the timeframe demanded of POR, SOR and TOR1, as required depending on the frequency event. It is also important to note the detail outlined in the SEMC PIR decision paper which indicated that varying views on the bundling of products were

expressed by stakeholders, with no clear consensus on the support for such an approach. Section 6.2.5 further discusses the issue on bundling.

4. Recommendations on Changing Capabilities of Reserve Providers

4.1. Summary of proposal

The TSOs provided an overview in the consultation paper on work underway[16] on reducing operational constraints, for example, reductions in the minimum number of conventional units and the inertia floor. These changes will require the TSOs to have the capability to operate the electricity system at 95% SNSP by 2030, while sourcing an increasing proportion of the required system services from low carbon technologies and demand response.

Chapter 4 of the Consultation paper provided the TSOs' considerations in terms of technology evolution in the context of system service capability. Detail was provided on generic characteristics of a range of technology types in the following graphic and the below Table.

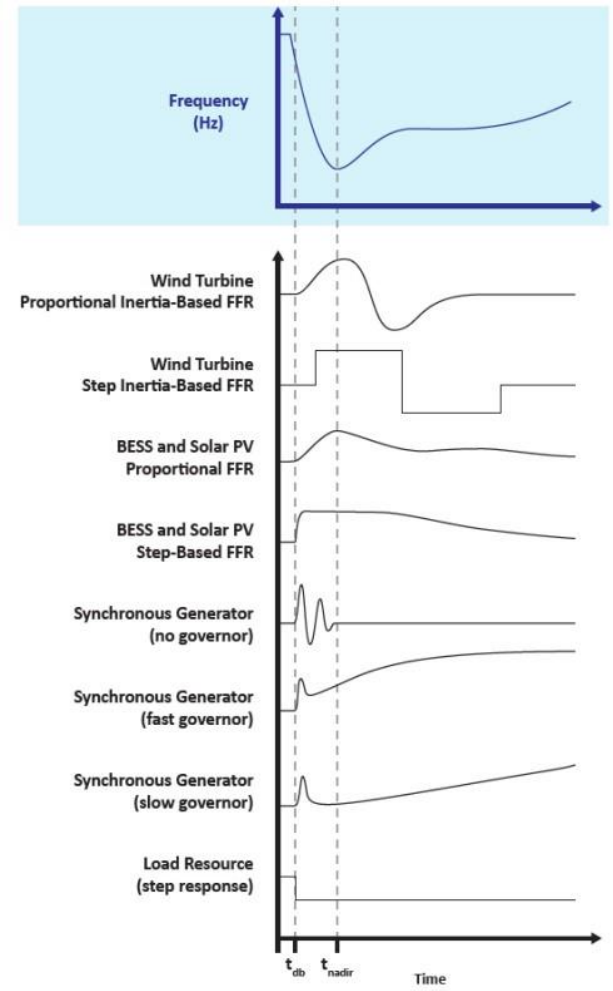


Figure 6: Illustration of Frequency Response from Different Resources (source: NERC)

[16] Operational Policy Roadmap 2023-2030 (eirgrid.ie)

	Plant	Full activation time	Time of sustained power	Dynamic/Static	Upward/Downward	
Existing products based on:	**Conventional plant**	2-15s	Hours	Dynamic based on governor	Upward and Downward	
	Demand	< 150 ms	Seconds to hours	Static	Typically Upward	
	HVDC interconnector	< 150 ms - 1000 ms	Seconds to hours	Static and Dynamic	Upward and Downward	
	Hydro storage	<2-15s	Hours - dependant on resource availability	Dynamic based on governor	Upward and Downward	
	Wind	0.5-1s	Few seconds with recovery (through virtual inertia), hours if operated below max output. Ineffective at low wind speed	Static and Dynamic	Upward and Downward	
	Solar PV	<150 ms - 1s	Seconds to hours if operated below max. output. Depending on sun.		Already contracted for POR, SOR etc in upward direction. Could provide downward	Future providers of system services
	Battery Energy Storage Systems (BESS)	<150 ms-1s	Seconds to hours	Static and Dynamic	Upward and Downward - depending on state of charge	
	Super capacitor	<150 ms	Seconds	Static and Dynamic		
	Flywheel	<150 ms	< 15 minutes	Dynamic	Upward and Downward	

Table 4 Comparison of generic capability of providers of FFR, POR, SOR, TOR1[17]

[17] Sources: EirGrid/SONI and 'Overview of frequency control techniques in power systems with high inverter-based resources: Challenges and mitigation measures', Dlzar Al Kez et al., published in IET Smart Grid, 8 June 2023 and 'Amendment of the Market Ancillary Service Specification (MASS) – Very Fast FCAS' by AEMO, 7 October 2022.

4.2. Consultation responses

The question we asked in relation to this section was:

> Q.6 Do you consider that we have accurately captured the generic characteristics of reserve providers? Are there additional considerations that you recommend we include?

4.2.1. Question 6: Do you consider that we have accurately captured the generic characteristics of reserve providers? Are there additional considerations that you recommend we include?

Three responses were provided that supported the TSOs' assessment of the generic characteristics, but the majority of respondents either had mixed views or noted some inaccurate or missing considerations for particular technology types. Many respondents noted that commercial considerations should not be overlooked when assessing available service capability, and that in addition to commercial drivers the application of different modes and Grid Code requirements may impact the actual service availability of providers.

Battery Energy Storage systems (BESS)

In relation to BESS several respondents provided comments on the modes of operations utilised for BESS. One respondent commented that *'The TSOs reference different modes of operations for batteries. Greater clarity on how the TSOs envisage a battery offering these modes to the TSOs and how the battery will be compensated is needed.'*.

The asymmetry between the agreed Maximum Import Capacity (MIC) and Maximum Export Capacity (MEC) of some existing BESS connection agreements was raised by one respondent indicating the potential impact on the availability of downward reserves from existing BESS assets; '*The Connection Agreements for existing BESS units are likely to be asymmetric, with a larger Maximum Export Capacity (MEC) than Maximum Import Capacity (MIC), providing for a large and rapid discharge following a low system frequency event (e.g. 50MW for 10 minutes), followed by a slow recharge (e.g. 5MW for 2 hours)'*. This was followed with a request to the TSOs to '*facilitate modification of connection agreements to increase MIC, accommodating symmetrical Upward/Downward service provision and faster recharging if there is an expectation to maintain a lower state of charge than would be typical for DS3 system service provision*'. This respondent also raised a question on whether the DASSA will respect the full *'"follow-PN" model for storage, i.e. is a charging battery capable of delivering upwards service for both its cessation of charging and delivery of discharge'*.

Two other respondents stated that currently some demand side participants are using BESS-based UPS systems to provide dynamic Frequency response and this should not be underestimated or omitted from considerations.

TSOs' response

As outlined in the consultation paper there exists a range of modes currently deployed on BESS, with the most appropriate mode selected by the system operators based on system conditions. These modes currently determine the frequency triggers /deadbands and trajectories that apply to the relevant batteries. The capability exists within the TSOs' control centres to select and apply the most appropriate mode for the unit. Further requirements in relation to mode application will be specified in the Grid Code / System Services Code.

In relation to the query on the Follow PN rule, we consider that service providers are responsible for submitting compatible FPNs with DASSA orders and self-lapsing if they cannot meet the commitment obligations. It should be noted that "follow PN" is a solution to facilitate utilisation of storage in scheduling that follows ex-ante trading by the participant and is not a "rule" per se. The binding rule to be considered in this case is that PNs submitted must align with ex-ante trading and that if a market participant submits a PN that does not align with their DASSA order, this indicates they did not match their own DASSA order in the ex-ante markets.

Considerations on MEC/MIC are external to this consultation and are not the focus of the DASSA auction. Technologies and providers will have to go through a pre-qualification phase (as outlined in the DASSA Auction arrangements publications) that will determine their technical availability. Market participants interested in increasing MIC at particular asset locations should note any such requirements would be subject to the normal connection request and contracting processes with the relevant TSO/DSO/DNO for their site location.

We acknowledge the evolving landscape of demand side provision and that dynamic FFR can be a feature of provision from demand side units – noting that the technical capability of the provision will depend on the technology providing the response and may require consideration of aggregator interactions.

Wind

In relation to wind assets, one respondent indicated that '*We agree with the generic characteristics of reserve providers, but we would welcome clarity on the TSO's future intentions (and use) of the OGSS service, as we note that Table 13 within the consultation highlights the use of wind for downward reserve (through, we assume the OGSS service)'.*

TSOs' response

The TSOs intend to ensure that the products to be procured through the DASSA arrangements are designed as technology neutral and open to all providers. The technical capability of wind farms as outlined in the paper indicates their ability to provide downward reserve – recognising that this is dependent on available wind resource at a given time. The Over Frequency Generation Shedding Scheme/Schedule (OFGSS)[18] is a system defence tool[19] that the TSOs utilise currently to be able to manage extreme circumstances of over-frequency. It is the intention of the TSOs to ensure that wind technology providers can take part in the DASSA arrangements for all types of reserve products they are technically capable of providing. In principle, sufficient reserves will be available to meet operational security standards and therefore only require the activation of system defence measures in very unusual circumstances and only after all available reserves have been activated. We therefore do not intend to remove the system defence measure of OFGSS but rather introduce downward reserve services that would reduce the need to activate this system defence measure. Frequency trigger setpoint recommendations for downward reserve procurement are as outlined Chapter 6.

HVDC Interconnectors

One respondent noted that dependency on system services from HVDC interconnectors as indicated in the consultation paper was worthy of further detailed consideration and of possible differences between GB and EU interconnectors.

TSOs' response

The TSOs welcome the comments on the provision of services from HVDC interconnectors and recognise that while interconnectors can technically respond very quickly, the actual capability may have a contractual and commercial reliance on neighbouring TSOs. This is because activation of frequency response services on one side of the interconnector can impact the system frequency and reserve holdings in the region on the other side of the interconnector, and capacity must be available on the relevant interconnector to facilitate reserve provision.

It is our understanding that under EU requirements the provision of reserves by interconnectors can only be facilitated by exchange or sharing of reserves, and where capacity is available on the relevant interconnector. As outlined in the current Synchronous Area Operational Agreement (SAOA)[20] and Load Frequency Control Block Operational Agreement (LFCBOA)[21] EirGrid and SONI do not currently exchange balancing capacity across the SEM-GB interconnectors. Sharing of reserve capacity is in place between SEM and GB for certain timeframes and the processes for enabling this are outlined in further detail in the

[18] OPI_INN_Over_Frequency_Generation_Shedding_Schedule_Summary_Report (eirgrid.ie)
[19] System_Defence_Plan_Proposal_Ireland-Re-submission.pdf (eirgrid.ie)
[20] S1-SAOA-for-the-Ireland-and-Northern-Ireland-Synchronous-area-29.09.2022-(post-Title-2-approval).pdf (eirgrid.ie)
[21] S2-LFC-Block-Operational-Agreement-for-Ireland-and-Northern-Ireland-29.09.2022.pdf (eirgrid.ie)

SAOA and LFCBOA. Day ahead procurement of reserve capacity may require further consideration with respect to current TSO-TSO arrangements for SEM-GB interconnectors, and future arrangements for new interconnectors.

Conventional/Thermal generation

While several respondents commented that the signalling of a FAT capability of 2 seconds for conventional plant coupled with the recommendations to procure FFR only up to 1 second FAT could contribute to strengthening exit signals for conventional plant, no respondent refuted that the technical capability of conventional plant was faster than 2 seconds FAT.

TSOs' response

The TSOs welcome the comments provided by a range of respondents on the value of the wider system services and reserves to conventional plants, and the need to consider a decarbonised thermal fleet. As outlined in the consultation paper and at the industry webinar, the TSOs are proposing technology agnostic products for the initial DASSA, that can support the transition to a lower carbon electricity system, and to ensure system stability and security during periods of high renewable output.

More generic considerations on the interactions between different market signals are covered in Chapter 2 of this paper.

4.3. TSOs' considerations

The TSOs consider that the comments raised by participants have indicated, in general, broad agreement with the summaries of the technical capability of different technologies. However, it is clear that industry members consider a greater evaluation of the interaction between practical considerations and technical capability is warranted. In particular, the ability to configure frequency trigger setpoints, trajectories and potential interactions with Grid Code requirements could impact the actual availability of services when considered in a competitive auction framework. We address this in further detail in Chapter 6.

5. EU alignment considerations

In Chapter 5 of the consultation paper the TSOs outlined the work undertaken to assist in determining appropriate product definitions including a high-level review of EU requirements, detailed power system simulation analysis, and consideration of current and future operational requirements. These assessments helped inform the Upward reserve product definitions, Downward reserve product definitions and EU alignment considerations. This chapter 5 discusses the alignment to EU requirements, while chapter 6 focuses on the product definitions.

5.1. EU alignment

Balancing services in an EU context are separated into balancing capacity and balancing energy. In the context of the SEM and DASSA structures this can be summarised as illustrated in Figure 7.

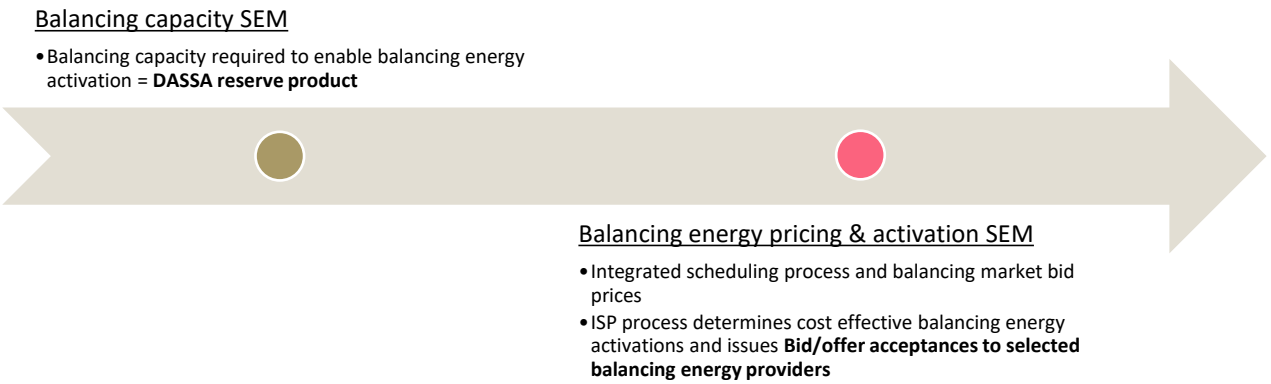


Figure 7. Balancing Capacity and Balancing Energy in the SEM

- **Balancing Capacity (SEM DASSA reserves)**: a volume of reserve capacity that a balancing service provider has agreed to hold and in respect to which the balancing service provider has agreed to submit bids for a corresponding volume of balancing energy to the TSO for the duration of the contract.
- **Balancing Energy (SEM Bid/offer acceptances)**: energy used by TSOs to perform balancing and provided by a balancing service provider. Balancing service providers either offer balancing energy bids to their TSO following the obligation from a balancing capacity contract or voluntarily.

As outlined in the Consultation the procurement of system services is being developed in the context of the requirements related to Balancing capacity contained within relevant European Regulations and Directives:

- **System Operation Guideline EU Regulation 2017/1485**
- **Electricity Balancing Guideline EU Regulation 2017/2195**
- **Clean Energy Package Regulation 2019/943 and Directive 2019/944**

The sections below provide an overview of the answers of respondents to the consultation, directly related to the specific topic of 'EU alignment'. The TSOs note that the respondents' answers to the questions also include comments that indirectly relate to this topic. These answers are discussed in the relevant chapters on General Consultation Feedback (section 2.2), System Needs (chapter 3) Capabilities of Reserve providers (chapter 4), Product Definitions (chapter 6), Locational requirements (chapter 7) and

Product scalars (chapter 8). Remaining considerations are addressed in chapter 9. The focus of this section is related to the system need specifically.

5.2. Consultation responses

The following question has been asked in relation to EU alignment.

Q.7 Do you agree with our assessment that the proposed DASSA reserve products will help achieve greater alignment with EU requirements?

5.2.1. Question 7: Do you agree with our assessment that the proposed DASSA reserve products will help achieve greater alignment with EU requirements?

In general, while 4 respondents agreed with the assessment, 4 had mixed views, 3 were not in support and 5 did not provide a comment.

Several respondents consider that there are still a number of open questions, including

- *'how alignment with EU requirements will work in practice under the DASSA arrangements. For example, while it is understood that both POR and SOR are mapped to the Frequency Containment Reserve product (FCR), it is unclear whether providers of FCR will be required to provide both POR and SOR, continued provision of these services, or only one of these services.'*
- *'whether providers of services will need to indicate availability of EU products in addition to DASSA products, or if the TSOs will manage this mapping separately.'*
- *How the proposed reserve products align with the EU Balancing Platforms, such as MARI for the exchange of mFRR which may become relevant once the Celtic Interconnector goes live, and if these are relevant.*
- *'If for example the EU FCR equates to POR and SOR – is there a need to continue with POR & SOR – should this not be aligned with EU? Similarly FRR instead of TOR1 & TOR2?'*
- *'It should be asked if we need multiple products, such as POR and SOR, when the EU can utilise fewer products?*
- *it is not clear that bundling of products would in fact be in the spirit of EU requirements. Review of article 2 and 3 of the EBGL, there is no indication that reserve capacity that is bundled or signalled as continuous provision, would be compatible with definitions or objectives, including preventing market distortion and ensuring there is transparency...'*
- *'How market participants can fully optimise their services and offerings to the TSO, and be rewarded accordingly.'*
- *'Whether these proposals for standard/non-standard products are EBGL compliant, and of the consequences of their not being compliant in the context of market reintegration with the Celtic Interconnector.'*

Referring to the considerations of '*the last regulatory view of system services considered that DS3 was out of scope for EBGL (SEMC decision 2021) since it was made up of non-standard products that were procured by fixed contracts and non-market-based procurement, so not eligible under EBGL compliance rules.*', a respondent requested a:

- *'clarification as to any outstanding areas of non-compliance, and when these are likely to be addressed ?'*

Two respondents further noted:

- ‘that a decision remains outstanding on the part of the RAs as to the extent to which the Irish market more generally is brought into strict compliance with the requirements of EBGL’ @

One respondent acknowledged that:

- *‘that the unique characteristics and challenges currently facing the All-island Power System power system may require more proactive and wide ranging changes, which go above and beyond the alignment of requirements set out within Europe (e.g. operating the electricity system at 95% SNSP by 2030). It is vital that the TSO’s consider all pathways and changes that may be required in order to develop an effective FASS model, not just aligning to standard European requirements. This currently appears to be missing, with the TSO’s prioritising lowest cost of delivery, rather than ensuring that the long-term investment signals are in place to obtain a just and timely transition to Net Zero for consumers.’*

Another respondent considers the different size of the Power System’ compared to the EU which would make it difficult to fully align with the EU.

TSOs’ response

The TSOs confirm the challenges referred to by several respondents as to how it will be possible to comply with the EU rules while operating a power system with unique characteristics and challenges and achieving the very ambitious objectives with respect to renewable energy (e.g. operating the electricity system at 95% SNSP by 2030). This requires a more pro-active approach, in which it shall be possible to make use of all potential capabilities of reserve providers that fulfil the system needs and create sound incentives for reserve providers for meeting the future system needs.

The question of EU compliance with EBGL is a wider issue than the review of the DASSA products discussed in this document, and requires detailed regulatory consideration. The main focus in recent years in Europe has been on standardisation on balancing energy products and the establishment of cross border balancing energy platforms (PICASSO, MARI and TERRE), with much less activity on balancing capacity product standardisation or exchange processes. As evidenced in the latest ENTSO-E Ancillary product assessment[22] there is wide variability in the balancing capacity products in place across Europe, with only limited cross border exchange of balancing capacity, and there is no cross border balancing capacity platform.

Figure 7 below aims to summarise considerations on balancing capacity (DASSA reserve products) and balancing energy (Balancing market bids/offer acceptances) when considering cross border balancing activities.

[22] https://ee-public-nc-downloads.azureedge.net/strapi-test-assets/strapi-assets/ENTSO_E_AS_survey_2022_results_d282930d22.xlsx

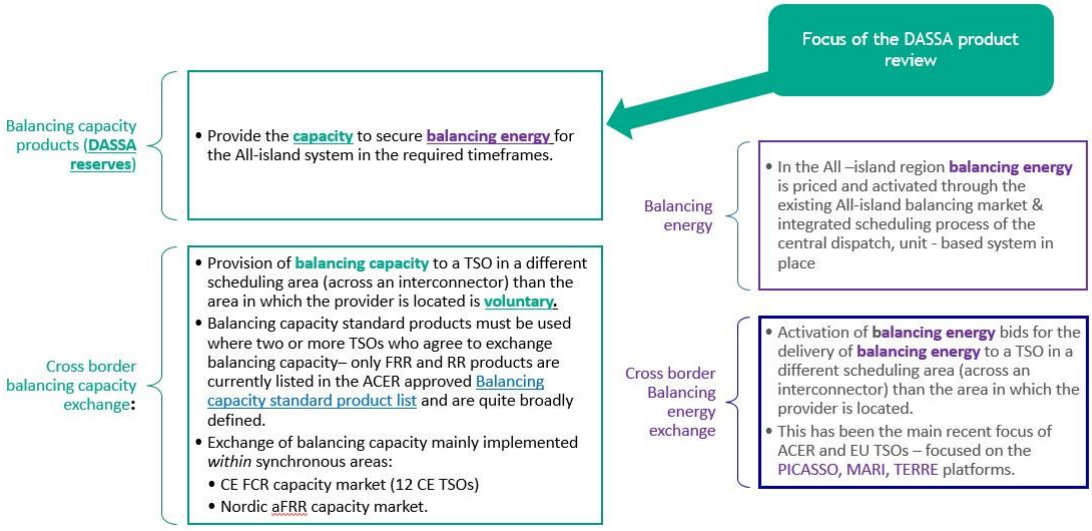


Figure 8. Outline of Balancing Capacity and Balancing Energy considerations

In line with Article 6 of Regulation 2019/943 the DASSA auction will move procurement of balancing capacity to a primary, day ahead market with marginal pricing, and separate procurement of upward and downward products, -in line with EU requirements. Central dispatch TSOs can also specify additional rules. Derogations are possible for local products that do not meet these requirements.

Under Article 26 of the EBGL, TSOs are permitted to define specific balancing products, including both balancing energy and balancing capacity. However, only standard balancing products can be exchanged via EU balancing platforms. Articles 27.2 and 27.3 of the EBGL state:

2. Each TSO applying a central dispatching model shall use the integrated scheduling process bids available for the real time management of the system to provide balancing services to other TSOs, while respecting operational security constraints.

3. Each TSO applying a central dispatching model shall convert as far as possible the integrated scheduling process bids pursuant to paragraph 2 into standard products taking into account operational security.

Currently, there is no pan-EU platform for the exchange of standard balancing capacity products. With the introduction of such a platform, as outlined in the EBGL (Article 27.3), balancing capacity bids for specific products would need to be converted to standard balancing capacity products.

As outlined above, considerations in relation to cross border balancing energy platforms are not directly relevant to the DASSA balancing capacity considerations. It is important to note that the TSOs have started industry engagement on the conversion of SEM integrated scheduling process bids (balancing energy bid/offer acceptances (BOAs) to EU standard balancing products. Please refer to Future Power Market updates[23] for further information on the development of this balancing energy conversion process (e.g. April 2024 Update[24])

Consequently, balancing capacity products offered and procured through the DASSA do not need to align with cross border exchanges of balancing capacity, as there is no mandatory obligation on TSOs to facilitate this and any conversion rules have yet to be determined. TSOs are collaborating with RAs to ensure the design complies with all relevant regulations.

[23] Electricity Markets Key publications | Shaping Our Electricity Future | EirGrid
[24] FPM Industry Workshop (eirgrid.ie)

6. Recommendations on Reserve Product definitions

6.1. Summary of proposals

A summary of the product definitions as originally proposed in the consultation paper is provided in section 5.2 of the consultation paper. There has been significant industry response to the product definitions which is outlined in this chapter and the TSOs are recommending some changes to the product definitions as a result. The new definitions are summarised in Section 6.3.

Consultation Questions:

Q.8 Do you have any views on the outlined requirements on frequency trigger capability, response trajectory capability, reserve step size & reserve step triggers for Upward reserve products? Please elaborate on any technical concerns you may have with regard to these proposals.

Q.9 Do you consider the standard definition of the FFR product which requires delivery of response between 1s-10s as proposed provide sufficient certainty for asset operators and investors?

Q.10 Do you consider our recommendations to require procurement of sub-categories of faster response FRR with full activation times of 150ms; 300ms & 1 sec enable industry providers to have sufficient incentives to bid in the auction structures? Are there additional aspects you consider should be included in the definition? Please elaborate in your response on aspects you consider need to be included.

Q.11 Do you agree with our proposal to remove the distinction between synchronised and desynchronised replacement reserve products (current DS3 definitions) to better reflect a changing service provider mix and to achieve better alignment with EU requirements? Please elaborate in your response if you have detailed concerns.

Q.12 Do you have any views on our consideration of procurement of a bundled upward reserve product? Please outline your views and any concerns you may have on this proposal.

Q.13 The TSOs recognise the potential provision of Upward dynamic reserves with discrete reserve step-sizes. We are not proposing this type of response as part of this DASSA Reserve Product Review. Please outline your views and any concerns you may have on this proposal.

Q.14 Do you have any views on the outlined requirements on frequency trigger capability, response trajectory capability, reserve step size & reserve step triggers for Downward reserve products? Please elaborate on any technical concerns you may have with regard to these proposals.

Q.15 Do you consider our proposed downward reserve definitions to be appropriate for an evolving system? Are there alternative definitions that you would recommend to ensure efficient service procurement and provision?

Q.16 Do you have any views on our consideration of procurement of a bundled downward reserve product? Please outline your views and any concerns you may have on this proposal.

Q.17 The TSOs recognise the potential provision of Downward dynamic reserves with discrete reserve step-sizes. We are not proposing this type of response as part of this DASSA Reserve Product Review. Please outline your views and any concerns you may have on this proposal.

6.2. Consultation responses

The sections below provide an overview of the answers of respondents to the consultation, directly related to the specific topic of 'System needs'. The TSOs note that the respondents' answers to the questions also include comments that indirectly relate to this topic. These answers are discussed in the relevant chapters on General Consultation Feedback (section 2.2), System need (chapter 3), Capabilities of Reserve providers (chapter 4), EU Alignment (chapter 5, Locational Requirements (chapter 7) and Product Scalars (chapter 8). Remaining considerations are addressed in chapter 9. The focus of this section is related to the system need specifically.

6.2.1. Question 8: Do you have any views on the outlined requirements on frequency trigger capability, response trajectory capability, reserve step size & reserve step triggers for Upward reserve products?

The responses received to Question 8 indicated that while 4 respondents indicated full support for the TSOs' proposal, 2 respondents were not in favour while 8 respondents had mixed opinions.

One respondent explicitly welcomed the TSOs' position to retain existing requirements for most System Services. Another respondent suggests that *'the appropriate design would be able to procure sufficient volumes from technologies capable of maintaining normal frequency regulation and also encourage participation from technologies best suited to mitigate maximum instantaneous frequency deviation, both services of which should not require to be mutually exclusive, and preference is not given to one technology type that can provide both in the design.'* Another more generic comment was that *'Introducing more onerous technical requirements will reduce competition for services and has the potential to apportion market power to individual providers or categories of providers if not carefully considered.'* And *'Relatedly it must not be the case that units crucial to ensuring ongoing system adequacy are not sent exit signals by virtue of being precluded from participating in DASSA or a subset of products. DS3 Revenue may well prove to be the difference between a unit continuing in the market or being stood down'*

Several respondents noted that *'Many of these capabilities cannot be known by stations or future units without consultation with their OEM provider'* and accordingly they *'would need additional time to assess the impact of this and if necessary, consult OEMs'*. They conclude that for them *'it is hard to be clear on whether these are feasible or limiting in their requirements'*.

Several respondents commented on the proposed frequency triggers / dead bands:

- *'The proposed requirement that dynamic providers be capable of responding at 49.985Hz and static providers at 49.8Hz would make providing such services commercially infeasible for many demand side customers.'* This respondent *'would like to propose the TSOs procure services across a range of triggers e.g.49.3Hz to 49.5 Hz, a second band from 49.5 Hz to 49.7 Hz and a third band from 49.7Hz upwards which would capture the technical characteristics of all providers. The alteration of the triggers by the TSO can then be between the minimum configurable range and the providers maximum trigger capability in the band of product which is being procured.'*
- 'Also in general it is commented that *'the +/-15 mHz deadband is extremely tight and would appear to be well within the standard variance of system frequency (standard frequency range: 49.8 Hz to 50.2 Hz). The +/-15 mHz deadband in the consultation appears to be nonstandard for frequency response type system services and is more akin to frequency regulation.'*
- *'If the deadband is to be tightened there should be distinctions and exceptions for system service providers who are not dispatched to provide energy but who are available for system services e.g. Battery Energy Storage (BESS). This would avoid frequent dispatching and cycling to ensure that the fast response system service capability of BESS remains available for large system frequency events, resulting in increased cost to provide.'*
- *'The proposal that all providers of Dynamic response must be capable and willing to provide at 49.985hz will result in the loss of a considerable segment of Demand Side service providers which*

will impact on the competitiveness of the DASSA. Currently, the Data Center industry is participating in Dynamic Response with their UPS (uninterruptible power supply), but at a lower Trigger Hz than is proposed here. The TSO is aware of the Data Centers which are participating in Dynamic Response currently and knows that this sector could increase substantially over the next 3-5 years. Data Centers (and all Demand Sites) provide Demand Flexibility as a secondary or peripheral service to their primary business, and these sites are conservative in sharing and safeguarding these UPS assets. If Demand Sites cannot provide their UPS for Dynamic Regulation (49.985hz), does this mean that they are of no value to the system? Another respondent considers that *'If the Data Center UPS segment is removed from participation in Frequency Reserve Products, it is difficult to know how Demand Flexibility targets can be achieved by 2030 (and beyond). [20-30% of electricity demand to be flexible, facilitating active participation by citizens and businesses in the energy market. LEUs will be expected to make a higher proportional contribution to the target… (National Energy Demand Strategy 2024), 600-1350MW from Data-Centres (System Services- 2030 Volumes (Indicative Portfolio Capability Analysis) , Appendix 1: 'All-island Portfolio 2-Mix' and 'All-island Portfolio 3-Demand Led)'* and *'recommends that the Trigger Hz required for Dynamic Containment Products (POR/SOR/TOR1) is set at a lower Trigger Hz'*

- 'One respondent *'believes both dynamic and static services can be procured in a manner which would introduce the option of lower frequency triggers.'* Although acknowledging that this may be a complex process to implement like the subcategories of FFR, they *'recommend the TSOs create a further subcategorization of the products by frequency triggers which is an essential variable for demand side technologies.'*In order to make more capacity available, another respondent suggested that *'Dynamic Response is procured at a second (lower) trigger hz (49.90hz), and possibly at a third (lower) trigger Hz (49.85hz).'* and static at *'a second (lower) trigger hz (49.70hz), and possibly at a third (lower) trigger hz (49.65hz).'* or *'Alternatively, the current Product Scalar should be retained to allow for varying Trigger Hz, and to link Trigger Hz with payment.'*

Respondents also have some questions about the implementation of the frequency trigger setpoints and trajectories:

- Several respondents commented that for some types of providers (like BESS) the response is readily configurable while for other service providers it would not be possible to implement a revised response configuration within 60 seconds, or - in some cases - it may not be possible at all. One respondent noted that '*If the TSO's anticipate that they will instruct these new trigger points on a regular basis (i.e. every 30 or 60 minutes), there is a risk that this may prevent a significant proportion of service providers from being able to participate within the DASSA auction (i.e. limiting participation from conventional assets).'* This respondent considers that this risk could be reduced '*if the TSO's do not envisage trigger points being instructed to be changed regularly (e.g. once a day), and processes will be put in place which provide sufficient notice prior to the requirement to change trigger points (e.g. more than 6 hours in advance)'*. Another respondent mentioned *'The need to know what the required frequency triggers are in advance to allow decision making as to what products to bid - depending on asset operations and characteristics*';
- Furthermore, one respondent commented that it *'should not be possible for an external body to have the capability to change critical power plant settings such as governor droop (i.e. Generator Control systems)'* and mentions that *'there is a cyber security risk and if this affects unit availability, there is an impact on market transparency reporting that generators are required to comply with.'*
- Some respondents expressed their concerns on the TSOs setting different trigger frequencies for different reserve providers, and preferring some reserve providers above the others which may be considered unfair, resulting in queries and disputes.

- *'Would be required for participants without a confirmed DASSA order or if default set points or ranges would be implemented.'*
- One respondent asked for clarification on the situation '*where a service provider (such as a BESS) does re-configure its response on TSO instruction, there is a potential that this could negate its ability to meet its DASSA Order or FAM assignment. It should be clearly specified that if the reconfiguration is on TSO instruction, that to the extent this impacts on service provision the provider is held harmless for any impacts, e.g. performance, scalars etc.'*
- One respondent asked for clarification *'on whether the TSO-instructed configuration is limited to services for which the service provider holds a DASSA Order (or will receive a FAM assignment) or could apply to additional services or service volumes.'* This respondent considers '*It would be illogical if a service provider is configured by the TSO to provide a service (which presumably the system requires) but receives no compensation because it does not hold a DASSA Order and may not receive a FAM assignment. Also, if not in receipt of a DASSA Order or FAM assignment, it should not be liable for performance penalties (scalars etc.).'* The respondent further considers that '*While we can understand that the TSO may for operational reasons want to have as much freedom as possible to utilise the system services capability available on the system, whether or not it is subject to a DASSA Order, the consequences for the service provider must be reasonably addressed.'*
- One respondent considers that *'It is logical that a service provider may wish to reconfigure its own response, consistent with its DASSA Orders. For illustration, if a BESS holds a DASSA order for TOR 2 but not for shorter timescale reserves, it may logically want to configure to provide no response until TOR2, to maximise its ability to provide the response for which it holds a DASSA Order.'* The respondent requires clarification on *'The circumstances in which a service provider is allowed to reconfigure its response (within the envelope of its DASSA Orders) or is not allowed to do so, should be clarified. Depending on the approach, there may be additional commercial considerations to be addressed.'*
- One respondent considered that *'It is vital that the TSO's consider the application of this proposal upon both existing and future providing units. If implemented, service providers will be required to make changes in order to provide reserves, including potentially being required to re-test with the TSO's. This may create costly delays to the process which do not appear to have been considered. Furthermore, clarity is required on if the TSO's anticipate that the altered trigger points will require Grid Code modifications, and if so, information is required on which clauses may be impacted by this proposal.'*

Several respondents considered it *'unclear how these factors will align with Grid Code obligations which are required at the commissioning of a unit, well before the same unit may be participating in the DASSA.'* Another respondent also welcomes clarity '*that where a service provider is obliged by Grid Code to provide a response but incapable of meeting the requirements to participate in the DASSA - in this case due to not being configurable - how that unit is ultimately remunerated.'* Another respondent commented refers to *'exceptions are included in the Grid Code for Energy Storage Power Stations'.*

One respondent considers the need for evolving the existing performance monitoring arrangements to reflect the nature of events which occur on the transmission network and refers specifically to frequency oscillations arising from reduced inertia and a greater volume of non-synchronous generation. This respondent *'believes that a review of System Services characteristics should consider whether existing requirements could be amended to result in more effective performance monitoring.'* Another respondent considers *'that every time the system experienced a frequency below 49.985 the slower resources would begin their ramp up process. In many cases by the time they are ready to start providing services the system frequency would already have returned to a level above that trigger, meaning they may need to disengage. In many cases these units would be terminating their start up sequence many multiples of times more than they would actually be providing services. In practice they only need to be engaged on occasions when the frequency falls to a much lower level, and so this requirement makes little sense'.*

TSOs' response

In general, the TSOs acknowledge that not all respondents were able to consult their OEMs to understand the impact of the changes.

The TSOs note that the proposed products try to optimise between a number of – sometimes conflicting – objectives. From a security of supply perspective, having sufficient capability (and momentarily sufficient capacity) to fulfil the system need would be the prime objective. This objective should be balanced against the objectives of keeping the procurement costs reasonable, the need for non-discriminating or 'technology agnostic products'. Furthermore, there is a requirement to keep the DASSA implementable (also in operational systems), usable for market participants and practical from a TSO implementation perspective.

While the TSOs tried to consult on a balanced product, the TSOs value and consider the changes proposed by the respondents and suggest implementing several. We discuss them below.

The TSOs acknowledge the challenges for the different technologies as raised in response to this consultation question and summarised above. Below, the TSOs address how to meet the system needs in such a way that as many technologies as possible are able to provide these services, while keeping the 'technology agnostic' objective in mind.

With respect to the deadbands, the TSOs consider that to achieve the aim of keeping the system frequency close to 50 Hz, response capability with a tight deadband is required. Hence, for dynamic reserves the TSOs propose keeping the existing deadband of +/- 15 mHz, which is in line with the System Operation Guideline Regulation 2017/1485 (SOGL)[25] and similar to the deadbands for FCR in Continental Europe Synchronous Area (10 mHz), the Nordic Synchronous Area (10 mHz) and GB (15 mHz). Hence, the TSOs do not agree with the respondents that a +/- 15 mHz deadband would be extreme.

For mitigating contingencies, the system requires faster reserves (e.g., FFR) that act in case of an incident that may result in a larger frequency deviation. In current practice the typical deadband setting for FFR is larger than 15 mHz, e.g. 100 mHz. However, to keep flexibility for the future, the TSOs consider that a +/- 15 mHz deadband capability is also appropriate for FFR. This aligns with the required deadband capability of POR – TOR2. Table 5 includes an overview of FFR deadbands in other jurisdictions.

As commented by the respondents, dynamic reserves have two functions: these products both keep the system frequency close to 50 Hz and stabilise the system frequency after a large incident. As suggested, these functionalities could be provided by separate services with different trajectories, e.g. a dynamic POR that acts between 49.8 Hz and 49.985 Hz for keeping the frequency continuously close to 50 Hz and another dynamic POR acting in the 49.5 Hz to 49.9 Hz that arrests that only triggers in case of larger frequency incidents. The increased complexity of this approach in both DASSA and operations needs to be balanced against increased competition. The proposal assumes to set incentives for new and existing reserve providers to facilitate both trajectories and accordingly do not recommend splitting the reserve products to different frequency ranges.

Several respondents commented on the impact of narrower frequency triggers / dead bands and the impact to reserve providing units of a certain technology. Some of these respondents suggested procuring additional separate products with three different frequency trigger levels. The TSOs are not in favour of introducing more levels for frequency triggers for both static and dynamic reserves, as suggested by some respondents. In a DASSA environment this would increase the complexity by adding new products, defining the reserve volumes and increasing the bidding complexity for reserve providers that are able to provide even more products. Similarly, the suggestion to apply a Product Scalar for trigger frequencies is considered not compatible with the DASSA approach (see section 6.2.5).

In response to the respondents' request to know what the required frequency triggers are in advance to allow decision making as to what products to bid, the TSOs will set out the process by which settings are changed in the System Services Code / Grid Codes.

[25] Regulation - 2017/1485 - EN - EUR-Lex (europa.eu)

Because of the future need to more closely control the operation of the reserves in order to guarantee the required response and to avoid unwanted response such as oscillations or unnecessary response of reserve providing units (as mentioned by the respondents), the TSOs proposed that settings of deadbands and trajectories should be changeable. This could be implemented in a similar way as currently for BESS which applies five modes, in which each mode would represent a combination of deadband and trajectory. Accordingly, the TSOs do not suggest removing this requirement as this would also mean that the implemented capability of some technologies (BESS, wind) would be lost. However, the TSOs understand the challenges for some existing providers to change their settings. The TSOs will take these concerns into account in upcoming work on the development of the System Services Code and Grid Code amendments in which the changing of the settings will be detailed.

The TSOs schedule in order to fulfil the requirements for system services (and other constraints) while minimising the cost of deviating from the FPNs. As FPNs will be required to align with DASSA results, system services will in principle be provided by the reserve providers cleared in the DASSA. However, there may be circumstances where this will not be the case and other reserve providers may be utilised. In these circumstances, the providers of the reserves will require the technical capability to comply with setting change requirements as will be set out in the System Services Code / Grid Codes.

The TSOs clarify that reserve providers shall only change their settings after an instruction by their TSO. This allows the TSOs to safeguard the optimal reserve response for the actual system conditions. Accordingly, this change shall not have impact on the performance or the perceived performance in relation to performance scalars.

The TSOs clarify that Grid Code requirements will continue to apply to system service providers. As noted in other sections of this paper a separate Grid Code review and amendment process to ensure necessary Grid Code amendments are expedited to align with DASSA is scheduled to begin in September 2024 - (Milestone 15 of the PIR).

6.2.2. Question 9: Do you consider the standard definition of the FFR product which requires delivery of response between 1s-10s as proposed provide sufficient certainty for asset operators and investors?

The responses received to Question 9 indicated that while 4 respondents indicated full support for the TSOs' proposal, no respondents were 'not in favour' while 9 respondents were in between. One respondent considered that insufficient information is available to confirm.

Several respondents commented that shortening the FFR FAT from 2 seconds to 1 second may limit the participation of certain FFR providers which may not be capable of meeting the faster 1 second threshold. More specifically, conventional assets and wind are mentioned. Other respondents state that their units can easily respond to below 1 second.

One respondent acknowledged that *'The standard definition of the Fast Frequency Response (FFR) product, requiring delivery of response between 1 second and 10 seconds, is generally aligned with industry best practices and should provide sufficient certainty for asset operators and investors.'* Furthermore, the respondent stated that *'The 1-10 second response window is consistent with FFR definitions in other advanced electricity markets, providing a familiar framework for asset operators and investors.'*. The respondent confirmed that *'Many current technologies, such as battery storage systems, flywheels, and advanced demand response systems, can comfortably meet this requirement, making the definition practical and achievable.'*

However, another respondent *'would like to see how the definition of FFR compares to EU definition of this service, and what the average needs are in other islanded countries specifically.'* and also suggests that *'This is also important to consider with respect to volumes of these services to be able to understand the extent of these extremes in speed are needed and why compared to other tools available to support the system.'*

Several respondents acknowledged that the standard definition may provide *'a signal to new investors of what is needed, but it is not clear at this time whether such a change is feasible for service providers, existing or new.'*

TSOs' response

The TSOs acknowledge that not all existing FFR providing units and technologies are able to meet the FAT of 1 second. However, more than 70% of the contracted capability in the current Regulated Arrangements is able to meet this requirement. Furthermore, the TSOs consider that the system needs should drive the requirements. As discussed in chapter 3, FFR with a FAT of not more than 1 second is needed. With this requirement (and associated sub-categorisation), the TSOs would like to provide incentives for investing in the FFR capabilities that the TSOs require.

In response to the respondents' questions, the table below provides an overview of FFR FATs as required in other jurisdictions, including EU and islanded countries:

Region	Service	Response Speed (seconds)	Frequency Trigger (mHz)
Australia (AEMO)	FFR	0.1 -1	15
GB	DC	1	15[26]
Nordic	FFR (static)	1.3, 1.0, 0.7	300, 400, 500
PJM, US	FFR	2	36
ERCOT, US	FFR	0.16	150

Table 5 Overview of Response speeds and frequency triggers for FFR in other jurisdictions

For an indication of the required volumes, the TSOs refer to the VFM consultation which will start in September.

6.2.3. Question 10: Do you consider our recommendations to require procurement of subcategories of faster response FRR with full activation times of 150 ms; 300 ms & 1 sec enable industry providers to have sufficient incentives to bid in the auction structures ? Are there additional aspects you consider should be included in the definition?

The responses received to Question 10 indicated that while 1 respondent indicated full support for the TSOs' proposal, no respondents were 'not in favour' while 11 respondents were in between. One respondent considered that insufficient information is available to confirm.

Several respondents commented that it is very difficult to respond to this question, because there is a lack of information (in this consultation paper and the DASSA Auction methodology consultation paper) on required volumes and on how the procurement of these different FFR sub-categories will be conducted or remunerated. Some respondents commented that it is not clear if FFR will be auctioned as three different products (150 ms, 300 ms and 1 s) or if it is 1 product with different volume requirements for the sub-categories with some mechanism to allow out-of-merit 150 ms FFR to be available to meet the 300 ms volume requirements. It is not clear to a respondent if both static and dynamic products will be procured for all three subcategories. Furthermore, one respondent required information on *'how their bids will be evaluated and what specific criteria are most important (e.g., speed of response, reliability, cost).'* Another respondent suggests the application of a product scalar and suggests *'if there are going to be similar product scalars for those in a sub product, category who can provide faster response such as 200 ms rather than 300 ms.'*

[26] Deadband delivery is 0% (+/- 0.015 Hz). Small linear delivery is required between 0.015 Hz and 0.2 Hz, to a maximum of 5% at 0.2 Hz.

Related to this, another respondent considered that '*the number of possible clearing prices (dynamic/static, up/down, Ireland/Northern Ireland, each half hour) can yield up to 384 prices per day, which dilutes investment signals.'*.

One respondent considers that including subcategories for faster response of FFR aligns with the faster response scalars in the DS3 arrangements and another respondent commented that *'Providers of the fastest response times (e.g., 150ms) should be compensated at a higher rate compared to those with slower response times (e.g., 300ms or 1 second). This differential payment structure would incentivise providers to invest in the technology and infrastructure necessary to deliver faster response times.'*

One respondent recommended '*the setting of times at 150ms, 500ms and 1sec. The setting of the intermediate time to 500ms would increase the number of participants and result in a lower cost product.'*

One respondent referred to the *'challenges posed by this variation in FFR compared to parameters in Grid Code that govern FFR performance.'*

One respondent asked *'if existing or soon to be commissioned units are expected to retest, upgrade or refurbish their units to provide for new FFR response times. If so, how this change will be aligned with Grid Code. (It is worth being aware that currently only FFR upward tests have been completed, so downward tests are still needed).'*

TSOs' response

For the DASSA, the intention of the TSOs is to procure a specified volume of FFR, taking into account specified minimum volumes for reserves with a maximum FAT of 300 ms and a maximum FAT of 150 ms, and minimum volumes for dynamic response. Accordingly, the DASSA fulfils the required volumes of all categories at minimum cost while the price of the products with a higher value for the power system (faster and dynamic response) will be the same or higher than the products with a lower value for the system.

The TSOs acknowledge the respondent's recommendation to change the FAT of category II from IV to '≤300 ms' as this would increase the number of participants and result in a lower cost product. Unfortunately, the respondent does not provide background information to this statement. However, in practice, there are very few FFR providers with a FAT in the range of 300 ms to 500 ms. Accordingly, the TSOs do not consider that the advantage of an increasing number of new providers would outweigh the disadvantage of potentially allowing a slower response.

For an indication of the required volumes, the TSOs refer to the VFM consultation which will start in September.

6.2.4. Question 11: Do you agree with our proposal to remove the distinction between synchronised and desynchronised replacement reserve products (current DS3 definitions) to better reflect a changing service provider mix and to achieve better alignment with EU requirements?

The TSOs have proposed removing the distinction between synchronised and desynchronised restoration reserve. This proposal received positive support from 6 respondents, with 2 respondents indicating that they were not in support of the proposal, and the remainder either not commenting or providing a mixed response.

Those in favour cited greater alignment with EU requirements and evolution of service providers and markets, e.g.

- *'The evolution of the energy market has led to a mix of technologies and service providers, such as demand response, energy storage, and renewable generation. A single, more flexible reserve product can accommodate these diverse sources more effectively than distinct synchronised and desynchronised products.'*

- *'The aligning of the replacement reserve product with that of the EU definition is to be welcomed. Given that it covers the timeframe of 20 minutes onwards then it matches well with the current products.'*

Issues raised by those that were not in support and those with mixed views highlighted some common themes including –

- Different understandings on the time horizons associated with RRS and RRD:
    - *'We fail to understand the proposal for these two products to be brought together – given that they act over different durations, 20 mins for Replacement Reserve Synchronised (RRS) and 40 mins for Replacement Reserve Desynchronised (RRD). Furthermore, as these services are distinctly different it would be neither logical nor fair to apply the same availability or event scalars across both, particularly in the case of peaking plant which is a key part of the service provision mix. Such a proposal would not be even close to technology neutral. In our DASSA Auction response we proposed that RRS and RRD be excluded from the Phase 1 Reserves scope on the grounds of simplifying, and making more achievable, the project implementation plan to introduce competitive arrangements – especially given the coincident timing with the introduction of the Celtic Interconnector as well as other market arrangements.'*
    - *'With RRS and RRD, they run to different periods. One needs to be maintained for 20 mins, and the other for 1 hour. Therefore, combining the two does not explain how these varying durations will be treated.'*
- Service provider bidding considerations and lack of rationale for the combined product:
    - *'We do not agree with this proposal from a technical perspective, and it would be hard to forecast how this is expected to be bid into the DASSA auction. For a conventional generator, desynchronised means that the generator may be for instance starting up, shutting down or operating at Full Speed No Load (FSNL). Time taken for the plant to complete its start-up to synchronise and from synchronise to start-up complete are defined in the Grid Code. In contrast, for synchronised replacement reserve is it assumed that the generator has completed its start-up, and it is operating above its min load setting per the Grid Code. These differing starting points are not considered in this proposal for practically and technically combining desync and sync as a single replacement reserve product. We can appreciate that the focus is on simply the concept of replacement reserve being combined as a single product and later dimensioned along the different directions. However, the differing starting states as per Grid Code are omitted from this discussion in the paper, so it makes it unclear how this will in fact be achievable and can be signalled in DASSA. We can appreciate that the EU expectation is better alignment, but semantically combining these 2 into a single definition does not explain technically and compliantly how these can be combined without unintended consequences or impacts.'*
    - *'We note that the current distinction between products, effectively rewards generation units that are already on and that this is appropriate from the System Operators perspective as a unit currently running is much less likely to trip or encounter difficulties than one coming online. The effect of procuring these products as a single service is likely to be that the price paid for the single service will be less than RRS, but greater than RRD were they to be procured competitively. While this may be in the consumer's interest at a superficial level, decreasing the value of the service may undermine the quality of how it's provided on average.'*
    - '*This paper is written from the perspective of what the TSO wants to have available to it on the system, in doing this it could consider what is possible with existing units, and what would be commercially and technically achievable for new providers of these services.*

- *'(We have) no fundamental issues with the TSO's proposal to remove the distinction between synchronised and desynchronised replacement reserve products. .. Little justification or analysis has been provided on the need for this change, other than EBGL compliance. Stakeholders would benefit from greater understanding of the importance and benefits of these proposals prior to making a final decision.'*

- EU standard and non-standard product considerations:
  - *'We appreciate that under EU requirements there is an intention for replacement reserve in both directions to be defined as one product. As per EBGL there is the concept of standard and non-standard products. In this consultation it is not explained whether any of these products would be deemed standard or non-standard. But it is reasonable for this paper to have demonstrated a consideration that if there is a rational reason for RRS and RRD to be kept separate, such as due to duration lengths, speed of activation or other reasons, and whether they can be maintained as non-standard products.'*
  - *'Furthermore, we recognise that within EBGL there is the concept of standard and non-standard products. If deemed as a non-standard product then this might provide a further route for RRS and RRD to move from the phase 1 reserve products to the phase 2 remaining products.'*
- Impact on carbon emissions of merging the products:
  - *'Whilst we can understand the stated desire behind the proposal to remove the distinction between synchronized and desynchronized replacement reserve products, we are concerned that this will undermine proposals to support and encourage the delivery of new (low or zero carbon) replacement reserve providers if the majority of the volume will in future continue to be provided by conventional generators. As the volumes shown in table 5, Contracted volumes per unit type as at Oct 23) indicate that the overwhelming majority (ca. 90%) of all replacement reserves (RR) comes from conventional plant, and that there has been little change in these proportions (unlike other DS3 services) - as was previously confirmed in the most recent DS3 tariff review consultation issued in March 2024, "it can be observed that across the years, there has been relatively little change in contracted volumes compared to other reserve products such as FFR, POR and SOR. As units close and new units commission, this contracted volume will fluctuate in future Gates". We therefore have significant concerns that, (in the event that only one RR product is procured), this will continue to be provided primarily by the conventional fleet (with higher carbon emissions) than would otherwise be the case. In this regard, we would urge the TSOs to ensure the product design of all future products in DASSA prioritizes the usage of low / no carbon sources for the provision of System Services, and until the MUON has been reduced from the current 7 down to 4 (as planned for 2030), that RR continue to be procured separately for de-synchronised and synchronised assets.'*

TSOs' response

The TSOs appreciate the views submitted by the respondents. In proposing the merging of the two products we considered the future requirements of the power system, where we will need access to replacement reserve from all types of generation, demand and storage technologies and in both the upward and downward directions. This could include, for example, a provider successfully bidding and receiving a DASSA order for downward reserves that would be served by turning on a demand (energy import) within 20 minutes for a duration of an hour or a generator or storage device successfully bidding in for upward RR provision that would be served by increasing generation/energy export within 20 mins for a duration of an hour.

Based on our current definitions in the DS3 System services arrangements, the definition of both RRS and RRD are aligned around a product FAT of 20 mins with a duration out to an hour, therefore we do not consider there is an inconsistency in FAT and duration timelines between the current RRS and RRD and

proposed future RR product. As noted in other sections of this paper a separate Grid Code review and amendment process to ensure necessary Grid Code amendments are expedited to align with DASSA is scheduled to begin in September 2024 (Milestone 15 of the PIR).

In relation to the points on EU Standard and non-standard balancing products, as outlined in Chapter 5, we consider that the RR product aligns well with the EU standard RR balancing capacity product.

On the concerns raised in relation to the potential impact on carbon emissions from the removal of the desynchronised RR product definition, the TSOs acknowledge that in a competitive auction format the selection of successful providers of balancing capacity for a generic RR product will be the cheapest providers and the auction will not distinguish between whether they are carbon emitting plant, storage devices, demand resources or renewable providers. Separately the activation of balancing energy bids will be conducted (as it currently is) through the scheduling and dispatch processes close to real time informed based by FPN, COD and TOD to select the most economically efficient providers and minimising deviation away from FPN submissions. While the scheduling and dispatch process also does not factor in the carbon emission differences between providers, it does take account of the latest available FPNs, COD and TOD and therefore should result in the most efficient units being scheduled.

The TSOs therefore remain satisfied that, on balance, the future needs of the system requires replacement reserves from the most cost effective resources, which over time will move to less carbon intensive sources. Our proposal remains as originally outlined in the consultation response that we intend to only procure one replacement reserve product.

6.2.5. Question 12: Do you have any views on our consideration of procurement of a bundled upward reserve product?

The responses received to this question indicated a majority either had significant concerns on the proposal or felt unable to offer approval or disapproval of the proposal as more detail was needed to fully understand what may constitute a bundle. Only two respondents indicated full support and stated:

- *'We would support the procurement of a bundled upward reserve product in line with the current 1.5 scalar for continuous service provision to recognise the value of continuous service provision.'*
- *'We support this proposal. The continuous provision scalar should only be removed if there is going to be a separate procurement process for a bundled reserve product. Otherwise, the value of continuous provision will not be recognised in the market.'*

Many respondents stated that the detail provided was insufficient to properly assess the TSO proposals:

- *'It is not clear what the TSOs' proposal is on bundled products. There is not enough information on bundled products in either this paper of the earlier DASSA design consultation. Do the TSOs' see bundled products and continuous provision as the same thing? This could be inferred from the design paper, but it is not clear. It remains unclear how bundled products would be procured and remunerated in the DASSA design. Equally it is not clear how they would interact with the secondary trading and FAM processes.'*
- *'From the consultation paper it would appear that the TSOs are not yet fully sure what products will be bundled (e.g. continuous deployment from FFR or POR up to TOR 1 or TOR 2 by one resource). For future consultations it would be appreciated if the TSOs could be more succinct in their proposals as it would appear that it could be any combination of products in a bundle. Greater analysis of why products should be bundles and which products are more aligned would have assisted in responding to this consultation paper.*
- *'(We believe) a (separate) consultation on the application of bundle, quality and continuous provision is needed before any decisions can be made. We are supportive of the review of the products needed and requirement to ensure that the system is secure and resilient to any frequency events. However, all proposed approaches must be technology neutral and not unduly favour some technologies over others. Impact analyses must be undertaken to ensure all*

modifications to system service product specifications do not have unintended consequences. A diverse portfolio must be brought forward and not be skewed towards one technology.'

Several respondents were clear in their response that they had serious concerns on bundling with several indicating they did not support bundling and preferred the procurement of single products only:

- *'From a systems operator perspective also, bundling may result in suboptimal allocation of resources as each type of reserve will not be sourced from the most efficient and capable provider. The approach may also lead to adverse selection as providers with superior capabilities in certain services might be deterred from participating if they are weak in others, leaving the market with less capable providers for certain services.'*
- *'Bundling may also reduce the number of participants who can meet all the bundled requirements, thereby decreasing competition. This can lead to market concentration and ultimately lead to higher prices for reserve services, as fewer providers can supply the entire bundle.'*
- *'Provision of system services by limited number of providers also increases the risk of geographic concentration. This reduces the resilience of power system as any localized disruption can have disproportionate impact. '*
- *'The approach can particularly put significant financial strain on smaller providers as they try to meet the diverse requirements of a bundled contract. This strain can lead to financial instability and reduce the overall resilience of the market. Considering the above, the system operator needs to carefully consider the various trade-offs when bundling services. The TSO's should adopt an approach that encourages competition, innovation, and equal opportunities for all players, thereby ensuring long term security.'*
- *'We recommend that products are procured singly and are not bundled. Creating a 'bundle' (longer duration product) will exclude participants who either cannot meet the fast activation time, or who cannot deliver to the full duration.'*
- *'Given that the system services market is being designed for the foreseeable future, we urge EirGrid and SONI to take cognisance of how its approach to bundled procurement of system services would affect the market in the long team in terms of efficiency, costs and competition. We believe that an unbundled approach would better leverage the specialized capabilities of various providers, fostering a more competitive and innovative market that ultimately benefits the stability and reliability of Ireland's power system.'*
- *'Our clear preference would be for the procurement of all services on an individual basis, from both the perspective of market transparency and creating greater competitive tension for specific products. We also believe this would simplify the requirements for the secondary traded market (and we set out our concerns regarding the proposed prohibition on bundled services in the secondary market, despite not having an explicit bundled services product in the DASSA). Given the expected evolution and transition from more conventional generation to more variable, renewable and demand side response, we are concerned that the requirement to bundle products would inadvertently limit competition and future participation from providers that are not yet in the market.'*

Several respondents did not support the inclusion of FFR in bundles:

- *'We are opposed to the bundling of products from FFR-TOR on the basis that it would limit the participation in the DASSA auction. The proposed transition from a threshold of 2s to 1s may not be feasible by all providers and therefore including FFR in the bundle may significantly reduce the potential providers for the bundled services. An additional reason why we are opposed to the bundling of products from FFR – TOR is that it's not clear in the consultation paper as to how the sub-categories of FFR will interact in the DASSA auction. Further clarity on these interactions would therefore be necessary for participants to make informed judgements on the merit of this proposal.'*
- *'More generally, our concern is that the bundling of products has the potential to concentrate market power within the market among a small number of providers. On the evidence of the methodology for continuous provision outlined in the prior paper, potential also exists for bunding to complicate the merit order of units delivering the requisite service. Circumstances should not arise for example, where one service provider is displaced in the merit order for a given product by another service provider on a basis other than price. Any benefit provided to a unit by virtue of being able to provide a multitude of services, must therefore not confer upon that unit an advantage vis-à-vis other participants.'*
- *'We don't believe that FFR should be included in a bundled product, or at least not on a mandatory basis, so as not to exclude technologies that can't adjust to providing FFR at <1s FAT. We are concerned that if the FFR FAT is shortened to 1s, then if in the future the TSOs introduce fixed product bundles such they must contain FFR, then this would exclude technologies can't meet the 1s requirement from providing the rest of the bundle. Market participants should have the freedom to define the bundles they are willing to provide.'*

One provider supported explicit bundles to be determined by service providers:

- *'bundling of products should be permitted via explicit service provider bids. By implementing this approach, it is likely to bring a wide range of benefits to resilient system management including 1) ease of system management as TSOs can be reassured that the necessary services required, can be provided, support in providing the TSO's with the most effective combination of services to enable efficient and economic dispatch, 2) increased certainty to service providers of revenue sources and deliverability of obligations in comparison to current simple P/Q bid structure with no linked bids, 3) increased transparency and 4) greater bidding flexibility which will be critical in minimising the cost of procuring services and ensuring greater competition within future DASSA auctions.'*

Several participants noted concerns on the separate treatment of Day ahead and secondary market with respect to bundles:

- *'There is an inconsistency .. between not being allowed to offer bundles of services in our bids while participants are restricted to secondary trading bundle of services only.. bidders should be allowed to offer individual products both for the primary DASSA market as well as for the secondary market as to do otherwise could dampen the scarcity price signal for an individual product. Until there is evidence to show otherwise our view is that this scarcity rent value is less likely to transfer within a secondary traded bundle of services.'*
- *'It is not clear why system service providers are restricted from offering a bundle of products, whilst the TSOs will perform this in the DASSA objective function but are then restricted to secondary trading bundle of services only.'*

One respondent *'believes that instead of bundling upward reserve products, more focus should be on procuring different tiers of frequency triggers across all reserve products.'*

TSOs' response

The TSOs appreciate the detailed consideration and responses received from industry. We recognize that limited information was provided in the document to allow for a full understanding of potential bundles and impacts for bidding considerations. For clarity, we are not proposing any bundling of both downward and upward reserves in any potential bundles; as previously indicated these will be procured separately in line with EU requirements.

In our recent Recommendations paper on the DASSA Auction Design we have outlined that the Auction design can accommodate implicit bundles. The TSOs recommend developing a future-proof process by which implicit bundles of reserve services can be defined in a flexible way, with the objective to support efficient auction outcomes.

6.2.6. Question 13: The TSOs recognise the potential provision of Upward dynamic reserves with discrete reserve step-sizes. We are not proposing this type of response as part of this DASSA Reserve Product Review.

Many respondents chose not to respond to this question or stated that there was insufficient evidence presented for the removal of the product category. Some respondents said that more detailed information should be provided and that removal of the product category may limit new providers of reserve response thereby reducing availability in future years.

Some of the comments raised include the following:

- *'It is not clear from the position in the consultation paper whether this is something that the TSOs envision as being necessary in the near future or far future. We request further information on the advantages to dynamic response with discrete step sizes, as well as the likelihood that the current position on these products will change.'*
- *'We do not wish to respond to this question at this stage.'*
- *'Little information is provided on this topic, please provide further information'*
- *'We believe that failing to address the potential provision of Upward dynamic reserves with discrete reserve side steps could create a barrier to entry for a range of technology types including solar, wind and BESS. Detailed technical engagement is required with industry prior to coming to a final decision on this. We have concerns that this position may unreasonably, and without any justification, limit this market. Therefore, resulting in, at best, inefficient outcomes for the system and consumers.'*
- *'It is not clear how these discrete reserve step changes intend to be communicated to the generator.'*
- *'Excluding discrete step-sizes might miss out on opportunities to integrate new technologies that can offer dynamic and flexible reserve solutions. Discrete step-size reserves can offer more granular control over reserve levels, potentially improving grid management and response capabilities during extreme events.'*
- *'Excluding discrete step-sizes might miss out on opportunities to integrate new technologies that can offer dynamic and flexible reserve solutions.'*

TSOs' response

The TSOs welcome the response of industry and wish to provide greater rationale for the proposed removal. The original introduction of the discrete reserve step sizes for dynamic provision of DS3 System services was to accommodate providers who may not be able to provide a linear dynamic response to frequency events. There have been no providers contracted for dynamic provision with discrete step sizes in recent DS3 rounds. The TSOs have indicated in the consultation paper, at the industry webinar and in this paper the increasing need for a wider variety of dynamic response provision, which is not based on a stepped type of response. We also value the contribution of static response provision (which can have

discrete step sizes of ≤ 75 MW for a single discrete step) and consider this will increase in importance as flexible demand grows to help manage greater complexity in power system operation. We therefore do not require to continue the categorisation of a stepped response product provision as a dynamic response.

We continue to recommend the removal of the Upward dynamic response with discrete step sizes and focus the DASSA on the procurement of both dynamic provision and static provision (with possible reserve step sizes).

6.2.7. Question 14: Do you have any views on the outlined requirements on frequency trigger capability, response trajectory capability, reserve step size & reserve step triggers for Downward reserve products?

The respondents referred to or raised the same comments as to Question 8 (see section 6.2.1).

In addition, several respondents commented that a *'trigger point dead band of 50.015'* Hz would *'be inappropriate as it would be triggered very regularly. This is particularly impractical for slower acting services such as POR, SOR, TOR 1 and TOR 2.'*. Another respondent added that this requirement will reduce competitiveness in DASSA and a third respondent stated that a deadband *'the use of 0.015Hz away from the nominal target value of 50Hz is too close due to the fluctuations in frequency due to generator instability.'*

TSOs' response

As many of the comments are already raised to Question 8, the TSOs refer to their response in section 6.2.1. Also the comment on the small deadband has been addressed in this section.

6.2.8. Question 15: Do you consider our proposed downward reserve definitions are appropriate for an evolving system? Are there alternative definitions that you would recommend to ensure efficient service procurement and provision?

The responses received to this indicated that while 7 respondents indicated full support for the TSOs' proposal, no respondents were 'not in favour' while 2 respondents were in between. One respondent considered that insufficient information is available to confirm.

Several respondents considered that the proposed downward reserve product definitions are appropriate. However, several commented that there was limited supporting information in the consultation document. Particularly, they were missing information on how the services would be offered, bundled, auctioned and remunerated, in what timescales and what volumes are procured and considered it difficult to provide a response.

One respondent added that the TSOs should clearly communicate the future requirements for downward provision to the market to ensure *'the future investment and provision by non-conventional generation can be assure, supporting the policy intent to decarbonize the electricity sector in line with both Carbon Budgets and in support of wider EU targets'*.

Another respondent suggested that *'The grid is continually evolving, and fixed definitions might not be flexible enough to address future challenges or opportunities in reserve management.'*. For that reason, this respondent considered that *'definitions might need to be updated to accommodate future advancements in energy storage, demand response, and other technologies.'*

One respondent commented that 'the capability of the plant for both definitions has to be tested' and considered that it has to be made clear how, and that *'practically, given the timelines given for testing under PIR, the time that will be needed for testing of capabilities at site and engagement with OEMs by generators and any system changes that may be needed for changing parameters to be communicated to generators in real time—we would think the timelines for this work are highly optimistic.'*

TSO response

The TSOs acknowledge that some respondents have indicated further information on a range of aspects, including downward reserve specification could have helped in developing a more comprehensive

understanding of DASSA auction design and interaction with product provision capability (see further detail in Section 2.2.4). However, we consider that given the number of positive responses to this proposal and other supportive comments there is, in general, agreement that the proposed downward reserve definitions are appropriate for an evolving system.

The TSOs further welcome the comment that *'fixed definitions might not be flexible enough to address future challenges or opportunities in reserve management'*, which aligns with our proposal to retain the ability to have configurable deadband and trajectory characteristics to enable appropriate service provision to meet evolving system needs. We acknowledge the concern of respondents in relation to testing requirements relevant for downward reserve provision. The System Services Code will provide greater clarity on the testing requirements for Downward reserve providers.

6.2.9. Question 16: Do you have any views on our consideration of procurement of a bundled downward reserve product? Please outline your views and any concerns you may have on this proposal.

The responses received to question 16 have some similar concerns as raised in relation to Question 12 on bundling of upward products, in terms of the need for greater detail on the bundles to be procured and the incentivisation of such bundles:

- *'The consultation paper does not provide any rationale or instances where bundled products would be advantageous over independently procured products. Based on the lack of any benefit, and the complications which this proposal would introduce to the DASSA, we are opposed to the procurement of bundled products.'*
- *'We assume a downward reserve product would be bundled separately to an upward reserve product and reiterate our comment from question 12 that we are supportive of a bundled product but there should be further clarity on the incentives for providing such a product and consideration should be given to allowing unbundling in the secondary market to promote liquidity.'*
- *'Designing and managing a bundled product can be complex and may require careful consideration of performance requirements, provider capabilities, and regulatory frameworks. Ensuring that the bundled product offers clear incentives for providers and supports a diverse range of technologies is crucial for its success. There is little to no detail within the consultation on how bundling would in effect work. Therefore, and in similar response to Question 12 it is impossible to comment on this question without further information.'*
- *'As mentioned before the bundling of products can be complex and even more so in a competitive auction process. The bundling of Upward products may however be easier than bundling of downward products, due to certain technologies having capabilities.'*

Other responses highlighted different concerns, dependent on the industry sector represented:

- *'We believe that instead of bundling reserve products, more focus should be on procuring different tiers of frequency triggers across all reserve products.' (Demand response)*
- *'Our clear preference remains that the TSOs should seek to procure the right level of services individually, thereby increasing the opportunity for transparency and price discovery. Furthermore, we believe this would be a simpler and less risky proposition for developers, who may not have previously considered participating in system services. We do not yet have clarity on the implications for the continuation (or not) of the current OGSS product and whether it is or is planned to be applied to solar plant too.' (Renewable provider)*
- *'Bundling of products is not well explained and does not account for the variations in parameters at a site when providing the different services. For instance, a conventional power plant, has min load and max load capabilities, such capabilities have to be considered in the procurement of products and specifically the bundling of products. Should products all be set at the same capabilities, or if their settings differ how can they be bundled. Such challenges would likely be*

the same for other technologies. Bundling is not well enough explained, evidenced or mapped to prove its utility, that it will not dampen any market signals and that it can take account of differences in capabilities across products. (Conventional provider)'

TSOs' response

In response the TSOs recognise the difficulty industry participants have faced in determining whether downward reserve bundles are something they would support or not as more detailed information was required. For clarity, we are not proposing any bundling of both downward and upward reserves in any potential bundles, as previously indicated these will be procured separately in line with EU requirements.

In our recent Recommendations paper on the DASSA Auction Design we have outlined that the Auction design can accommodate implicit bundles. The TSOs recommend developing a future-proof process by which implicit bundles of reserve services can be defined in a flexible way, with the objective to support efficient auction outcomes.

In relation to the comments related to OFGSS and downward reserves we refer to our earlier response on this in Section 4.2 which in summary clarifies that we intend to ensure that the products to be procured through the DASSA arrangements are designed as technology neutral and open to all providers. The OFGSS[27] is a system defence tool that the TSOs utilise currently to manage extreme circumstances of overfrequency and only after all available reserves have been activated. We therefore do not intend to remove the system defence measure of OFGSS and do not consider this will reduce the capability of OFGSS providers to provide downward reserves.

6.2.10. Question 17: No proposed Downward dynamic reserves with discrete reserve step-sizes.

The responses received to this question mirrored the comments received to Question 13 on the removal of the category of Upward dynamic reserves with discrete step sizes. In summary the responses either indicated no comment or that there was insufficient evidence presented for proposal not to include this product category. Some respondents said that more detailed information should be provided and that exclusion of such a product category may limit new providers of reserve response thereby reducing availability in future years.

TSOs' response

The TSOs welcome the response of industry and wish to provide greater rationale for the proposed exclusion. The original introduction of the discrete reserve step sizes for Upward dynamic provision of DS3 System services was to accommodate providers who may not be able to provide a linear dynamic response to frequency events. There have been no providers contracted for dynamic provision with discrete step sizes in recent DS3 rounds. We also value the contribution of static response provision (which can have discrete step sizes of ≤ 75 MW for a single discrete step) and consider this will increase in importance as flexible demand grows to help manage greater complexity in power system operation. For Downward dynamic reserve we are proposing to follow the same proposal as for our upward dynamic response products and therefore will not include a categorisation of a stepped response product provision as a downward dynamic response.

We continue to recommend the exclusion of a Downward dynamic response with discrete step sizes and instead focus the DASSA on the procurement of both dynamic provision and static provision (with possible reserve step sizes).

[27] OPI_INN_Over_Frequency_Generation_Shedding_Schedule_Summary_Report (eirgrid.ie)

6.3. Recommendations on Reserve Products

In response to the responses to the consultation questions, the TSOs have not made any change to the proposals for product definitions.

Table 6 summarises the response times and response duration for the different types of reserves and their categories as proposed in section 5.3 and 5.4 of the consultation document. The table applies to both Upward and Downward Reserves which are to be contracted separately.

Reserve product	Category	FAT	Response duration
FFR - Static response	I	150 ms	Response sustainable up to up to 10 s after the event
	II	≤ 300 ms	
	III	≤ 1s	
FFR - Dynamic response	IV	150 ms	
	V	≤ 300 ms	
	VI	≤ 1s	
Static POR	I	≤ 5 s	up to 15 s after the event
Dynamic POR	II		
Static SOR	I	15 s	up to 90 s after the event
Dynamic SOR	II		
Static TOR1	I	90 s	up to 5 minutes after the event
Dynamic TOR1	II		
Static TOR2	I	5 minutes	up to 20 minutes after the event
Dynamic TOR2	II		
RR		20 minutes	up to 1 hour after the event

Table 6: Response times and response duration for Upward and Downward Reserves

Table 7 specifies additional key requirements for *Upward* FFR, POR, SOR, TOR1 and TOR2, separately for Static and Dynamic categories, while Table 8 shows similar (but mirrored) requirements for the Downward products and categories. These requirements include the capability ranges for Reserve Trigger, Trajectory[28], Reserve Step Sizes and Reserve Step Triggers, which the contracting TSOs may request to change in real-time as appropriate and determined by system conditions. Enabling and disabling of reserve response, alterations to the Reserve Trigger, Trajectory, Reserve Step Sizes and Reserve Step Triggers shall be implemented by the Providing Unit within 60 seconds of specification.

[28] The term FFR Trajectory is used in the table to define the frequency range in which the response needs to increase linearly from 0% to 100% of the *maximum response* contracted from the reserve providing resource. The term Reserve Droop has a strong relation with the trajectory, but relates to the *nominal capacity of the reserve providing unit*. For example, a Reserve Droop of 4% indicates that a unit of 100 MW increases its response to a frequency change with - 50 MW/Hz. For a FFR Trajectory of 500 mHz this would be equivalent of a maximum response of 25 MW. Or conversely, if a 250 mHz FFR Trajectory would be applied for the same 25 MW at the same unit, a Reserve Droop of 2% would be required.

Criteria for	Trigger F_1	End of trajectory F_2	Reserve Steps Sizes	Reserve Step Triggers
Static FFR, POR, SOR, TOR1 and TOR2	configurable for each step between: $49.3 \leq F_1 \leq 49.8$ Hz	Not applicable	1 or more steps of ≤ 75 MW for a single discrete step.	Smallest available discrete step in response at any time must be no less than 20 % of the MW value of the Providing Unit's largest available step at that time
Dynamic FFR, POR, SOR, TOR1 and TOR2	configurable in range: $49.5 \leq F_1 \leq 49.985$ Hz	configurable in range: $49.3 \leq F_2 \leq 49.8$ Hz and $F_1 - F_2 \geq 200$ mHz	Not applicable	Not applicable

Table 7: Additional key requirements for Upward FFR, POR, SOR, TOR1 and TOR2 (refer to Figure 9)

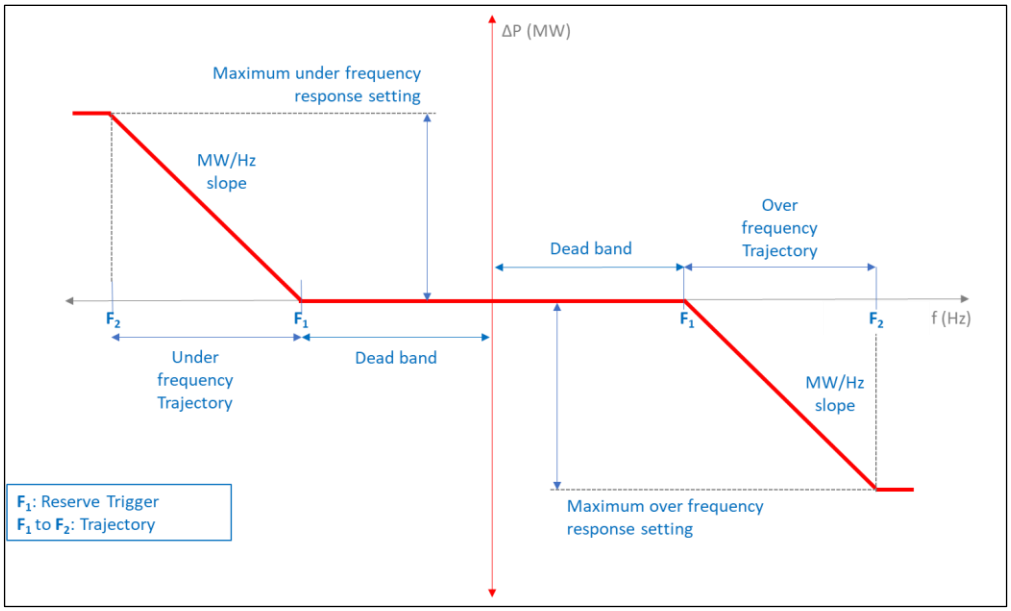


Figure 9: Illustration of Reserve Trigger F_1 and Trajectory F_1 - F_2

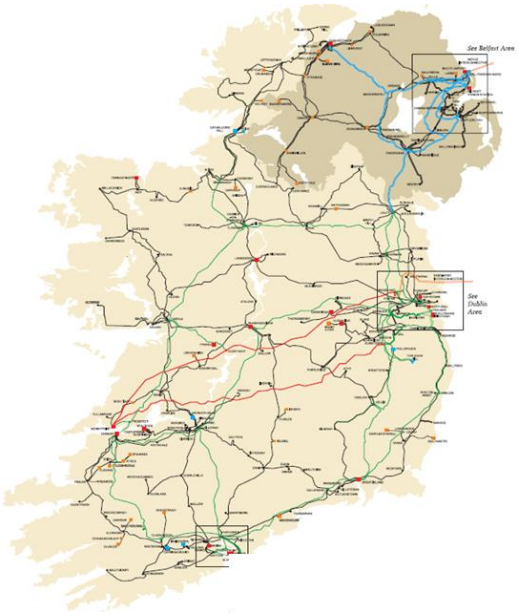
Criteria for	Trigger F_1	End of trajectory F_2	Reserve Steps Sizes	Reserve Step Triggers
Static FFR, POR, SOR, TOR1 and TOR2	configurable in range for each step: $50.2 \leq F_1 \leq 50.7$ Hz	Not applicable	1 or more steps of ≤ 75 MW for a single discrete step.	Smallest available discrete step in response at any time must be no less than 20 % of the MW value of the Providing Unit's largest available step at that time
Dynamic FFR, POR, SOR, TOR1 and TOR2	configurable in range: $50.015 \leq F_1 \leq 50.5$ Hz	configurable in range: $50.2 \leq F_2 \leq 50.7$ Hz and $F_2 - F_1 \geq 200$ mHz	Not applicable	Not applicable

Table 8: Additional key requirements for Downward FFR, POR, SOR, TOR1 and TOR2 (refer Figure 9)

7. Recommendations on Locational Requirements

7.1. Summary of proposals

The TSOs outlined in the consultation that as the focus of this Product review paper is on the reserve services only, the locational considerations outlined only relate to the reserve services required to maintain frequency within operational standards. As Ireland and Northern Ireland comprise a single, synchronous power system, frequency is assumed common across the island and reserve services are shared to manage contingency events.



Currently, the only locational requirements for reserve services are that minimum reserve capabilities must be held in each jurisdiction due to the risk of a 'system-separation' event in which the Northern Ireland and Ireland systems separate. This event can be triggered by a fault and tripping of the existing 275 kV 'tie-line' that runs between the two jurisdictions[29]. Detailed analysis undertaken by the TSOs which highlights the risks to system frequency, in particular in NI, if the tie-line is lost, was referred to in the Product review paper. Note that the TSOs expect more locational considerations/methodology for non-reserve services such as voltage support (i.e., local in nature). These considerations, however, are subject of non-reserve services review in 2025 as part of the FASS PIR.

The consultation paper therefore proposed that separate jurisdictional requirements would be required to manage the risk of a system separation.

Consultation Questions:

Q.18 Do you agree with our assessment of the locational considerations for the reserve services? Are there additional aspects that you consider may be valuable to include?

7.2. Consultation responses

7.2.1. Question 18: Do you agree with our assessment of the locational considerations for the reserve services? Are there additional aspects that you consider may be valuable to include?

The responses received to this question indicated that while 4 respondents indicated full support for the TSOs' proposal, 2 respondents were not in favour while 8 respondents were in between.

Several respondents highlighted that in the absence of detailed information it is hard to comment more widely and that the introduction of changes following the completion of the new N-S Interconnector may create an investment risk. These respondents especially request additional information on:

[29] The North-South Tie-Line is a 275 kV double circuit. Both circuits are carried on the same overhead towers so is considered a credible contingency.

- How the delivery of the second North-South interconnector will impact locational requirements in the future.
- the impact of the Celtic Interconnector: *'Would this result in the potential for a higher Largest Single Infeed which may contribute to increased service requirements.´* or in other changes to locational requirements.
- If *'the TSOs expect locational requirements to evolve over time as a result of other system characteristics (such as level of renewables, and system non-synchronous penetration).'*
- *'the methodology for determining locational constraints in the DASSA'.*
- *'the forecast flow direction on the tie-lines in the daily publication of the volume requirements.'*
- *'if it is intended to exclude the potential for other locations to be defined, at least for reserve services.'* As envisaged in previous consultations: *'for example the DotEcon/AFRY paper "Future Arrangements for System Services" (September 2023) noted (emphasis added): For some products (for example reactive power, but also for reserve due to jurisdictional requirements or congestion in some areas), locational differentiation may be needed.'*
- *'how and why locations are removed or altered in the future'*

Some respondents suggest that '*while reserves are not typically valued for their location, in practice there are many constraints on the network that necessitates that reserves may need to be located in a specific location to be effective in some circumstances. Going forward, it may therefore be appropriate for the DASSA to reward generators located in certain areas of the network as the system evolves, such as close to large demand centres, large inflows etc.'*

One respondent considers that *'This analysis does not consider voltage requirements, only frequency considerations. This is an omission that means that locational considerations are underestimated.'* Another respondent suggests that *'By strategically placing reserves in areas prone to congestion, it is possible to alleviate transmission constraints and improve the flow of electricity across the grid.'* and further stated that *'Locational reserves offer greater operational flexibility, enabling TSOs to manage grid constraints dynamically and respond to localised issues more efficiently. As renewable energy sources like wind and solar are often concentrated in specific locations, having reserves in these areas can help manage variability and ensure a stable supply. Implement a continuous monitoring of reserve performance and grid conditions to ensure that locational strategies remain effective especially when the second north/south tie-line is delivered.'*

TSOs' response

As stipulated in the consultation document, the TSOs propose *'to maintain jurisdictional reserve requirements for upward reserves, and introduce jurisdictional requirements for downward reserves'*

Our requirements are based on detailed system studies utilising network models and adhering to mandated operational security standards requirements. We will continue to evaluate system requirements in line with our evolving power system, and applicable operational security standards.

After delivery of the second North – South Interconnector, the jurisdictional reserve requirements will be reviewed by the TSOs (i.e., based on detailed dynamic studies).

The TSOs do not foresee other system characteristics that would trigger the need for locational requirements for reserves, e.g.. while the Celtic Interconnector is expected to impact the All-Island Largest Single Infeed (LSI) and Largest Single Outfeed (LSO), it will not result in additional locational requirements. The same applies for other system characteristics, such as level of renewables, and system non-synchronous penetration. Furthermore, the TSOs do not consider that network issues, such as congestion and voltage issues, will be mitigated by locational reserve requirements.

The TSOs will provide further detail on our considerations related to jurisdictional volumes in the VFM Consultation due to be published in September 2024.

7.3. Recommendations

The response to the consultation did not change the TSOs' proposal. We recommend maintaining jurisdictional reserve requirements for upward reserves and introducing jurisdictional requirements for downward reserves. These requirements will be reviewed in line with the delivery of the second North – South Interconnector.

8. Recommendations on Product Scalars

8.1. Summary of proposals

Scalars were an effective method for rewarding and incentivising providers as part of a qualification and tariff based /fixed contract arrangement under the DS3 System Services arrangements. As we transition to daily auctions it is necessary to remove or replace the majority of the DS3 scalars in order to have an effective and efficient auction process. In our consultation paper we provided the rational for the proposed the removal of the following scalars:

- Temporal Scarcity Scalar
- Faster Response of FFR Scalar
- Enhanced Delivery Scalar
- Continuous Provision Scalar
- Regional Scarcity Scalar

We also proposed, at a high level, two new performance scalars based on Availability and Event performance.

Consultation Questions:

Q.19 Do you agree with our proposals on the removal and replacement of the above scalars? Are there aspects that you believe still warrant a scalar based approach in an auction-based procurement process? Please provide a detailed response on what you consider would be appropriate and how this would enable more efficient procurement outcomes.

8.2. Consultation responses

8.2.1. Question 19: Do you agree with our proposals on the removal and replacement of the above scalars? Are there aspects that you believe still warrant a scalar based approach in an auction-based procurement process?

The responses received to this question indicated that while 3 respondents indicated full support for the TSOs' proposal, 5 respondents were not in favour while 7 respondents were in between. Several respondents note that the proposals set out in chapter 7 of the consultation document mirror the proposals set out in the DASSA consultation earlier this year to which the respondents responded before.

Some respondents welcome the removal of scalars in general when the DASSA arrangements are introduced. They argue that:

- *'The use of scalars is generally not aligned with Competitive arrangements, provided there is free competition, in a pure market.'*
- *'Scalars are a feature of the existing Regulated Arrangements and therefore are inappropriate where competition exists.'*
- *'Scalars were beneficial under the Regulated Arrangements due to the fact that these arrangements were tariff based and paid based on availability. This means that scalars were capable of increasing the value of services at times when they were most required or reducing payments to less reliable providers. This mechanism is obsolete in an auction-based procurement framework. One would expect that increased demand for services, or scarcity of services, will be reflected organically through higher auction clearing prices.'*

- *'In light of no decision being made on the DASSA auction design, potential bidding controls and introduction of price caps, ESB GT does not agree with the introduction of scalars. In order to enable effective market decisions and the best value for consumers, ESB GT believes that the market should be able to freely identify the value of scarcity through bid pricing. It is counterintuitive to layer a regulatory intervention, such as the scalars, on top of the market design for auctions when no issue/barrier has been identified to require a regulatory intervention. However, if the RA's believe that market price caps and bidding code of practice are to be introduced, ie limiting free bidding, there is a need for greater discussion on scalars including greater detail on how performance will be assessed by the TSO's, and on the values and duration of scalars. A transparent process, with iterative stakeholder engagement, is required when developing any assessment methodology. This should be coupled with an audit process that is led by the RA's to ensure accurate assessments have been made, and stakeholders did not face unnecessary or higher than necessary penalties.'*
- *'It is encouraging that scalars are being removed since scalars were necessitated by DS3 being a Regulated Arrangement, thereby requiring positive incentivisation to ensure participation and to drive competition during the DS3 phase of ancillary services. We are not supportive of the new proposed scalars. We are not supportive of the continuation of any scalars in the DASSA carried from the Regulated DS3… As there is sufficient competition, these services cease to be part of DS3 Regulated Arrangements and cease to require the incentivisation of scalars. The scalars proposed are assumed to be penalty only as they are proposed at a range between 0 and 1. This is not an incentive for entry into a competitive and open market. DASSA auction design and product review approaches suggest that the TSO does appreciate this.'*

Some respondents would also welcome the removal of the proposed availability and event performance scalars as:

- *'proposed availability and event performance scalars are inappropriate given the distortion that they will introduce to the market. This will obscure units' bidding and ultimately result in less efficient auction outcomes. Units which incur payment deductions through the proposed scalars can simply include this impact in any future bids ultimately resulting in higher market clearing prices. Additionally, the inclusion of these scalars will increase the risk element associated with DASSA bidding which is also likely to result in higher prices.'*
- *'It is unclear why both the SEMC and TSOs are reluctant to engage with stakeholders in earnest on the availability scalar. EPUKI has raised concerns around this proposal through a number of consultation responses, and it is understood that industry groups have flagged similar issues. No rationale or justification has been provided for including the scalars. Based on the lack of any rationale for these scalars and their impact on transparency, market efficiency, and costs for consumers, they should be removed from the DASSA design.'*
- *'EPUKI notes that mechanisms already exist in the energy whereby units are required to pay the cost of replacement for unfulfilled energy provision. It is not clear why a similar mechanism cannot be applied in the DASSA. This would remove uncertainty and complexity from the procurement arrangements and the cost for not fulfilling a day-ahead position would be directly linked to the outcome of unfulfillment, as opposed to an arbitrary value as would be the case with using a scalar.'*
- *'We do not believe that having an Availability scalar is consistent with having Competitive arrangements. Markets should be free to perform without fetter, as to do otherwise is to introduce market inefficiency and market distortion.*
- *'availability scalars are not appropriate for the investor, particularly as there are already enough market signals incentivising availability in the Energy and System Services streams.*
- *'The Availability Performance Scalar appears to be a double counting of the Compensation Payment and EAI do not accept that 2 penalties are required.'*

- *Scalars already exist for the provision of generation, which units must seek to ensure is remunerated first in DAM, before being able to provide system services. Additional scalars will have a compounding effect as a secondary service to generation, and furthermore, may act as a stronger deterrent for participation in DASSA.'*

Several respondents consider that their acceptance of removal of the Temporal Scarcity Scalar requires:

- Appropriately designed and implemented DASSA auctions, which should provide the potential for higher prices at times of product scarcity. *'However, this is only the case if the auctions are appropriately designed and implemented and allowed to function on a proper commercial basis, without inappropriate bidding or price caps, or unsuitable default prices.'* 'In short, scarcity should be allowed to dictate the price ultimately paid for services within the DASSA auction.'

Several respondents provided suggestions to the implementation of the Performance scalars:

- *'ensure that there is no double counting of penalties that could deter investment in system service provision.'*
- *more detail be provided, both now and in the code which will be written to govern DASSA. Issues with the current performance scalars include poor clarity on the methodology for assessment, defined communications channel and no avenue for appeal.'*
- *'The Performance Scalar is designed to incentive participants to deliver the Available Capacity MW meeting the requirements of the Reserve Characteristics as per the Schedule 9. Where a unit fails to perform, it is appropriate that the Performance Scalar would drop with resulting drop in revenue. However, the Performance Scalar is used as a mechanism to deal with units which have not been assessed in 12 months or more. It is not appropriate to use the same Scalar to deal with two different problems. Enel X recommends that the link between Data-Poor-Records and the Performance Scalar is broken, and that the Performance Scalar is used solely for the purposes of assessing Units performance in response to a Frequency Event:*
    1. *The current assessment process and tools used by the Performance Monitoring team are not shared with participants. Methodology given in the Protocol document is not sufficiently detailed to allow participants to build their own tools, without the experience collected in submitting Frequency Event Reports. Workshops for participants to demonstrate how the different services and different response types are assessed should be included in future planning;*
    2. *There is no process or timeframe for an appeal or query of the Assessment of Frequency Event Reporting. Queries submitted to the Performance Monitoring team can take weeks or months to be answered. Enel X recommends that a process and timeframe is included in the governing Code for FASSA.*
    3. *With Frequency Event Reporting (Dynamic), Demand Side response is assessed similarly to FTM (front of meter) BESS. This is not appropriate as Demand Sites are also managing the site load which can interfere with voltage and frequency during Frequency Event response, and can be picked up at 20-millisecond reporting. Enel X requests that Demand Side characteristics are considered in the assessment of Demand Sites in Frequency Response reporting and assessment.'*

Several respondents did not agree on the removal of the Enhanced Delivery Scalars (which provide extra revenue for higher trigger frequencies and steeper trajectories). It is commented that:

- *'The higher the trigger frequency, the more often the plant will be called on to provide a response. Under the new proposal, these will be configurable by the TSO so the Service Provider will not be able to predict the duty cycle on their plant in advance. The scalar should not be removed unless there is to be separate auctions for different bands of trigger frequency as is proposed for response times. Providers can then decide which auctions to bid into at prices that reflect the costs to them of the associated duty cycles.'*

- *'It is not clear to see how the remuneration of the enhanced delivery scalar will be efficiently be delivered through the product design and auction mechanism; greater clarity is required.'*
- *'There is no reason to remove the existing AVR multiplier.'*

One respondent is minded that the product scalar can be removed if reserve products can be procured reserve products across frequency triggers. If this is not the case, this respondent supports the retainment of the Product Scalar across the reserve products.

Some respondent commented on the FFR scalar:

- *'With the removal of the FFR scalar this does remove the sliding-scale incentive for achieving incremental improvements in response time. It would be good to understand if the speed of response would be taken into account in the "Event performance scalar".'*
- *'Certain high-value services, which were previously rewarded through scalars, might be undervalued in a scalar-free auction, leading to insufficient provision of these services. iPower propose scalars that reward high-performance attributes such as Faster Response of FFR scalar, and Enhanced Delivery scalar are retained. This ensures that high-quality services are incentivised and adequately valued.'*

One respondent comments that they *'look forward to further engagement on scalars depending on auction and product review design decisions.'*

TSOs' response

The TSOs agree that in principle, it is preferable not to use scalars in a market environment, which is why the TSOs have proposed removing most scalars: We consider that the DASSA auctions provide the potential for higher prices at times of product scarcity, which makes the Temporal Scarcity Scalar redundant. Furthermore, the TSOs consider that both the differentiation in products (e.g. FFR categories, dynamic vs. static) and product definitions replace the need for the Faster Response of FFR Scalar and the Enhanced Delivery Scalar. The TSOs therefore recommend the application of only performance scalars.

8.3. Recommendations

The response to the consultation did not change the TSOs' proposal. We recommend that only performance scalars targeted at availability performance and event performance are applicable to market participants. Further consultation on the design of such scalars will take place.

9. Additional considerations

The TSOs asked two further questions to ascertain whether additional aspects needed consideration as part of this product definition phase, and also for future Product reviews.

Consultation Questions:

Q.20 Are there aspects that have not been covered in this paper that you feel need further consideration during the final product definition phase? Please provide a detailed response on any recommended additional considerations.

Q.21 As part of a future Product Review the TSOs will be conducting analysis that will help inform the product definitions of non-reserve System services and potentially new products. Do you have any recommendations on what needs to be included in the work programme for such future Product Reviews?

The responses received were varied in relation to both questions. Where the comments submitted by industry participants align with the overarching issues noted in Chapter 2, or in relation to the other topics covered in this paper we have captured the comments there. The rest of this section deals with aspects that are additional to points already addressed:

One respondent suggested to '*Consider ensuring the volume requirements take account of multiple trips - e.g. where the loss of one infeed/outfeed leads to further tripping.*'

TSOs' response – As outlined, the jurisdictional volumes will secure the system against the loss of the N-S tie-line. All-island reserve volume requirements will primarily be determined on the basis of loss of the largest system infeed/outfeed (LSI/LSO). In both cases, the TSOs may also consider other significant infeed/outfeed losses in line with operational experience and risks in setting the overall volume requirements. More detail on the inputs to the volume forecasting methodology will be available to industry and comments welcomes as part of the forthcoming consultation on this.

One respondent commented that '*In terms of the speed of rollout of changes we would caution that the evolution shown in Figure 9 looks to be over ambitious and that there is a need to keep existing service providers whole, for security of supply. There are very large challenges in bringing about what is shown, and there are over estimated benefits from service providers which have inadequately short term contracts available to them, e.g., LCIS. Additionally, the system needs performed in the consultation is a 2025 scope. This will need to be projected forward and reworked to bring in new services. Service providers already await introduction of remuneration for Dynamic Reactive Response (DRR) and Fast Post Fault Active Power Recovery (FPFAPR).*'

TSOs' response - The Future Product review and consultation outlined for 2025 will consider all other potential system services.

One respondent raised two key considerations:

- *'EDIL (Declarations Logger). All DS3 services Availability MW must be submitted 'in real time' through EDIL(Declarations Logger), which is completely manual. Each time the availability of the providing unit changes, this must be input into EDIL. Where the unit is participating in 7 services (FFR through RM1), this requires seven inputs. A Demand Side unit may be altering availability throughout the day, and Declarations would be updated at least hourly, or even every 30mins. For providers with more than one units, the workload is doubled, or multiplied for 5(or by 10). The manual nature of EDIL requires that providers employ full-time staff who input 24/7 into EDIL, which is a most tedious task and prone to human error. For more efficient and accurate declarations, Enel X recommends an API (automated programmable interface) for EDIL which allows for automated declarations (linked to SCADA). DSU providers have been requesting an*

option for automation of EDIL declarations for the past few years. Enel X recommends that this is introduced prior to the commencement of DASSA.

- *The link between Data-Poor-Records and the Performance Scalar should be broken. Units which have not submitted Frequency Event Reports for 12 months are paid less (decreasing monthly) for providing the same service. It is hardly sensible or fair. If the unit is unreliable, and fails to respond to a Frequency Event then it is appropriate that the unit will be penalised by the reduction in payments linked to the reduction in the Performance Scalar. To penalise units for the passage of time is to use the Performance Scalar for a second, slightly arbitrary reason. Enel X recommends that the issue of Data-poor-records is managed through a different mechanism.'*

TSOs' response – We welcome these detailed considerations. Further consideration of the availability declaration requirements will be examined as part of DASSA implementation.

In relation to the comments on Data Poor Records and Performance, as outlined in Chapter 8, further consideration of the scalar design and provider requirements will be included in the considerations to be outlined in a forthcoming Scalar consultation.

One respondent commented '*We believe that there is another aspect to consider, which is outside the scope of this consultation. ACER is pushing TSOs and NEMOs to consider the implementation of Co-optimisation instead of a market-based approach for procuring balancing capacity. The focus of Co-optimisation is allocating cross-zonal capacity in the day-ahead market for the exchange of balancing capacity, between Member States, also allowing to facilitate the exchange of balancing energy in real time. Our understanding is that with Co-optimisation, procurement of energy and balancing capacity will happen together in the Day-Ahead time frame. It seems like SEM has picked the Market Based approach (as per Article 41 of the Electricity Balancing Guidelines (EBGL (EU 2017/2195) which procures energy and balancing capacity separately albeit in the same Day-Ahead timeframe. While ACER highlights the welfare gains from Co-optimisation at an EU level, individual studies need to be done at the all-island level to gauge its benefit to Irish consumers. Significant effort has gone in creating the framework for Day-Auction for System services. Implementing new arrangements at this stage might delay the FASS program. We would urge Eirgrid to provide more information if available on this subject.'*

TSOs' response - Information on the full integration of the SEM into EU day ahead, intraday and balancing markets and capacity considerations will be available through our regular Future Power Market updates and any detailed developments will be highlighted to industry through this route.

One respondent commented that '*As the power system becomes more digitalised, cybersecurity becomes increasingly important. Product definitions should include cybersecurity standards to protect against cyber threats. Reserve products should also consider resilience against physical and cyber threats. This includes criteria for* robustness and redundancy in reserve services.'

TSOs' response – The TSOs agree that cyber security in relation to TSO/system service provider interactions is an important topic. Further consideration on cyber security requirements for TSO/System services provider interactions will be considered as part of ongoing work in relation to the implementation of DASSA arrangements.

For future product reviews several participants noted recommendations along the lines of

- *'The TSOs should engage earlier with stakeholders on the TSOs' own initial thinking on future products and product definitions. This could:*
    - *take the form the basis for a period of co-creation with industry and*
    - *help industry highlight areas where further clarity is needed or there could be unintended consequences.*
    - *allow time for market participants to seek input from OEMs.*
- *Such an approach would enable the TSOs to deliver a comprehensive and well-rounded Product Review'*

TSOs' response – The TSOs note the feedback received from industry in relation to future engagement on System Service products that have not been reviewed or proposed in this paper. It is the TSOs intention to incorporate these insights in the development of the second iteration of the Phased Implementation Roadmap, with work set to commence on these activities in 2025.

10. Next Steps

This paper sets out the TSOs' recommendations to the SEM Committee for the required reserve products for a DASSA auction in 2026, taking into account the detailed responses received from industry during the consultation.

As part of the activities required to implement DASSA arrangements in 2026, the TSOs are also currently developing the Volumes Forecasting Methodology for the proposed Reserve Service products. The TSOs will consult on their proposals on this methodology towards the end of Q3 2024.

It is also worth noting that the enduring high-level model for managing TSO-DSO interactions related to the provision of System Services from distribution connected service providers, including management of limitations on service provision, is currently being considered as part of the TSO-DSO Future Operating Model discussions. Following the agreed high-level vision and principles, detailed design of the arrangements will follow. Note also that the TSOs (EirGrid and SONI) and DSO/DNOs (NIEN and ESBN) plan to engage with relevant stakeholders including industry and the Regulatory Authorities as part of the Future Operating Model work.

This recommendations paper focuses on reserve services. A separate Product Review and Locational Methodology consultation is envisaged during 2025 to examine the required product design for the other DS3 System services, any further alignment with EU requirements and any additional services that may be required for future system operation.

Once the final reserve product definitions are approved by the SEM Committee, a detailed review of the Grid Code in terms of DASSA product definition alignment will begin as outlined in Milestone 15 of the Phased Implementation Roadmap[30]. Moreover, in preparation for the DASSA go live, there will be further detail developed on some aspects that have been highlighted by industry as important considerations related to product design and product procurement. This includes future engagement with industry on our forthcoming VFM proposals, Grid Code alignment workstreams, System Service code development, and further consultation on the design of Performance Scalars.

[30] FASS-TSOs-PIR-March-2024-EirGrid.pdf