



# **SINGLE ELECTRICITY MARKET COMMITTEE**

## **Future Arrangements for System Services Product Review and Locational Methodology**

**Decision Paper**

**SEM-24-074**

**22 October 2024**

## EXECUTIVE SUMMARY

On 4<sup>th</sup> September 2024 the TSOs submitted the recommendations paper on the Day Ahead System Services Auction (DASSA) Product Review and Locational Methodology, under the Future Arrangements for System Services (FASS) project. The TSOs received 17 responses to the consultation. Following a period of engagement with the Regulatory Authorities (RAs), the TSOs formally submitted their Recommendations Paper to the SEM Committee. This decision should be read in conjunction with the TSOs' Recommendations Paper, which is published alongside it.

The SEM Committee has considered the TSOs' Recommendation Paper, alongside consultation responses in publishing this decision. The SEM Committee welcomes the analysis carried out by the TSOs. The recommendations in terms of technical products are reasonable and well defined in terms of addressing system need. In particular the SEM Committee welcomes the proposal to introduce downward reserve products. This will provide market participants with an incentive to provide greater stability to the system and is in line with EU standards. The SEM Committee has decided to approve the products recommended by the TSOs.

There are several areas where the SEM Committee considers that there is a need for more consideration through a further product review, to be conducted ahead of DASSA go-live. The areas in which the SEM Committee requires the TSOs to give further consideration to include:

- the deviation of recommended products with EU requirements as per [EBGL](#)<sup>1</sup>;
- locational methodology; and
- the interaction of the proposed services with the Grid Code.

Additionally, the SEM Committee considers there to be a need for further exploration of the approach to bundling products. Under the DASSA Design Decision Paper (SEM-24-066), the decision was made to proceed with the ability to procure explicit bundle products, alongside the TSOs having the ability to form implicit bundles based on participants' bids. In light of there being no recommendation to define explicit bundle products, and no identified system need for bundling, alongside industry concerns on same, the SEM Committee has decided there is a need to further explore options for bundling products in the DASSA. In that context, a separate workstream needs to be established as part of the programme of work to analyse options in this space.

The SEM Committee considers that the recommended technical definitions for specific System Services products are suitable for the DASSA. However, there is a need for the TSOs to provide more detailed rationale for deviating from the EU Standard Products for Balancing Capacity given the ongoing development of interconnection with mainland Europe and the growth of cross border European trading. The SEM Committee requires that future Product Review consultations begin with the standard products as the base point, with any deviations from these being clearly explained and robustly evidenced.

The High Level Design (HLD) required the TSOs to develop a generally applicable locational methodology that would provide transparency for market participants and investors so that they could better understand any locational requirements for a given service, where they exist. The SEM Committee notes that while the TSOs propose that, initially, locational zones would reflect

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<sup>1</sup> EBGL (EU) 2017/2195: "Establishing a guideline on electricity balancing", <https://eur-lex.europa.eu/eli/reg/2017/2195/oj>

the jurisdictional constraints in Ireland and Northern Ireland no methodology was included in the recommendation paper. The SEM Committee considers there to be a need for a locational methodology for System Services products in order to provide transparency for market participants. The locational methodology is a requirement of the HLD and accordingly the TSOs are directed to include proposals for a methodology to identify and define further locational zones based on system need in the next product review.

The SEM Committee considers that additional information should be provided with regards to technical information on the services and interactions with Grid Code requirements. The SEM Committee requests the TSOs to provide more technical detail in order to facilitate a detailed industry engagement on the product definitions.

Following on from this decision, the TSOs will enter into a detailed review of the Grid Code, in terms of DASSA product definition alignment as outlined in the Phased Implementation Roadmap (PIR). In addition, the PIR is required to be updated to reflect the additional consultation and workstream requirement as required per this decision. A further product review, taking account of this decision, will take place ahead of DASSA go-live.

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## 1. INTRODUCTION & BACKGROUND

The Future Arrangements for System Services (FASS) project was formally launched by the SEM Committee in July 2020, with the publication of a Scoping Paper (SEM-20-044) for public consultation. Following on from this, the SEM Committee published the SSFA Decision Paper 1 (SEM-21-021), in March 2021. This closed the scoping phase (Phase I) and initiated the High Level Design Phase (Phase II).

The High Level Design Consultation paper (SEM-21-069) was issued in August 2021, with the consultation on that paper closing on 21 October 2021. The SEM Committee subsequently published its decision on the High Level Design on 14 April 2022. The decision paper set out a range of decisions that form the SSFA High Level Design. It also closed Phase II of the project and commenced Phase III, Detailed Design and Implementation.

On 8 December 2023 the SEM Committee published its decision on Phase III: Phased Implementation Roadmap (SEM-23-103). This paper set out a proposed Phased Implementation Roadmap (PIR) to support timely delivery of the project. The draft PIR set out responsibilities for the TSOs and RAs for deliverables across the different workstreams of the project and directed the TSOs to revise the draft PIR and publish a more detailed final PIR, subject to SEM Committee approval.

The High-Level Design has three broad pillars. Firstly, the needs analysis which includes the volumes methodology, product design and locational methodology. In essence, setting out what needs to be procured, where and in what volume. In this implementation phase, the establishment of the underlying methodologies for these analyses are important; and on an enduring basis analysis within the methodologies will ensure that system needs are clearly identified and provide transparency for market participants. Secondly, there is market design which includes the DASSA, LPF and Fixed Contract Framework. In essence, establishing the mechanisms for how the identified system needs will be procured and on what timeframe. Lastly, there is governance which includes the qualification process, the System Services Code and supplier tariff. These collectively set out the rules and procedures for the arrangements established by the High-Level design and the processes for making changes.

Following on from the SEM Committee's decision, the TSOs subsequently published the final PIR and committed to reviewing the workstreams and publishing an updated PIR every six months. The PIR specified that the TSOs would develop a consultation paper on the DASSA Product Review and Locational Methodology by the end of May 2024. This consultation was published in May 2024. Following a consultation period which included a workshop, the TSOs commenced a period of engagement with the Regulatory Authorities during the development of the recommendation paper, and subsequently submitted their recommendations paper. This paper sets out the SEM Committee's decisions with respect to the DASSA Product Review and Locational Methodology.

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## 1.1. Objectives and Assessment Criteria

SEM-21-021 set out a final decision on the Objective of the project and Assessment Criteria. The objective of the project is:

*“to deliver a competitive framework for the procurement of System Services, that ensures secure operation of the electricity system with higher levels of non-synchronous generation.”*

In order to better facilitate the achievement of this objective, the SEM Committee has developed a set of criteria for assessing the proposed framework:

- **Consumer Value:** The pricing of services will be market-based in so far as these secure competitive outcomes in order to deliver consumer value, while taking into account levels of market power for each service;
- **European Compliance:** The arrangements will comply with relevant legislation including the Clean Energy Package (CEP) and the Electricity Balancing Guideline (EBGL) Network Code;
- **System Need:** The framework will operate in a manner which ensures the needs of the system including security of supply are maintained;
- **Alignment:** The SEM Committee will seek to ensure appropriate alignment between the markets in energy, capacity, and System Services, along with all other relevant revenue streams, to ensure an efficient overall outcome for consumers;
- **Accuracy:** The volume of services procured should match the requirements of the system as accurately as possible;
- **Adaptability:** The framework should be sufficiently agile to meet any system changes caused by future policy developments;
- **Simplicity:** The framework should be sufficiently simple and transparent to be readily understood and accessible to all stakeholders;
- **Enable the Energy Transition:** The arrangements will be cognisant of policy decisions in Ireland, Northern Ireland and the UK, and will enable the energy transition in so far as possible;
- **Clarity for Investors:** The arrangements will be clear in terms of how auctions will operate, in order to give a reasonable degree of clarity to developers in terms of financing; and

- **Transparency:** The framework will be transparent such that there will be no imbalance of information among market participants, and full sight of auction results and procurement requirements will be fully visible.

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## 1.2. Paper Structure

The decision paper is structured as follows:

- Reserve Product definitions
- EU Alignment
- Reserve Product definitions: Bundling
- Locational Requirements
- Reserve Product Scalars
- Additional Considerations
- Summary of Decisions
- Next Steps

## 2. RESERVE PRODUCT DEFINITIONS

The TSOs have provided a number of recommended updates to reserve requirements to support maintaining frequency within the standard frequency ranges and to mitigate large disturbances to the system in response to changing system needs in the future. As set out below, the SEM Committee has approved the proposals and the revised product definitions are set out in Annex 1 and 2 of this paper.

The SEM Committee welcomes the analysis of the TSOs in this area. The SEM Committee acknowledges that the needs of the system are changing in response to changes to the demand profile and the types of technologies present on the system. It is therefore important that the reserve requirements are reviewed and updated to reflect those changing needs. In that context, the SEM Committee considers the recommendations of the TSOs to be reasonable.

The SEM Committee notes the concerns raised by respondents on the assessment of system needs based on the system in 2025, for go-live in 2026. Additionally, system requirements could change with the Celtic Interconnector due to go-live in late 2026 and the building of the new North South interconnector. This raised concerns about the need to make changes to the Reserve Service as the system evolves, creating uncertainty for market participants. Whilst some stakeholders generally agreed with the TSOs' identification of system needs, several stakeholders highlighted the importance of regular review of system needs on an on-going basis. The SEM Committee considers that subsequent product reviews may benefit from considering the future and evolving system needs and potential impacts, if any, this may have on the reserve requirements in the future. In that context the SEM Committee considers it important that there is a further reserve product review consultation conducted ahead of DASSA go-live.

The SEM Committee also notes that respondents requested further clarity and detail on the technical rationale for the proposals, considerations for different technology types and the interactions with other requirements such as Grid Code. The SEM Committee requests that future product reviews and analysis provide additional detail in this regard.

SEMC Decision: The SEM Committee approves the proposed product designs for the reserve services as set out in Annex 1 and Annex 2 of this paper subject to a further product review being carried out in 2026. This review should include additional detail as discussed above.

### 3. EU ALIGNMENT

TSO Recommendations: In their consultation the TSOs reviewed the EU requirements in the context of balancing capacity products and of current and future operational requirements. In the recommendation paper the TSOs consider that the balancing capacity products offered and procured through 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. The TSOs are collaborating with the RAs to ensure the design complies with all relevant regulations.

SEMC Commentary: The SEM Committee welcomes the analysis of the TSOs in this area. The SEM Committee notes that the TSOs did not propose the use of Standard Products and all of the proposed products are Specific Products in terms of the EU framework. The TSOs note that EU regulations allow TSOs to propose specific balancing products including both balancing energy and balancing capacity, if required for operational security. However, the TSOs do not fully explain the reason for the deviation in their recommendation paper. As per the Electricity Balancing Guideline (EBGL) Article 26 (1) the TSOs are required to provide reasons for the deviation from the standard EU products. The SEM Committee requires the TSOs to include in-depth analysis on the reason for deviation from standard EU products in the future consultations prior to DASSA go-live. In addition, the analysis should begin from whether, and to what extent, the standard products meet system needs with the use of specific products being reserved for system needs that cannot be addressed by the standard products.

In the recommendation paper the TSOs have also indicated that they have started industry engagement on the conversion of SEM integrated scheduling process bids (balancing energy bid/offer acceptances (BOAs)) to EU standard balancing products. The SEM Committee welcomes the TSOs commitment for further engagement with industry in this area.

SEMC Decision: The SEM Committee considers that further analysis is needed in relation to the extent to which standard products can meet system needs and on the need to deviate from or supplement those products. This analysis should be included in the next product review.



## 4. RESERVE PRODUCT DEFINITIONS: BUNDLING

The definition for explicit and implicit bundling was another area where concern was raised by the respondents. In the DASSA design decision paper ([SEM-24-066](#)), the SEM Committee welcomed the commitment from the TSOs to enabling the addition of explicit bundle service products and decided that services will initially be procured both on an individual service basis and for any explicit bundle of services that may be defined as an individual product in the auction. The SEM Committee also decided to allow the TSOs to implicitly bundle products, in order to account for system needs (for example for continuous service provision, similar to current operational constraints).

In making this decision the SEM Committee noted that the ability to have explicit bundles could address service providers' concerns relating to costs and inefficient auction outcomes. The SEM Committee considers that implicit bundles should only be used where there is a clear system need. The use of implicit bundles could reduce liquidity in the secondary market and could introduce inefficiencies into DASSA bidding. Therefore, where implicit bundles are used, the TSOs should create definitions for an equivalent explicit bundle to remove the need for that implicit bundle as quickly as is practical.

SEM-24-066 indicated that the RAs were further exploring the approach to bundling, and would engage with the TSOs regarding the potential for introducing additional measures post Go-Live. In light of the concerns raised by stakeholders in terms of the approach to bundling, the SEM Committee has decided that a workstream exploring options for bundling is to be established, and a consultation will take place on bundling in the future. It is noted that enduring solution for bundling may not be implemented for Go-Live, in which case the framework of implicit and explicit bundling will remain in place.

**SEMC Decision:** The SEM Committee has decided that a workstream exploring options for bundling is to be established, and a consultation will take place on bundling in the future. The timing of this consultation will be set out in the next version of the PIR.

## 5. LOCATIONAL REQUIREMENTS

TSO Recommendations: In their consultation the TSOs outlined the locational considerations in relation to the reserve services required to maintain frequency within operational standards. In the recommendation paper the TSOs recommend maintaining jurisdictional reserve requirements for upward reserves and the introduction of jurisdictional requirements for downward reserves. These requirements can be reviewed in line with the delivery of the second North – South Interconnector.

SEMC Commentary: The SEM Committee welcomes the analysis of the TSOs in this area. The SEM Committee notes the concern raised by respondents that little detail was provided on the locational elements of the DASSA in the consultation paper. The SEM Committee welcomes the additional information that has been provided by the TSOs as part of the recommendation paper. The SEM Committee also appreciates the TSOs commitment to carry out a separate consultation on the locational requirements after the introduction of the North – South Interconnector.

The TSOs do not foresee other system characteristics that would trigger the need for locational requirements for reserves. While the Celtic Interconnector is expected to impact the All-Island Largest Single Infeed (LSI) and Largest Single outfeed (LSO), the TSOs do not envisage that it will result in additional locational requirements. The same applies for other system characteristics, such as the level of renewables, and system non-synchronous penetration.

However, the SEM Committee notes that no locational methodology was included in the recommendations paper as per the requirement of the High-Level Design (HLD). The Committee notes that the requirements for reserve in Ireland and Northern Ireland are based on existing operational constraints. However, the HLD required a generally applicable methodology that would provide transparency for market participants and investors so that they could better understand any locational requirements for a given service, where they exist. The SEM Committee requires the TSOs to develop a Locational methodology for consultation, as required by the HLD prior to DASSA go-live.

SEMC Decision: The SEM Committee has decided to approve the TSOs' recommendation to maintain current locational reserve requirements for upward reserves and to introduce those same locational requirements for downward reserves. Additionally, the SEM Committee requires the TSOs to develop and consult on a locational methodology for system services, prior to DASSA go-live.

## 6. RESERVE PRODUCT SCALARS

TSO Recommendations: In their consultation the TSOs provided justifications for the removal of DS3 scalars for the DASSA auction process and proposed the introduction of two performance scalars. In the recommendation paper the TSOs' recommend that only performance scalars targeted at availability performance and event performance are applicable to market participants. Further, it was recommended that consultation on the design of such scalars take place.

SEMC Commentary: The SEM Committee welcomes the analysis of the TSOs in this area. The SEM Committee agrees with the respondents' feedback that scalars are not aligned with a competitive market which were specifically designed for the existing Regulated Arrangements. As per the DASSA Decision Paper (SEM-24-066) the incentivisation for maintaining availability at all times, up to and including real-time dispatch, should be dealt with through the commitment obligation framework.

SEMC Decision: In consideration of the DASSA Market Design decision the SEM Committee requires the TSOs to carry out further consultation to determine unit performance standards at the point of activation. Incentivisation of maintaining availability at all times, up to and including real-time dispatch, should be dealt with through the commitment obligation framework.

## 7. ADDITIONAL CONSIDERATIONS

This section provides a summary of the SEM Committee's considerations on further topics raised by respondents in response to the TSOs' questions regarding additional aspects that the respondents think that the TSOs should consider with regards to product definitions. The main issues raised by respondents are summarised below.

### 7.1. Trips due to loss of LSI/LSO:

The SEM Committee notes that some respondents flagged the risk of multiple trips due to the loss of one infeed/outfeed. The TSOs noted that the all-island reserve volume requirements will primarily be determined on the basis of the loss of the largest single infeed/outfeed (LSI/LSO). In both cases, the TSOs will consider consequential trips of other infeeds or outfeeds in setting the overall volume requirements. The SEM Committee welcomes the TSOs' commitment of providing further information on the volume forecasting methodology in the forthcoming volumes consultation.

### 7.2. Existing system services

The SEM Committee notes that one of the respondents raised concerns around the pace at which changes are being introduced in the market and stressed the importance of keeping existing system service providers whole. The SEM Committee welcomes the TSOs' commitment to consider all other potential system service needs as part of the Future Product review and

consultation outlined for 2025. It is noted that the transition to competitive markets, either through DASSA, LPF, or Fixed Contracts, will ensure that remuneration to all system services providers will be market-based.

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### **7.3. Availability declaration requirements and Scalar design**

The SEM Committee notes that respondents raised concerns on the Availability declaration requirements and linkage between Data-Poor-Records and the Performance Scalar. The SEM Committee welcomes the TSOs' commitment to address the issues in the future as part of DASSA implementation and requests the TSOs to carry out consultation to determine performance standards at the point of activation.

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### **7.4. Integration of the SEM into EU day ahead, intraday and balancing markets and capacity considerations**

The SEM Committee notes that concerns were raised by respondents on the full integration of the SEM into EU day ahead, intraday and balancing markets. The SEM Committee welcomes the TSOs' commitment to provide information on the integration of SEM into EU markets and also provide information on capacity considerations through the TSOs' regular Future Power Market updates.

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### **7.5. Cyber security in relation to TSO/system service provider**

The SEM Committee notes that respondents raised concerns around cyber security with regards to the TSO/system service provider interactions. The SEM Committee welcomes the TSOs' commitment to addressing this concern as part of ongoing work in relation to the implementation of DASSA arrangements.

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### **7.6. Early engagement**

The SEM Committee notes one of the respondent's requests around early engagement with industry for product reviews in order to allow enough time for consultation with Original Equipment Manufacturers (OEMs). The SEM Committee welcomes the TSOs' commitment 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.

## 8. SUMMARY OF DECISIONS

Having considered the TSOs' position, alongside industry feedback, the SEM Committee has made a number of decisions on the proposals set out the TSOs' recommendations:

### **Reserve Product Definitions:**

The SEM Committee approves the proposed product designs for the reserve services as set out in Annex 1 and Annex 2 of this paper subject to a further product review being carried out in 2026. This review should include additional detail as discussed above.

### **EU Alignment Considerations:**

The SEM Committee considers that further analysis is needed in relation to the extent to which standard products can meet system needs and on the need to deviate from or supplement those products. This analysis should be included in the next product review.

### **Bundling:**

The SEM Committee has decided that a workstream exploring options for bundling is to be established, and a consultation will take place on bundling in the future. The timing of this consultation will be set out in the next version of the PIR.

### **Locational Requirements:**

The SEM Committee has decided to approve the TSOs' recommendation to maintain current locational reserve requirements for upward reserves and to introduce the same locational requirements for downward reserves. Additionally, the SEM Committee requires, as per the HLD, the TSOs to develop and consult on a locational methodology for system services, prior to DASSA go-live.

### **Reserve Product Scalars:**

In consideration of the DASSA Market Design decision the SEM Committee requires the TSOs to carry out further consultation to determine unit performance standards at the point of activation. Incentivisation of maintaining availability at all times, up to and including real-time dispatch, should be dealt with through the commitment obligation framework.

## 9. NEXT STEPS

The TSOs to enter into a detailed review of the Grid Code, in terms of DASSA product definition alignment as outlined in the Phased Implementation Roadmap. In addition, the TSOs should also update the PIR to reflect the additional consultation and workstream requirement as required per this decision. A separate Product Review and Locational Methodology consultation be undertaken during 2025 to examine the required product design for the other System services, any further alignment with EU requirements and any additional services that may be required for future system operation.

## ANNEX 1

The TSOs have made several recommendations so as to maintain the frequency within the standard frequency range and mitigate large disturbances. These include:

- **Response time:** In the recommendation paper the TSOs recommend that the faster time to frequency nadir/zenith necessitates faster responding FFR. In Chapter 6 of the DASSA Product Review and Locational Methodology recommendation paper 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 ( $\pm 15$  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  $\pm 15 - 500$  mHz.
  - Static response provision can be tailored to provide response to mitigate larger frequency excursions, with a deadband range of  $\pm 200 - 700$  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).
- **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.

## ANNEX 2

Table 1 summarises the response times and the response duration of the different types of reserve products proposed to be procured for DASSA. The table applies to both Upward and Downward Reserves and are to be contracted separately.

Table 1. Response times and Response duration for Upward and Downward Reserves

Reserve product	Category	FAT	Response duration
FFR – Static response	I	150 ms	Response sustainable up to 10s 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	90s	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 2 specifies additional key requirements for the proposed products for Upward FFR, POR, SOR, TOR1 and TOR2, separately for Static and Dynamic categories, while Table 3 shows similar (but mirrored) requirements for the Downward products and categories. The reserve Trigger F1 and F2 have been defined in Figure 9 of the TSOs' recommendation paper (Section 6.3).

Table 2. Additional key requirements for Upward FFR, POR, SOR, TOR1 and TOR2

Criteria for	Trigger F1	End of trajectory F2	Reserve Steps Sizes	Reserve Step Triggers
Static FFR, POR, SOR, TOR1 and TOR2	configurable for each step between: $49.3 \leq F1 \leq 49.8$ Hz	Not applicable	1 or more steps of $\leq 75$ 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: $49.5 \leq F1 \leq 49.985$ Hz	configurable in range: $49.3 \leq F2 \leq 49.8$ Hz and $F1 - F2 \geq 200$ mHz	Not applicable	Not applicable

Table 3. Additional key requirements for Downward FFR, POR, SOR, TOR1 and TOR2

Criteria for	Trigger F1	End of trajectory F2	Reserve Steps Sizes	Reserve Step Triggers
Static FFR, POR, SOR, TOR1 and TOR2	configurable in range for each step: $50.2 \leq F1 \leq 50.7$ Hz	Not applicable	1 or more steps of $\leq 75$ 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: $50.015 \leq F1 \leq 50.5$ Hz	configurable in range: $50.2 \leq F2 \leq 50.7$ Hz and $F2 - F1 \geq 200$ mHz	Not applicable	Not applicable