

DS3 System Services Scalar Design RECOMMENDATIONS PAPER

DS3 System Services Implementation Project

23 October 2017



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Executive Summary

The SEM Committee decision paper SEM-14-108 directed that System Services scalars should be implemented to incentivise flexibility, reliability, value for money and performance. Scalars are categorised under four categories: Performance, Scarcity, Product and Volume.

In July 2017, EirGrid and SONI published a consultation paper on the TSOs' minded-to position for Enduring DS3 System Services scalar design. The consultation paper set out our proposals for each category of scalar, as well as our initial thoughts relating to the implementation of frequency response curves as a means of defining the provision of the Fast Frequency Response Service. Feedback was invited from interested stakeholders.

Following consideration of the responses to the consultation, we are publishing this recommendations paper on DS3 System Services Scalar Design. The purpose of this paper is to provide stakeholders with information on the various elements of our recommendations.

This paper is being published in parallel with the recommendations paper on DS3 System Services Tariffs for Regulated Arrangements. The tariffs for Regulated Arrangements underpin the rationale for both the choice of scalars and their values, with particular reference to the temporal scarcity framework.

DS3 System Services Scalars Recommended for Regulated Arrangements

The scalars listed below are recommended for implementation for Regulated Arrangements:

- Performance Scalar
- Product Scalar for the Faster Response of FFR
- Product Scalar for the Enhanced Delivery of FFR, POR, SOR and TOR1
- Product Scalar for the Continuous Provision of Reserve from FFR to TOR1
- Product Scalar for the Enhanced Delivery of SSRP with an AVR
- Product Scalar for SSRP with Watt-less MVars
- Temporal Scarcity Scalar for DRR and FPFAPR
- Temporal Scarcity Scalar for FFR
- Temporal Scarcity Scalar for 11 Existing System Services
- Locational Scarcity Scalar for All System Services

In this document, we describe the specific design features of the scalars that we recommend should be implemented for Regulated Arrangements and put forward the rationale behind our recommendations. Consideration has been given to the feedback to the consultation, which is reflected in some of our design choices.

With regard to the product scalar for the enhanced delivery specifically of the FFR Service, this document will set out the next steps in the development of the scalar. It is our position that frequency response curves should be implemented for the purpose of defining the provision of FFR for Regulated Arrangements, with the curves' parameters to inform the design of the product scalar for the enhanced provision of FFR. The latest thinking on this design is set out as part of the consultation on DS3 System Services Contracts for Regulated Arrangements; this is to facilitate additional feedback from interested parties to our proposals.

DS3 System Services Scalars Not Recommended for Regulated Arrangements

The scalars listed below are not recommended for implementation for Regulated Arrangements:

- Locational scarcity scalar for SSRP
- Product scalar for enhanced delivery of DRR with more reactive current
- Product scalar for enhanced delivery of SSRP with a PSS
- Product scalar for SIR with Reserve
- Product scalar for Faster Response of FPFAPR
- Temporal scarcity scalar for Reserve Products
- Temporal scarcity scalar for SIR
- Volume scalar

In this document, we put forward the rationale behind our recommendation that these scalars should not be implemented. While these do not include any scalars already implemented for Interim Arrangements, they do include a scalar – the volume scalar – that we had previously been minded to implement for Regulated Arrangements.

Frequency Response Curves Proposed for Regulated Arrangements

It is our position that frequency response curves should be implemented for the purpose of defining the provision of the Fast Frequency Response Service for Regulated Arrangements. The curves would include control parameters that would be specified bespoke to each providing unit, depending on the unit's capabilities and system requirements. Arising from the completion of initial TSO studies on the suitability of selected curves, we propose that a response curve for units capable of a dynamic response to frequency events and a separate curve for units capable of delivering static responses be implemented.

Our latest thinking on the design of the response curves, including qualifying criteria and the parameters inputting to the product scalar for the enhanced delivery of FFR, is set out as part of the consultation on DS3 System Services Contracts for Regulated

Arrangements; this measure is to facilitate additional feedback from interested parties to our proposals.

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1. Introduction and Background

1.1. DS3 Programme

The objective of the 'Delivering a Secure Sustainable Electricity System (DS3)' Programme, of which System Services is a part, is to meet the challenges of operating the electricity system in a safe, secure and efficient manner while facilitating higher levels of renewable energy.

One of the key workstreams of the DS3 Programme is System Services. The aim of the System Services workstream is to put in place the correct structure, level and type of services in order to ensure that the system can operate securely with higher levels of non-synchronous renewable generation (up to 75% instantaneous penetration). Operating in this manner will reduce the level of curtailment for wind farms and should deliver significant savings to consumers through lower wholesale energy prices.

1.2. DS3 System Services

In December 2014, the SEM Committee published a decision paper on the high-level design for the procurement of DS3 System Services (SEM-14-108)¹.

The SEM Committee's decision framework aims to achieve the following:

- Provide a framework for the introduction of a competitive mechanism for procurement of System Services;
- Provide certainty for the renewables industry that the regulatory structures and regulatory decisions are in place to secure the procurement of the required volumes of System Services;
- Provide certainty to new providers of System Services that the procurement framework provides a mechanism against which significant investments can be financed;
- Provide clarity to existing providers of System Services that they will receive appropriate remuneration for the Services which they provide;
- Provide clarity to the TSOs that the required System Services can be procured from 2016 onwards in order to maintain the secure operation of the system as the level of wind increases;

¹ DS3 System Services Procurement Design and Emerging Thinking Decision Paper (SEM-14-108): <https://www.semcommittee.com/sites/semcommittee.com/files/media-files/SEM-14-108%20DS3%20System%20Services%20Decision%20Paper.pdf>

- Provide clarity to the Governments in Ireland and Northern Ireland (and indeed the European Commission) that appropriate structures are in place to assist in the delivery of the 2020 renewables targets;
- Ensure that Article 16 of Directive 2009/EC/28 is being effectively implemented (duty to minimise curtailment of renewable electricity);
- Provide assurance to consumers that savings in the cost of wholesale electricity, which can be delivered through higher levels of wind on the electricity system, can be harnessed for the benefit of consumers;
- Provide assurance to consumers that they will not pay more through System Services than the benefit in terms of System Marginal Price (SMP) savings which higher levels of wind can deliver².

Table 1 below provides a high-level summary of the DS3 System Services products.

Table 1: Summary of DS3 System Services Products

Service Name	Abbr.	Unit of Payment	Short Description
Synchronous Inertial Response	SIR	MWs ² h	(Stored kinetic energy) * (SIR Factor – 15)
Fast Frequency Response	FFR	MWh	MW delivered between 2 and 10 seconds
Primary Operating Reserve	POR	MWh	MW delivered between 5 and 15 seconds
Secondary Operating Reserve	SOR	MWh	MW delivered between 15 to 90 seconds
Tertiary Operating Reserve 1	TOR1	MWh	MW delivered between 90 seconds to 5 minutes
Tertiary Operating Reserve 2	TOR2	MWh	MW delivered between 5 minutes to 20 minutes
Replacement Reserve – Synchronised	RRS	MWh	MW delivered between 20 minutes to 1 hour
Replacement Reserve – Desynchronised	RRD	MWh	MW delivered between 20 minutes to 1 hour

² Note: the composition of the price that will be paid by end consumers for wholesale electricity will change significantly following the introduction of the I-SEM trading arrangements. The savings delivered by DS3 will be split across the imbalance settlement, balancing costs, the price in the ex-ante markets and the Capacity Remuneration Mechanism.

Ramping Margin 1	RM1	MWh	The increased MW output that can be delivered with a good degree of certainty for the given time horizon.
Ramping Margin 3	RM3	MWh	
Ramping Margin 8	RM8	MWh	
Fast Post Fault Active Power Recovery	FPFAPR	MWh	Active power >90% within 250 ms of voltage >90%
Steady State Reactive Power	SSRP	MVarh	MVar capability* (% of capacity that MVar capability is achievable)
Dynamic Reactive Response	DRR	MWh	MVar capability during large (>30%) voltage dips

1.3. DS3 System Services Scalars

The SEM Committee decision paper SEM-14-108 directed that scalars should be applied to the remuneration rates of the 14 System Services in order to incentivise flexibility, reliability, value for money and performance.

The paper classified scalars under four categories – Product, Scarcity, Volume and Performance – and described their purpose as follows:

Product Scalar: "Incentivising both the more effective delivery of a service and for faster response times for certain services."

Scarcity Scalar: "To create marginal incentives for providers to make themselves available during periods or in locations of scarcity, therefore enhancing the performance of the system where it is most needed."

Volume Scalar: "To ensure consumers are protected from unnecessarily high prices and maintain the integrity of the overall procurement process."

Performance Scalar: "To reward and incentivise high levels of performance" and "to ensure lower payments from the consumer for a lower level of performance."

1.4. DS3 System Services Volumes and Tariffs

The finalised recommended design of the System Services scalars has been arrived at in conjunction with the tariffs recommended for implementation for Regulated Arrangements. The underlying principles in determining those tariffs – including ensuring that payments for System Services stay within the overall expenditure set out by the SEM Committee, the need to drive investment in necessary System Services provision, and the appropriate coordination between energy, capacity and System Services payments – have informed the design and values of the scalars. The recommendations

paper on DS3 System Services Tariffs for Regulated Arrangements sets out the tariffs and their underlying rationale in detail.

Figure 1 illustrates the interaction between tariffs and scalars for Regulated Arrangements.

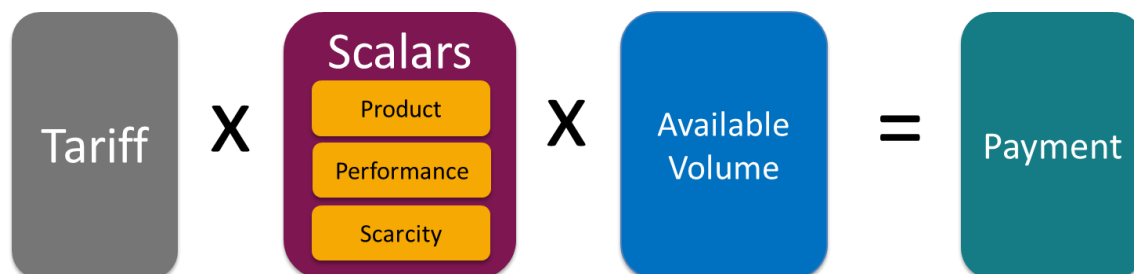


Figure 1: System Services Regulated Tariffs, Scalars and Volumes

1.5. 2017 Consultation on Enduring Scalar Design

In July 2017, EirGrid and SONI published a consultation paper on the TSOs' minded-to position for enduring DS3 System Services scalar design³. This consultation paper set out our proposals for each category of scalar as well as our initial thoughts relating to the implementation of frequency response curves as a means of defining the provision of the Fast Frequency Response Service. The consultation paper invited feedback from stakeholders through the presentation of a series of questions, 18 in total, relating to the specific proposals for scalars and frequency response curves. A total of 23 responses were received, including 5 where the respondents requested confidentiality.

The 18 responses that were not marked confidential were received from the following parties:

³ 2017 Consultation on DS3 System Services Scalar Design:
<http://www.eirgridgroup.com/site-files/library/EirGrid/DS3-System-Services-Enduring-Scalar-Design-Consultation-Paper.pdf>

AES	Bord Gáis Energy
Bord Na Mona	Demand Response Aggregators for Ireland
Electric Ireland	Electricity Association of Ireland
Electricity Exchange	Endeco Technologies
Energia	ESB GWM
Innogy Renewables Ireland	IWEA
Lumcloon Energy	Moyle Interconnector Ltd
Power Capital Renewable Energy	PowerNI PBB
Renewable Energy Systems Ltd	SSE

1.6. Other Inputs to Scalar Design

Prior to the July 2017 publication of the consultation on Enduring Scalar Design, the TSOs had previously consulted on the design of System Services scalars, publishing a consultation paper in March 2016⁴. This paper proposed a number of scalars to be implemented across the 4 scalar categories and provided stakeholders with the opportunity to feed into the design process through consultation.

Published alongside this earlier consultation paper was a report completed by TNEI and Pöyry on the design of the Product, Scarcity and Volume Scalars, "High Level Principles of Scalars for DS3 System Services", which was commissioned by the TSOs⁵. In the consultation, the TSOs set out their views with regard to the recommendations made in the TNEI / Pöyry report; while the latter suggested multiple scalars, only a subset of these was initially proposed for implementation in the consultation paper.

Both the 2016 consultation paper, the feedback received to it from industry, and the TNEI / Pöyry report remain key inputs to Systems Services scalar design.

⁴ 2016 Consultation on DS3 System Services Scalar Design:
<http://www.eirgridgroup.com/site-files/library/EirGrid/DS3-System-Services-Scalar-Design-Consultation-FINAL.pdf>

⁵ High Level Principles of Scalars for DS3 System Services:
<http://www.eirgridgroup.com/site-files/library/EirGrid/High-Level-Principles-of-Scalars-for-DS3-System-Services-FINAL.pdf>

1.7. Purpose of This Document

The purpose of this document is to describe the scalars that we recommend should be implemented for Regulated Arrangements. The design of the scalars reflects the recommended tariffs for Regulated Arrangements, feedback received from stakeholders through the scalar consultation process, additional detailed analysis and studies carried out by the TSOs, and learnings gleaned from Interim Arrangements.

1.8. Structure of This Document

This document will detail our recommendations on the scalars that should be implemented for Regulated Arrangements, provide a summary of responses received from the consultation on Enduring Scalar Design, and set out the rationale for the chosen course.

Section 2 describes the System Services scalars that we recommend should be implemented for Regulated Arrangements.

Section 3 details those scalars that we recommend should not be implemented for Regulated Arrangements.

Section 4 details the feedback received to the proposal to implement frequency response curves for the definition of the FFR Service and sets out the next steps in the refinement of the proposal.

2. Scalars Recommended for Regulated Arrangements

The TSOs recommend that the following scalars should be implemented for the duration of Regulated Arrangements:

- Performance Scalar
- Product Scalar for the Faster Response of FFR
- Product Scalar for the Enhanced Delivery of FFR, POR, SOR and TOR1
- Product Scalar for the Continuous Provision of Reserve from FFR to TOR1
- Product Scalar for the Enhanced Delivery of SSRP with an AVR
- Product Scalar for SSRP with Watt-less MVars
- Temporal Scarcity Scalar for DRR and FPFAPR
- Temporal Scarcity Scalar for FFR
- Temporal Scarcity Scalar for 11 Existing System Services
- Locational Scarcity Scalar for All System Services

The following sections describe the finalised design that we recommend should be implemented for each of the above scalars for Regulated Arrangements. Where applicable, we note those design measures that continue to be subject to consultation.

2.1. Performance Scalar

Summary

This section sets out the TSOs' recommendation that the Protocol document accompanying the contractual agreement for the provision of System Services⁶ should be utilised to define the performance scalar and its underlying methodologies for the duration of Regulated Arrangements.

In addition, this section summarises the feedback to the TSOs' proposal to introduce an assessment of *certainty of service availability* as a component of the performance scalar for Regulated Arrangements. Our latest thinking on the composition of the performance scalar is presented as part of the consultation on DS3 System Services Contracts for Regulated Arrangements⁷.

Introduction

Performance reliability is a key aspect of the System Services arrangements. A unit that performs consistently when called upon to provide a Service gives a greater degree of certainty to the TSOs than a unit that performs sporadically. The SEM Committee decision paper SEM-14-108 proposed that a performance scalar be introduced that rewards and incentivises high levels of performance as well as ensuring lower payments for lower levels of performance.

Protocol Document for Regulated Arrangements

The Protocol document accompanying the contractual agreement for the provision of System Services provides information on compliance and performance monitoring requirements that need to be satisfied by providing units as part of DS3 System Services contractual arrangements.

Interim Arrangements

For Interim Arrangements, the specification of the performance scalar and its related performance assessment methodologies has been set out in the Protocol document accompanying the contractual framework. The Protocol document allows for the amendment of the performance scalar on a quarterly basis from the commencement of Interim Arrangements (subject to approval by the Regulatory Authorities).

⁶ DS3 System Services Protocol – Interim Arrangements
<http://www.eirgridgroup.com/site-files/library/EirGrid/DS3-System-Services-Interim-Protocol-Documents/DS3-System-Services-Interim-Protocol-Documents-Version-2.1.pdf>

⁷ Consultation on DS3 System Services Contracts for Regulated Arrangements
http://www.eirgridgroup.com/site-files/library/EirGrid/DS3-System-Services-Regulated-Contracts-Consultation_final.pdf

As an example of how the Protocol document has functioned in practice, in response to prior consultation feedback from stakeholders on the design of the performance scalar as implemented at the commencement of Interim Arrangements, the TSOs addressed issues relating, but not limited, to the binary nature of the pass / fail award and the infrequency of relevant system events and its impact on a unit's 'reliability'. The output of this process was the decision paper on Interim Performance Scalar Revised Methodology⁸, which was published on 28 June 2017; the amended methodologies have been reflected in the Protocol document since 1 July 2017.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that the contractual definition of the performance scalar, and underlying performance assessment methodologies, would be described in the Protocol document to accompany the contractual agreement for the provision of System Services for Regulated Arrangements, as per the Interim Arrangements. This would allow for the ongoing development of those methodologies as required and as dependent TSO systems allow.

Stakeholder Comments on the Protocol Document for Regulated Arrangements

While no specific question was asked relating to the utilisation of the Protocol document as described above for Regulated Arrangements, 2 stakeholders commented on the risk to investment of the ability of the TSOs to make significant changes to the performance scalar through this means during the lifetime of Regulated Arrangements.

TSO Recommendation for Regulated Arrangements

We recommend that the contractual definition of the performance scalar and underlying performance assessment methodologies should be set out in the Protocol document to accompany the contractual agreement for the provision of System Services for Regulated Arrangements. This would maintain the practice implemented for Interim Arrangements.

Rationale for Recommendation

This recommendation would allow for the continuing development of performance assessment methodologies for the duration of Regulated Arrangements, reflecting advanced thinking on their design, ongoing feedback from stakeholders, and periodic TSO system deliverables.

⁸ Decision Paper on the Revised DS3 System Services Interim Performance Methodologies: <http://www.eirgridgroup.com/site-files/library/EirGrid/Decision-Paper-Interim-Performance-Scalars-Revised-Methodology.pdf>

Changes to the Protocol document would be subject to consultation with industry and approval by the Regulatory Authorities.

Certainty of Service Availability

The TSOs consider that *certainty of service availability* will become increasingly important as more providing units with greater variability in their service availability provide System Services for Regulated Arrangements. As such, we recommend that the composition of the performance scalar should include an additional measure to incentivise a unit to supply to the TSOs an accurate forecast of its availability to provide reserve and ramping margin Services.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that a unit be required to supply a forecast, in advance, of its availability to provide any of the reserve or ramping margin Services. It was proposed that discount factors would apply, in the form of a reduced performance scalar, where an ex-post evaluation of a unit's declared forecasted availability against its actual availability had shown an over-forecast of availability to provide said Services.

We proposed that units were to provide a forecast of availability for a block of 6 hours, i.e. 12 trading periods, at a minimum of 6 hours (latest provision time) in advance of that block commencing.

It was proposed that this measure would be allowed for in contracts for Regulated Arrangements but that, in acknowledgement of the system and signal availability dependencies, the proposal may not be implemented at the commencement of Regulated Arrangements in 2018.

Figure 2 below illustrates at a high level how the proposed evaluation of an over-forecast of availability would be carried out.

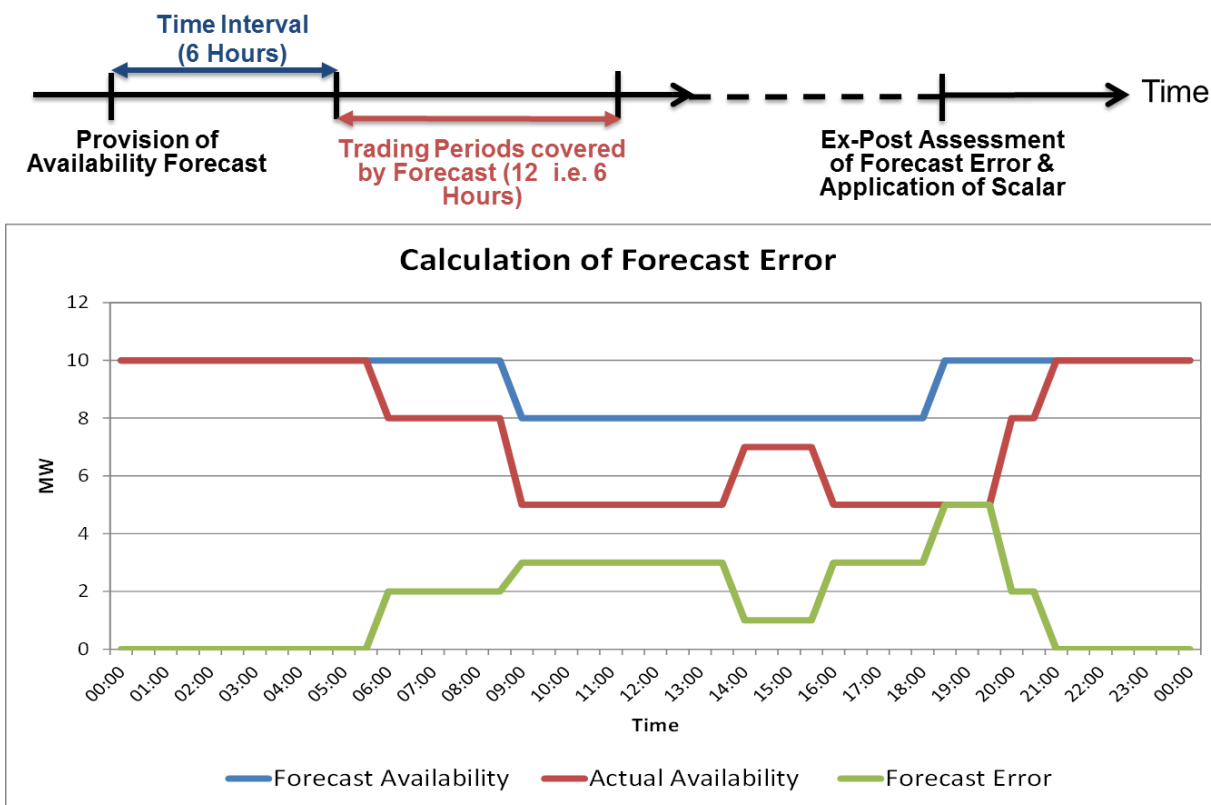


Figure 2: Proposed Evaluation of Certainty of Service Availability

Stakeholder Comments on Certainty of Service Availability

The following question was asked in the consultation paper:

“Do you agree with our proposal to include in the performance assessment methodology to determine the value of the Performance Scalar an additional measure to incentivise a unit to supply to the TSOs an accurate forecast of its availability to provide Reserve and Ramping Margin Services? If not, please specify why or identify what element of the proposal you believe requires amendment?”

There was a mixed response to this proposal. 2 respondents agreed in principle with the proposal without proposing any changes to the design. 11 respondents agreed in principle with the proposal, but disagreed with some of the specifics of the design.

A number of respondents questioned whether the 6-hour forecast would be workable, particularly for wind generation, and suggested that nearer time would be more accurate and less likely to result in penalties for inaccurate forecasting; potential remedies included a weighting for forecasts of availability depending on the timing, and the application of tolerances to the forecasts.

Some respondents noted that over-forecasting of availability should be treated more favourably than under-forecasting. Respondents commented that a scalar greater than unity should apply to accurate forecasts.

Respondents also noted that the design should not conflict with any incentive mechanisms that will be in place for I-SEM.

6 respondents did not agree with the proposal. The rationale for the measure was questioned as it was posited that mechanisms already exist in the market to incentivise this behaviour. Respondents commented that it represented a change to the design of the performance scalar and also that it would be too costly for providers to implement.

Further Consultation

We continue to refine the proposal to implement an additional component to the performance scalar to incentivise the provision of accurate forecasts of availability.

Our latest thinking on the composition of the performance scalar is set out in the consultation on DS3 System Services Contracts for Regulated Arrangements (Section 3.39). This is to allow for interested stakeholders to continue to provide feedback on this measure.

2.2. Product Scalar for Faster Response of FFR

Summary

This section sets out the TSOs' recommendation that a product scalar to incentivise the faster provision of FFR up to an upper threshold of 0.15 seconds following a frequency event should be implemented for Regulated Arrangements.

Introduction

FFR is not being procured under Interim Arrangements. It is scheduled to go live on 1 September 2018.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed to implement the product scalar for the faster response of FFR for Regulated Arrangements as follows:

For a speed of response quicker than 2 seconds a scalar greater than 1 was to be applied on a sliding scale up to a scalar value of 2 at a response time of 0.5 seconds; and

For a speed of response quicker than 0.5 seconds a scalar greater than 2 was to be applied on a sliding scale up to a maximum scalar value of 3 at a response time of 0.15 seconds.

Figure 3 below graphically illustrates this proposal.

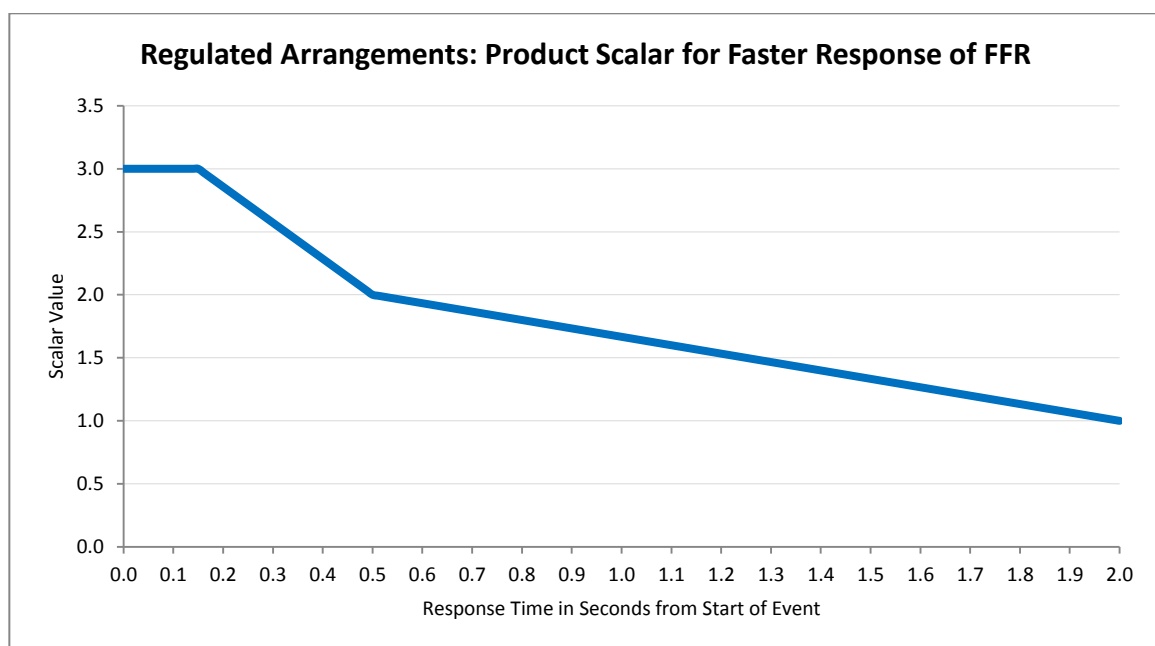


Figure 3: Product Scalar for Faster Response of FFR

Mathematically this proposed scalar is represented as:

If $TR \leq 0.15$ secs, $Scalar = 3$

If $0.15 \text{ secs} < TR < 0.5$, $Scalar = ((0.5-TR) / (0.35)) + 2$

If $0.5 \text{ secs} \leq TR < 2$ secs, $Scalar = ((2-TR) / (1.5)) + 1$

Where: TR = Response time from event start time

Stakeholder Comments on the Product Scalar for Faster Response of FFR

The following question was asked in the consultation paper:

“Do you agree with our proposal to implement a Product Scalar for the Faster Response of FFR? If not, please specify why or identify what element of the scalar design you believe requires amendment?”

A majority of respondents were in favour of the proposal. 13 respondents agreed in principle with the proposal without proposing changes to the design. 2 respondents commented that a speed of response should be incentivised faster than 150ms.

Clarity was sought by a number of respondents on the rationale for the scalar values and the linear design. Respondents made suggestions relating to the determination of a unit's scalar based on various considerations of a unit's capabilities.

TSO Recommendation for Regulated Arrangements

We recommend that the product scalar for the faster response of FFR, as set out in the consultation paper and repeated above, should be implemented for Regulated Arrangements

The value of the scalar applicable to each unit would be derived from the unit's contracted capability to provide the FFR Service at a specified time, e.g. 1.5 seconds following the commencement of the frequency event, and would be based on the capability and willingness of the unit to commit to the response time. This would be agreed during the procurement process and form the basis for Settlement. Operationally, the TSOs would place the unit at a response time no more demanding than that to which it has committed.

Performance monitoring mechanisms would assess whether the unit responded within its contracted timeframe, with discount factors to apply in the form of a reduced performance scalar if the contracted timeframe is established not to have been met.

Rationale for Recommendation

This recommendation is supported by internal studies carried out by the TSOs in Q2 2017. The upper threshold of 0.15 seconds at which the faster response of FFR is to be incentivised reflects standard system protection times. Responses above this upper threshold, i.e. faster than 0.15 seconds, are within the bounds of system inertia, the provision of which is to continue to be incentivised through the SIR product.

With reference to respondents' feedback relating to the linear form of the scalar, while we acknowledge that the benefits to the system do not accrue in such a linear fashion, the complexity in identifying the exact and proportionate value of responses to system events along the proposed timeline of 0.15 to 2 seconds determines that a more simplistic approach be implemented.

2.3. Product Scalar for Enhanced Delivery of FFR, POR, SOR and TOR1

Summary

This section sets out the TSOs' recommendation that a product scalar to incentivise the enhanced provision of FFR, POR, SOR and TOR1 should be implemented for Regulated Arrangements.

The recommended finalised scalar design for the POR, SOR and TOR1 Services, which represents a modified version of that implemented for Interim Arrangements, is described.

With regard to the scalar design for the FFR Service, this section summarises the feedback received to the consultation on Enduring Scalar Design; our latest thinking on the proposal is presented as part of the consultation on DS3 System Services Contracts for Regulated Arrangements.

Introduction

The POR, SOR and TOR1 Services are currently being procured under Interim Arrangements and will continue to be procured for Regulated Arrangements from 1 May 2018. This section will detail the following relating to the product scalar for the enhanced delivery of POR, SOR and TOR1:

- The scalar design that was implemented for Interim Arrangements;
- The scalar design that we proposed for Regulated Arrangements in the consultation, together with the feedback received to that proposal;
- The scalar design that we recommend should be implemented for Regulated Arrangements.

The FFR Service is scheduled to go live from 1 September 2018. This section will detail the following relating to the product scalar for the enhanced delivery of FFR:

- The scalar design that we proposed for Regulated Arrangements in the consultation, together with the feedback received to that proposal;
- The details of further consultation that we are undertaking with regard to the design of this measure.

Product Scalar for Enhanced Delivery of POR, SOR and TOR1

The product scalar for the enhanced delivery of the POR, SOR and TOR1 Services is comprised of 2 component scalars:

- A trigger scalar, representing the frequency trigger capability⁹ of the providing unit;
- A type scalar, representing the type and profile of its response curve.

Implementation for Interim Arrangements

The product scalar for the enhanced delivery of POR, SOR and TOR1 has been implemented for Interim Arrangements as follows:

Product Scalar = (trigger scalar + type scalar) / 2 if *trigger scalar is greater than 0*; or

Product Scalar = 0 if trigger scalar is equal to 0.

Where:

- The trigger scalar, as graphically illustrated in Figure 4, is a function of the highest frequency set-point (≤ 50 Hz) at which the unit is capable and willing to provide a MW output response, with a linear scale between 0, where the frequency trigger ≤ 49.3 Hz, and 1, where the frequency trigger = 50Hz.
- The type Scalar is 1 for a dynamic response and 0.5 for a static response, where dynamic and static capabilities have been defined by the TSOs.

⁹ This is the frequency value at which a service provider is capable and willing to start providing the frequency response i.e. the frequency at which the response is triggered.

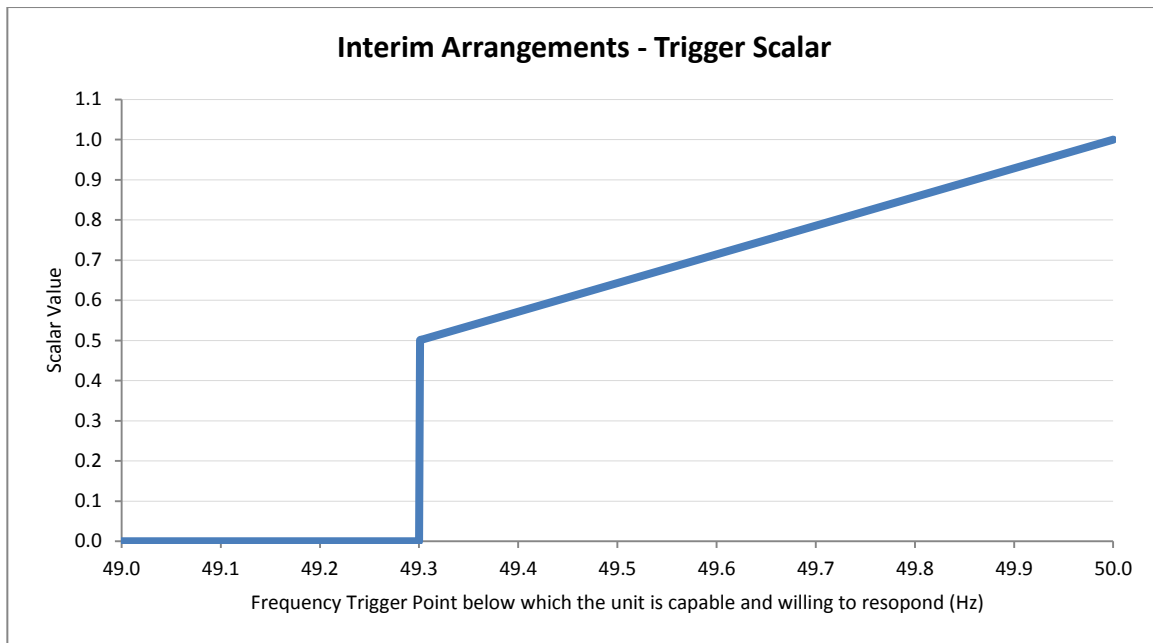


Figure 4: Interim Arrangements – Trigger Scalar

Mathematically the trigger scalar for Interim Arrangements is represented as:

If $FT \leq 49.3\text{Hz}$, $\text{Scalar} = 0$

If $FT > 49.3\text{Hz}$, $\text{Scalar} = 1 - ((50 - FT) \times (5 \div 7))$

Where: FT = Absolute value of frequency trigger capability

During the procurement process for Interim Arrangements, the classification of dynamic and static responses was set out in a Clarification Note on Dynamic versus Static Response¹⁰.

For Interim Arrangements, a dynamic response has been defined by the TSOs as either the capability to respond continuously to frequency disturbances (as illustrated in Figure 5) or with a minimum of 10 discrete steps in a continuously controlled manner proportional to the power system frequency (as illustrated in Figure 6).

¹⁰ Clarification Note on Dynamic vs Static Response:
<http://www.eirgridgroup.com/site-files/library/EirGrid/Clarification-Note-on-Dynamic-vs.-Static-Response.pdf>

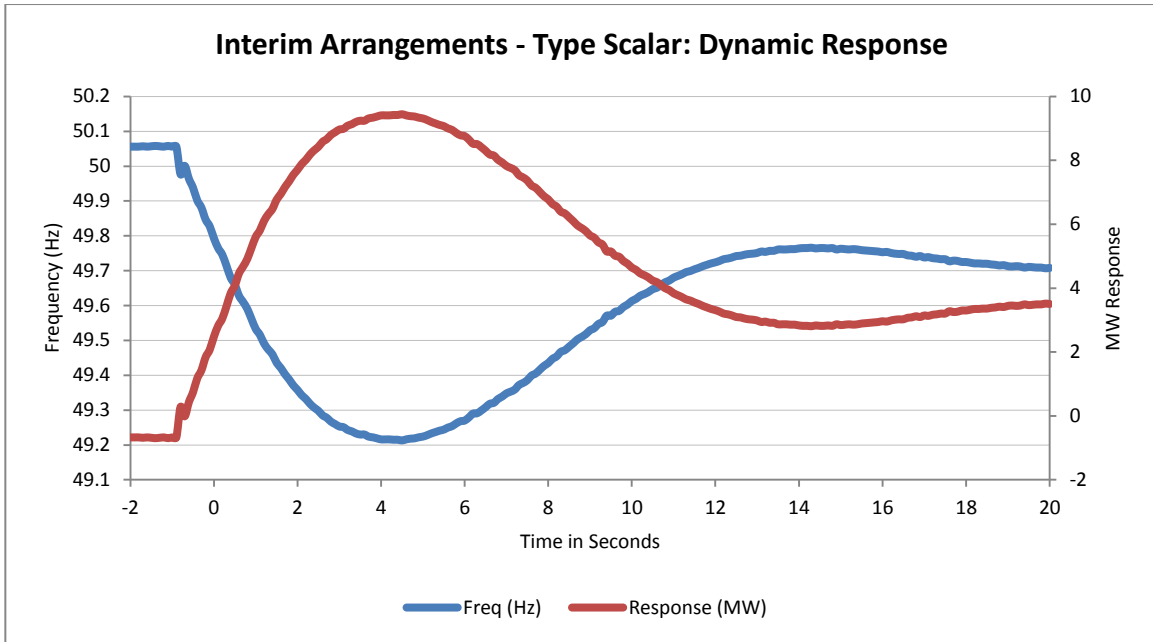


Figure 5: [For illustrative purposes only] Interim Arrangements – Type Scalar: Fully Dynamic Response

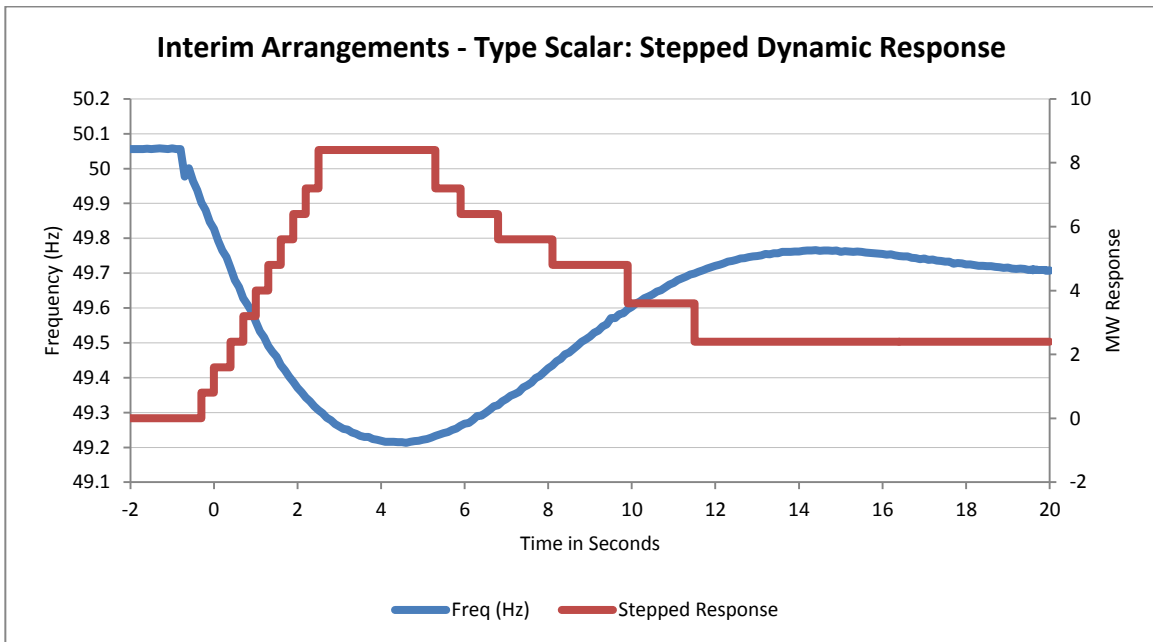


Figure 6: [For illustrative purposes only] Interim Arrangements – Type Scalar: Dynamic Response (10 steps continuously tracking frequency)

For Interim Arrangements, a response to a frequency event provided in less than 10 discrete steps, whether it tracks the power system frequency or not (Figure 7), or a response provided in 10 or more discrete steps that does not track the power system frequency (Figure 8), are defined as static responses.

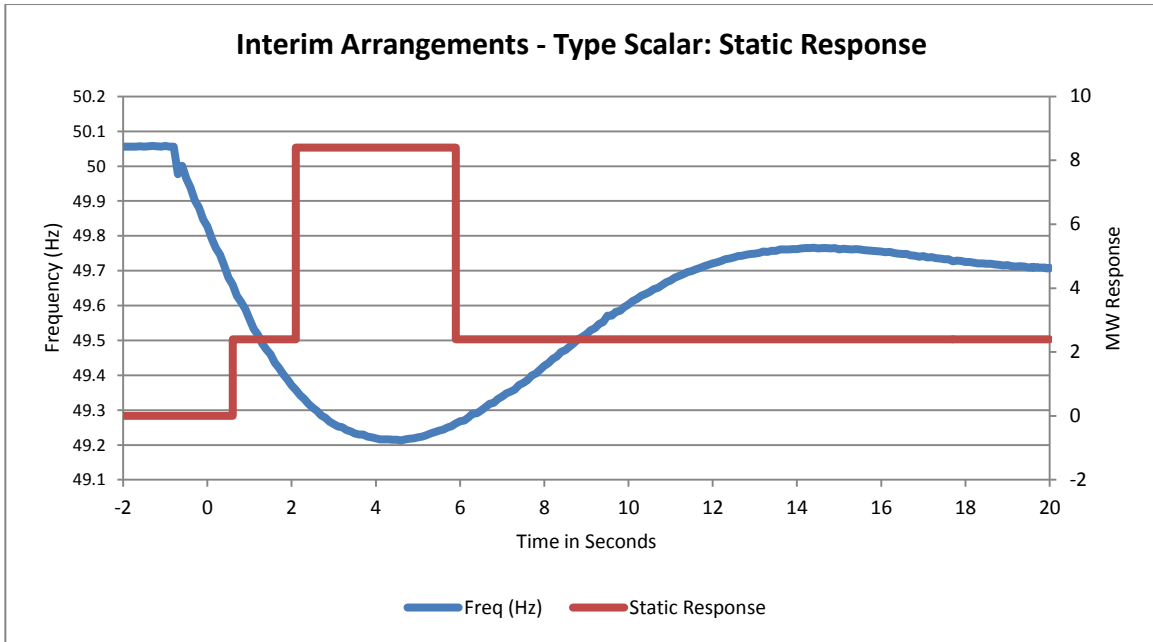


Figure 7: [For illustrative purposes only] Interim Arrangements - Static Response (2 steps – response tracks frequency)

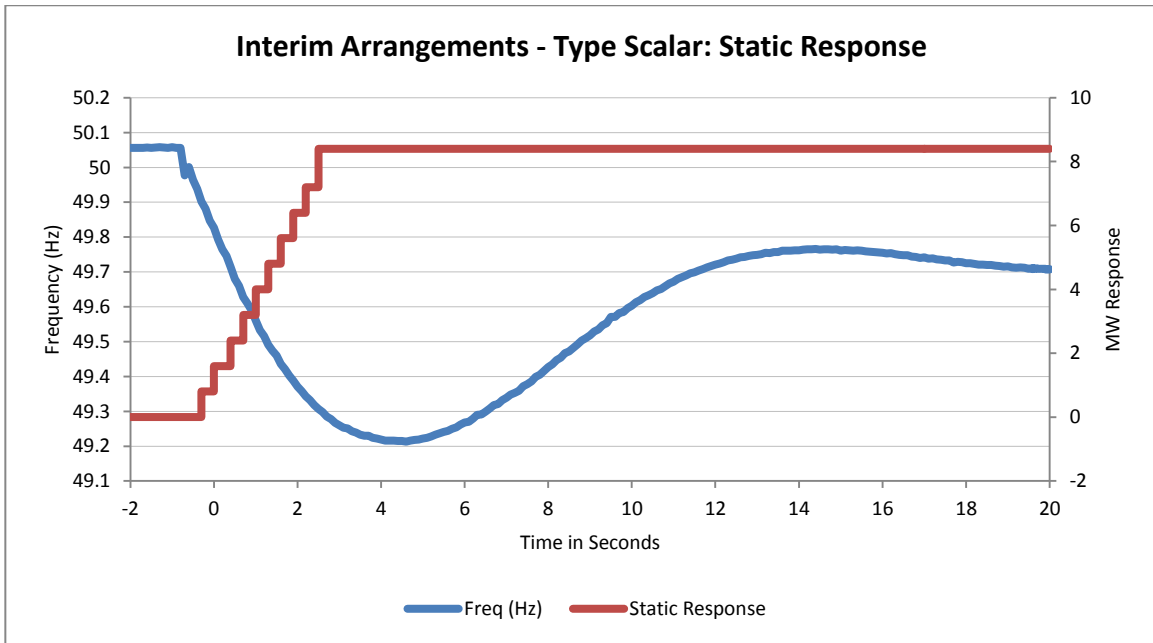


Figure 8: [For illustrative purposes only] Interim Arrangements - Static Response (10 steps – response does not continuously track frequency)

For units that can provide a dynamic response it is required that the TSOs can specify in real-time whether the response should be enabled or disabled, the frequency trigger, which will be at or below the contracted capability of the provider, and the droop setting.

For a response provided in discrete steps it is required that the TSOs can specify in real-time whether the response should be enabled or disabled, the frequency trigger, which will be at or below the contracted capability of the provider, and the step sizes.

For Interim Arrangements, units have 60 seconds to implement any changes in real-time.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that the product scalar for the enhanced delivery of POR, SOR and TOR1 that has been implemented for Interim Arrangements be implemented for Regulated Arrangements, with just one amendment to the upper threshold of the trigger scalar component as follows:

Product Scalar = (trigger scalar + type scalar) / 2 if trigger scalar is greater than 0; or

Product Scalar = 0 if trigger scalar is equal to 0.

Where:

- The trigger scalar, as graphically illustrated in Figure 9, is a function of the highest frequency set-point ($\leq 49.985\text{Hz}$) at which the unit is capable and willing to provide a MW output response, with a linear scale between 0, where the frequency trigger $\leq 49.3\text{Hz}$, and 1, where the frequency trigger = 49.985Hz .
- The type Scalar is 1 for a dynamic response and 0.5 for a static response, as has been implemented for Interim Arrangements and where dynamic and static capabilities have been defined by the TSOs. This was noted as a provisional proposal in the consultation.

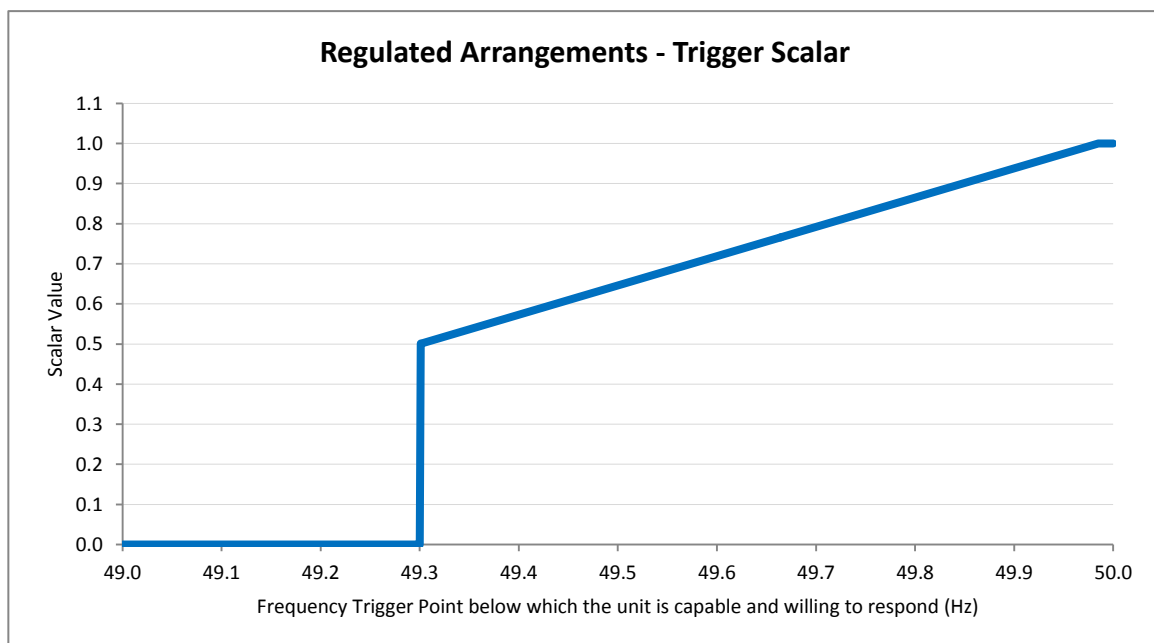


Figure 9: TSO Proposal 2017 – proposed Trigger Scalar for enhanced delivery of FFR, POR, SOR & TOR1

Mathematically the proposed trigger scalar for Regulated Arrangements is represented as:

If $FT \leq 49.3\text{Hz}$, Scalar = 0

If $FT > 49.3\text{Hz}$, Scalar = $1 - ((49.985 - FT) \times (5 \div 6.85))$

Where: FT = Absolute value of frequency trigger capability

We proposed that the requirement, implemented for Interim Arrangements, for units to respond within 60 seconds to TSO instructions relating to the enablement and configuration of the trigger and type scalars, be maintained for Regulated Arrangements.

Stakeholder Comments on the Product Scalar for the Enhanced Delivery of POR, SOR and TOR1

The following question was asked in the consultation paper:

“Do you agree with our proposal to implement a Product Scalar for the Enhanced Delivery of [FFR,] POR, SOR and TOR1? If not, please specify why or identify what element of the scalar design you believe requires amendment?”

A majority of respondents were in favour of the scalar. 12 respondents agreed in principle with the proposal without proposing significant changes to the design. 7 respondents generally agreed with the principle of the proposal, but disagreed on the scalar design.

Several respondents stated that the minimum scalar value should be 1, noting that the proposed design does not comply with the standard definition set out in SEM-14-108.

Several correspondents suggested changes to the type scalar component to reflect the differences in value and cost between dynamic and static capability.

A number of respondents questioned the linear nature of the trigger scalar component, and commented that a trigger setpoint close to 49.985Hz was expensive to achieve and should be incentivised more than double the lower threshold of 49.3Hz. 1 respondent commented that the reduced upper trigger scalar threshold of 49.985Hz was too low.

TSO Recommendation for Regulated Arrangements

We recommend that the product scalar for the enhanced delivery of POR, SOR and TOR1, as set out in the consultation paper, should be implemented for Regulated Arrangements, with just one amendment to the lower threshold of the trigger scalar component as follows:

Product Scalar = $(\text{trigger scalar} + \text{type scalar}) / 2$ if trigger scalar is greater than 0; or

Product Scalar = 0 if trigger scalar is equal to 0.

Where:

- The trigger scalar, as graphically illustrated above in Figure 9, would be a linear scale between 0.5 and 1 where the frequency trigger $\geq 49.3\text{Hz}$ and $\leq 49.985\text{Hz}$, and would be a value of 0 where the frequency trigger $< 49.3\text{Hz}$;
- The type scalar would be 1 for a dynamic response and 0.5 for a static response, as has been implemented for Interim Arrangements and where dynamic and static capabilities have been defined by the TSOs.

With reference to the trigger scalar component, the value of the scalar applicable to each unit would be derived from the unit's contracted capability to provide the Services at a specified frequency set point, e.g. 49.9Hz, which would be based on the capability and willingness of the unit to commit to a frequency set point. This would be agreed during the procurement process and form the basis for Settlement. Operationally, the TSOs would place the unit at a frequency set point no more demanding than that to which it has committed. Performance monitoring mechanisms would assess whether the unit responded within its contracted timeframe, with discount factors to apply in the form of a reduced performance scalar if the contracted timeframe is established not to have been met.

With reference to the type scalar, the ability to provide any pre-emptive response capability would not be considered relevant in the determination of a unit's capability as either dynamic or static; the definitions as described above would be the sole factor in ascribing dynamic or static capability to a unit in the provision of POR, SOR and TOR1.

Rationale for Recommendation

We retain our position, as outlined in the consultation paper, that the upper threshold for the trigger scalar of 49.985Hz is appropriate as it reflects the maximum frequency deadband of 15mHz for Governor Control Systems allowable under the Grid Code and differentiates between the containment of frequency events and the pre-fault regulation of reserve.

As noted in the consultation paper, the lower threshold for the trigger scalar of 49.3Hz would apply in order to facilitate participants of the STAR scheme, on its termination, to qualify for the provision of System Services (assuming all eligibility requirements would be met). In the longer term, this legacy lower threshold would be assessed for ongoing suitability.

With reference to respondents' feedback relating to the linear form of the trigger scalar, while we acknowledge that the benefits to the system do not accrue in such a linear fashion, and that a response provided at 49.3Hz may well deliver less than 50% of the value to the system than that which a response close to 50Hz provides, the complexity in identifying the exact and proportionate value of responses to system events along the proposed frequency set points would determine that a more simplistic approach be implemented.

Relating to the design of the type scalar, we consider that the definitions of dynamic and static capability in response to a frequency event that were implemented for Interim

Arrangements remain suitable for determining the scalar values for POR, SOR and TOR1. Where a unit is providing the FFR Service, its response characteristics for FFR would apply to the provision of any of POR, SOR and TOR1, i.e. in line with the proposed frequency response curves set out in Section 4.

While the TSOs acknowledge that the maximum scalar value of 1 may not align with the SEM Committee's decision paper SEM-14-108 (which states that scalars default to 1 and then increase), its value reflects the holistic approach applied to the overall volumes and tariffs considerations applicable to the commercial arrangements for System Services. This approach is described in the recommendations paper on DS3 System Services Tariffs for Regulated Arrangements.

Product Scalar for the Enhanced Provision of FFR

The product scalar for the enhanced delivery of the FFR Service is to comprise a number of component scalars that reflect a providing unit's capabilities, including (but not limited to) and where applicable:

- The type and profile of the unit's response curve;
- The frequency trigger capability of the unit;
- The unit's ability to provide responses within a range of droops; and
- The number of discrete steps that a unit is capable of in response to a frequency event.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that the trigger scalar component of the product scalar for the enhanced delivery of FFR was to be the same as POR, SOR and TOR1, i.e. a function of the highest frequency set-point ($\leq 49.985\text{Hz}$) at which the unit is capable and willing to provide a MW output response, with a linear scale between 0, where the frequency trigger $\leq 49.3\text{Hz}$, and 1, where the frequency trigger = 49.985Hz .

In the consultation paper for Enduring Scalar Design, we advised that the type scalar component of the product scalar for the Enhanced Provision of FFR was still under consideration and that the utilisation of frequency response curves to define the provision of the FFR Service would inform the final scalar design, including any additional components.

Stakeholder Comments on the Product Scalar for the Enhanced Provision of FFR

The following question was asked in the consultation paper:

"Do you agree with our proposal to implement a Product Scalar for the Enhanced Delivery of FFR[, POR, SOR and TOR1]? If not, please specify why or identify what element of the scalar design you believe requires amendment?"

The comments as noted above in response to the proposal for the product scalar for the enhanced provision of POR, SOR and TOR1 apply in general to the FFR Service. Further information on the composition of the scalar was requested by a number of respondents.

Further Consultation

We continue to refine the proposal to define the provision of the FFR Service through parametrisable frequency response curves:

- 1 curve to apply to units with dynamic capability in response to a frequency event;
- 1 curve to apply to static capability;
- Criteria to determine whether either the dynamic or static curve, and their associated parameters, is to apply to a unit.

The design of the product scalar for the enhanced delivery of FFR is to be driven by these curves.

In acknowledgement of industry requests for further information from the TSOs on this measure, an expanded proposal on the design of the parametrisable curves and the product scalar for the enhanced provision of FFR is set out in the consultation on DS3 System Services Contracts for Regulated Arrangements (Section 3.27). Please also see section 4 of this paper.

2.4. Product Scalar for Continuous Provision of Reserve from FFR to TOR1

Summary

This section sets out the TSOs' recommendation that a product scalar to incentivise the continuity of provision of reserve from FFR through to TOR1 should be implemented for Regulated Arrangements.

Introduction

FFR is scheduled to go live on 1 September 2018.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that a product scalar for the continuous provision of reserve from FFR to TOR1 be implemented for Regulated Arrangements.

The proposed scalar design was as follows:

Scalar Value	Criteria for Scalar Value Applicable to FFR Service
1.5	Providers of FFR that also provide all of POR, SOR & TOR1
1	Other providers of FFR

It was intended that this scalar only be applicable to the FFR Service.

Stakeholder Comments on the Product Scalar for Continuous Provision of Reserve from FFR to TOR1

The following question was asked in the consultation paper:

“Do you agree with our proposal to implement a Product Scalar for the Continuous Provision of Reserve from FFR to TOR1? If not, please specify why or identify what element of the scalar design you believe requires amendment?”

The majority of respondents were in favour of the proposal. 7 respondents agreed in principle with the proposal without proposing significant changes to the design. 12 respondents generally agreed with the principle of the proposal, but disagreed on the scalar design.

The rationale for the scalar value of 1.5 was questioned by several respondents. A number of respondents proposed that the design should be on a scale depending on how many of POR, SOR and TOR1 a provider of FFR was also capable of delivering. Some respondents commented that the scalar should apply to all of FFR, POR, SOR and TOR1, not just to FFR.

TSO Recommendation for Regulated Arrangements

We recommend that the product scalar for the continuous provision of reserve from FFR to TOR1, as described in the consultation paper and repeated above, should be implemented for Regulated Arrangements.

The application of this scalar would be based on a unit's contracted capability to provide an agreed MW output response from FFR through to TOR1.

This scalar would only apply to the FFR Service for Regulated Arrangements.

Rationale for Recommendation

Studies conducted by the TSOs in Q2 2017 have demonstrated the benefits to the system of providers of the FFR Service continuing to maintain, at the end of the FFR timeframe of 10 seconds following a frequency event, a MW response for the duration of the timeframe demanded of POR, SOR and TOR1, as required depending on the frequency event.

Given that the benefits accrue through to the TOR1 timeframe, we consider that a stepped approach or a linear scale, that would attach value also to the provision of POR and SOR, is not warranted in this instance.

2.5. Product Scalar for Enhanced Delivery of SSRP with an AVR

Summary

This section sets out the TSOs' recommendation that a product scalar to incentivise the provision of the SSRP product with an Automatic Voltage Regulator (AVR) should be implemented for Regulated Arrangements.

Introduction

SSRP is being procured under Interim Arrangements and will continue to be procured under Regulated Arrangements.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that a product scalar for the enhanced delivery of the SSRP product be implemented, where providers that have an Automatic Voltage Regulator (AVR) installed, that is both functional and in operation, are rewarded. This maintained an existing practice under HAS arrangements.

The proposed scalar design was as follows:

Scalar Value	Criteria for Scalar Value Applicable to SSRP Service
2	AVR installed, turned on and fully operational
1	Otherwise

This scalar has previously been implemented for Interim Arrangements.

Stakeholder Comments on the Product Scalar for Enhanced Delivery of SSRP with an AVR

The following question was asked in the consultation paper:

"Do you agree with our proposal to implement a Product Scalar for Enhanced Delivery of SSRP with an AVR? If not, please specify why or identify what element of the scalar design you believe requires amendment?"

The majority of respondents were in favour of maintaining a product scalar for the enhanced delivery of SSRP with an AVR. 14 respondents agreed in principle with the proposal without proposing changes to the design. 3 respondents agreed with the proposal, but queried the arrangements for DSO-connected embedded generators to operate under voltage control.

TSO Recommendation for Regulated Arrangements

We recommend that the product scalar for the enhanced delivery of SSRP with an AVR, as currently implemented for Interim Arrangements and as described in the consultation paper and repeated above, should continue to be implemented for Regulated Arrangements.

It is recommended that the definition of AVR currently in place for Interim Arrangements, as set out in the Framework Agreement¹¹, is to continue for Regulated Arrangements.

We are working with the DSO on putting in place the arrangements that would allow embedded generators to provide the SSRP Service. It is intended that the nature of these arrangements will be communicated to stakeholders in advance of the procurement process.

Rationale for Recommendation

The SEM Committee decision paper (SEM-13-098)¹² stated that the variant of the SSRP product in the HAS arrangements, where providers deliver the Service under the control of an AVR, be retained.

¹¹ "Automatic Voltage Regulation" means the automatic maintenance of a Providing Unit's terminal voltage or the automatic maintenance of a Providing Unit's Voltage setpoint, Reactive Power setpoint or Power Factor setpoint at its Connection Point, as appropriate

¹² SEM DS3 System Services Technical Definitions Decision Paper SEM-13-098:
https://www.semcommittee.com/sites/semcommittee.com/files/media-files/SEM-13-098%20%20DS3%20System%20Services%20Technical%20Definitions%20Decision%20Paper%20-%20FINAL_0.pdf

2.6. Product Scalar for SSRP with Watt-less VARs

Summary

This section sets out the TSOs' recommendation that a product scalar to incentivise the provision of the SSRP product with Watt-less VARs, i.e. the capability of providing reactive power at a zero MW output level, should be implemented for Regulated Arrangements.

Introduction

SSRP is being procured under Interim Arrangements and will continue to be procured under Regulated Arrangements.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that a product scalar for SSRP with watt-less VARs be implemented for Regulated arrangements.

The proposed scalar design was as follows:

Scalar Value	Criteria for Scalar Value Applicable to SSRP Service
2	Unit is capable of providing SSRP at 0MW and has been instructed to do so by the TSOs
1	Otherwise

In any given trading period, it was proposed that the upper scalar would only apply when the TSOs dispatch a unit operating at 0MW output to provide SSRP.

Stakeholder Comments on the Product Scalar for SSRP with Watt-less VARs

The following question was asked in the consultation paper:

"Do you agree with our proposal to implement a Product Scalar for SSRP with Watt-less VARs? If not, please specify why or identify what element of the scalar design you believe requires amendment?"

6 respondents agreed in principle with the proposal without proposing changes to the design. 7 respondents generally agreed with the principle of the proposal, but disagreed on the scalar design. The primary concerns related to the energy costs for the provision of SSRP at 0MW: that the scalar should be higher in order to make it commercially viable and that more information is required of any operational support contracts.

1 respondent commented that the scalar should not apply to devices such as static compensators.

2 respondents disagreed with the proposal on the grounds that it was not financially viable and that devices providing watt-less VARs will be paid for the full reactive power range they can provide whenever they are available anyway.

TSO Recommendation for Regulated Arrangements

We recommend that a product scalar for the provision of SSRP with watt-less VARs, as described in the consultation paper and repeated above, should be implemented for Regulated Arrangements.

In any given trading period, the upper scalar would only apply when the TSOs dispatch a unit operating at 0MW output to provide SSRP.

We recognise that there may be some uncertainty around the willingness of some units to provide this capability given the energy costs that may be incurred. It is our position that these costs would not be compensated for through DS3 System Services contracts and would need to be assigned either to the dispatch instruction against the energy market or to an operational support contract. We will continue to examine how these outstanding issues may be resolved with reference to I-SEM deliverables and the nature of operational support contracts that may be required.

Rationale for Recommendation

While we note that the revised definition of SSRP as implemented for Interim Arrangements incentivises the provision of SSRP at lower MW output levels, we consider that there is benefit in incentivising the provision of SSRP right down to 0MW output levels.

2.7. Temporal Scarcity Scalar for DRR and FPFAPR

Summary

This section sets out the TSOs' recommendation that a temporal scarcity scalar to incentivise the provision of the DRR and FPFAPR Services at very high levels of SNSP – specifically when SNSP is greater than 70% – should be implemented for Regulated Arrangements.

Introduction

DRR and FPFAPR are not currently being procured under Interim Arrangements. Both Services are scheduled to go live on 1 September 2018 for Regulated Arrangements.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that a temporal scarcity scalar, based on a metric linked to the percentage of SNSP with regard to demand in a given trading period, be implemented for the DRR and FPFAPR Services for Regulated Arrangements.

The proposed scalar design was as follows:

Scalar Value	Criteria for Scalar Value Applicable to DRR & FPFAPR
8.5	SNSP > 70%
0	SNSP ≤ 70%

This proposal should be considered in conjunction with the Scarcity Scalar Framework set out in the consultation on Enduring Tariffs.

Figure 10 graphically illustrates the proposed design of this scalar.

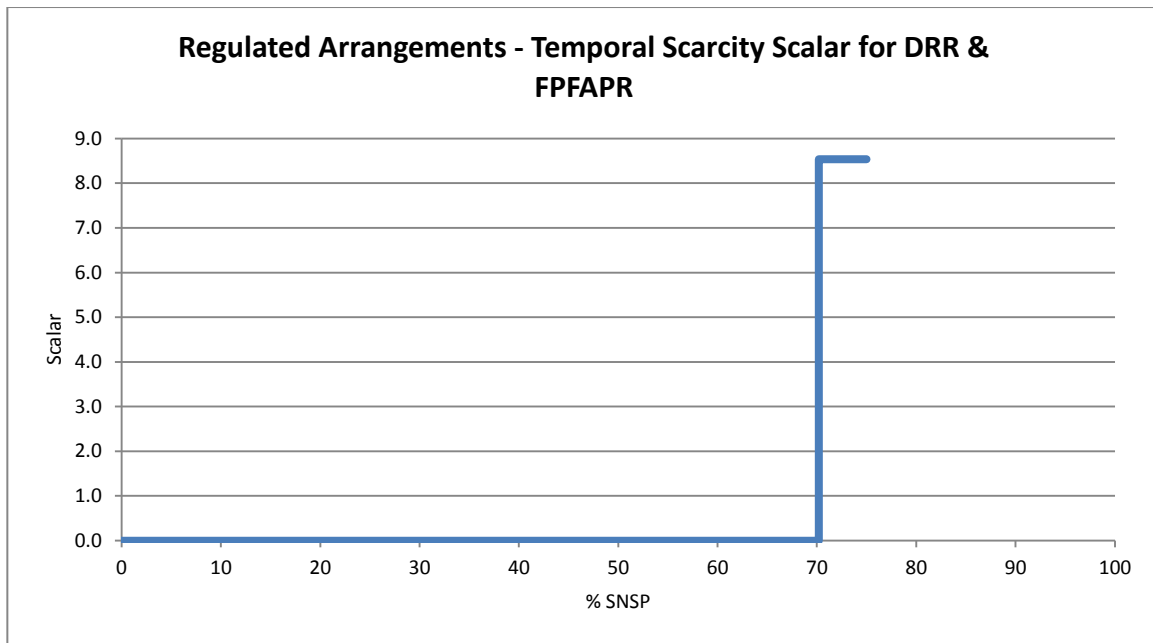


Figure 10: TSO Proposal 2017 - Temporal Scarcity Scalar for DRR & FPFAPR

Stakeholder Comments on the Temporal Scarcity Scalar for DRR and FPFAPR

The following question was asked in the consultation paper:

"Do you agree with our proposal to implement a Temporal Scarcity Scalar for DRR and FPFAPR? If not, please specify why or identify what element of the scalar design you believe requires amendment?"

The majority of respondents were broadly in favour of linking the payment for the DRR and FPFAPR Services to an SNSP metric. 3 respondents agreed with the proposal without proposing changes to the design. 13 respondents agreed in principle with aligning the scalar to SNSP, but disagreed with the specifics of the scalar design.

In general, respondents commented that the SNSP threshold of 70% for payment for the Services was too high, that it placed undue risk on the provider and would discourage investment in the provision of these Services. Respondents also noted the dependency on the success of the broader DS3 programme, including RoCoF, in order to achieve 70% SNSP, as adding to investor uncertainty. Suggested remedies included having a minimum scalar value of 1, reducing the threshold below 70% to reflect current system capability, and introducing multiple steps to the scalar.

Some respondents also questioned how the scalar value of 8.5 was arrived at.

1 respondent disagreed with the proposal given that there was a risk that 75% SNSP would not be achievable and that, even if it was, it was extremely difficult to predict the amount of time this level would be operated at annually.

This feedback should be considered in conjunction with the feedback on the Temporal Scarcity Framework component of the consultation on Enduring Tariffs, as summarised in the recommendations paper on DS3 System Services Tariffs for Regulated Arrangements.

TSO Recommendation for Regulated Arrangements

We recommend that a temporal scarcity scalar, based on a metric linked to the percentage of SNSP with regard to demand in a given trading period, should be implemented for DRR and FPFAPR for Regulated Arrangements. Note: this recommendation differs to the proposal described in the consultation on Enduring Scalar Design.

The recommended design of this scalar is as follows:

Scalar Value	Criteria for Scalar Value Applicable to DRR & FPFAPR
6.3	$\text{SNSP} > 70\%$
0	$\text{SNSP} \leq 70\%$

Figure 11 graphically illustrates the recommended design of this scalar.

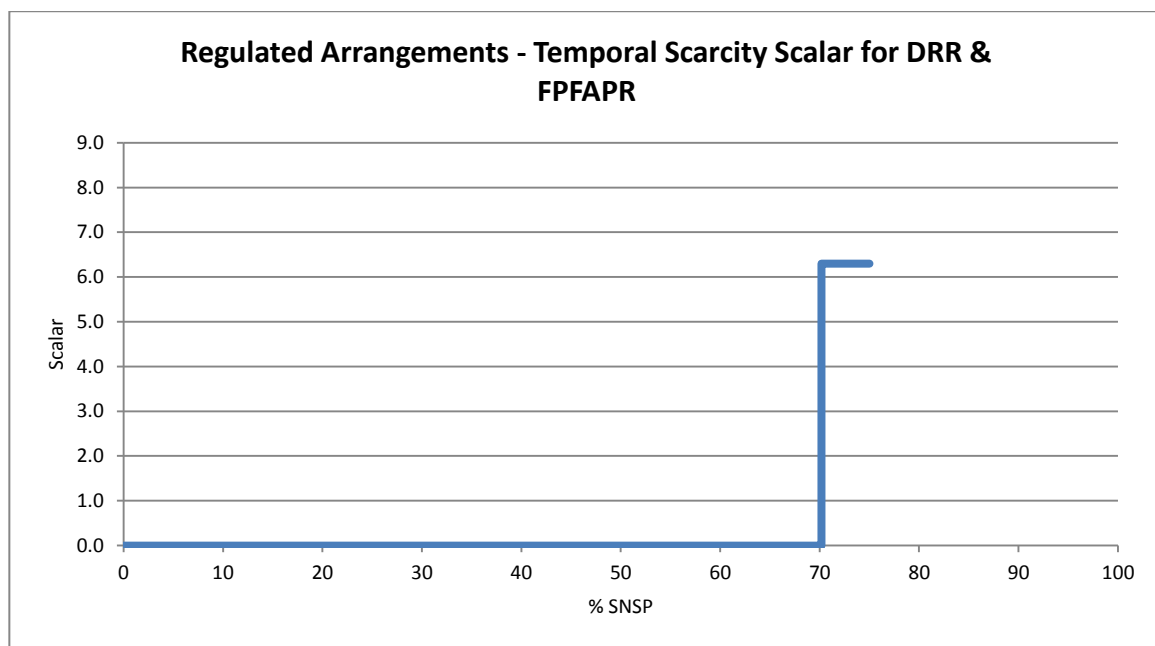


Figure 11: TSO Recommendation 2017 - Temporal Scarcity Scalar for DRR & FPFAPR

Rationale for Recommendation

This recommendation should be considered in conjunction with the Scarcity Scalar Framework set out in the recommendations paper on DS3 System Services Tariffs for Regulated Arrangements.

In summary, the recommended downwards adjustment of the temporal scarcity scalar value that is to apply above 70% SNSP, from 8.5 to 6.3, is to offset a 5% recommended increase to the base tariff rates as well as the additional expenditure arising from the recommended changes to the temporal scarcity scalar for FFR (see section 2.8 of this paper).

It is our position that, as the system stability issues that DRR and FPFAPR are designed to address are not seen until high levels of wind, there is no justification for the payment of FPFAPR and DRR at low levels of wind penetration.

2.8. Temporal Scarcity Scalar for FFR

Summary

This section sets out the TSOs' recommendation that a temporal scarcity scalar to incentivise the provision of the FFR Service at high levels of SNSP – specifically when SNSP is greater than 50% – should be implemented for Regulated Arrangements.

Introduction

FFR is not being procured under Interim Arrangements. It is scheduled to go live on 1 September 2018.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that a temporal scarcity scalar, based on a metric linked to the percentage of SNSP with regard to demand in a given trading period, be implemented for the FFR Service for Regulated Arrangements.

The proposed scalar design was as follows:

Scalar Value	Criteria for Scalar Value Applicable to FFR
8.5	$\text{SNSP} > 70\%$
6.2	$\text{SNSP} > 60\% \text{ and } \leq 70\%$
0	$\text{SNSP} \leq 60\%$

This proposal should be considered in conjunction with the Scarcity Scalar Framework set out in the consultation on Enduring Tariffs.

Figure 12 graphically illustrates the proposed design of this scalar.

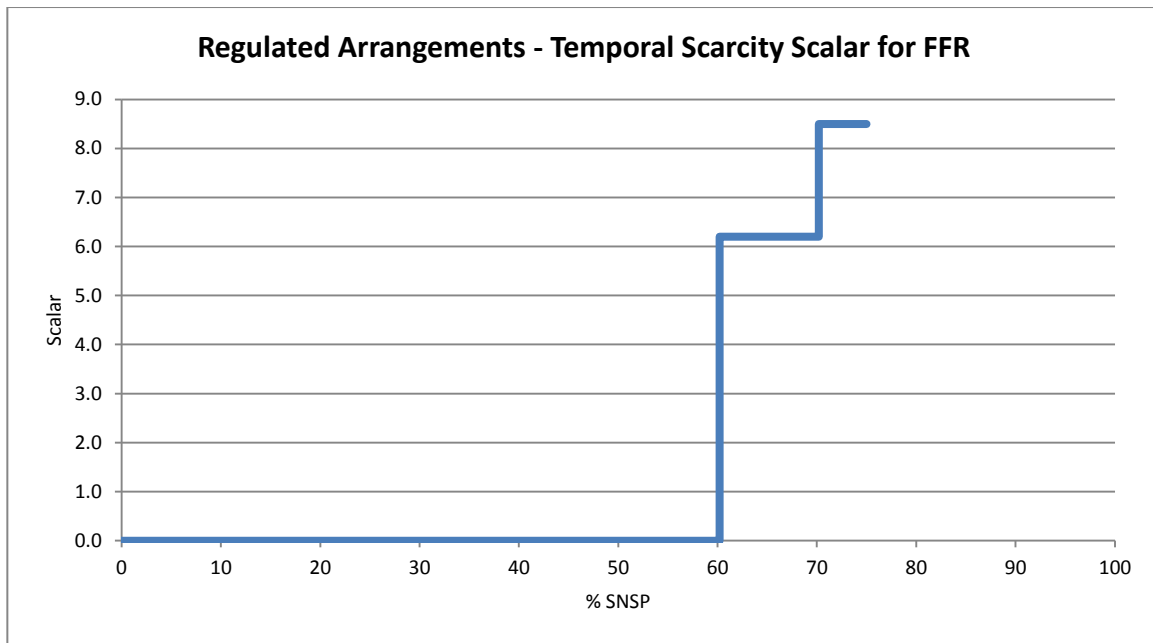


Figure 12: TSO Proposal 2017 - Temporal Scarcity Scalar for FFR

Stakeholder Comments on the Temporal Scarcity Scalar for FFR

The following question was asked in the consultation paper:

"Do you agree with our proposal to implement a Temporal Scarcity Scalar for FFR? If not, please specify why or identify what element of the scalar design you believe requires amendment?"

The majority of respondents were broadly in favour of linking the payment for the FFR Service to an SNSP metric. 1 respondent agreed with the proposal without proposing changes to the design. 15 respondents agreed in principle with aligning the scalar to the SNSP metric, but disagreed strongly with the specifics of the scalar design.

Primarily, respondents commented that the benefits of FFR to the system can be seen across the full range of SNSP and should be rewarded accordingly with at least a minimum scalar of 1 below 60%. 1 respondent specifically contested the TSO-held view that the system has operated securely at 60% SNSP without FFR. Respondents also proposed that additional steps be added to the 2 steps currently proposed at 60% and 70%.

As with the Temporal Scarcity Scalar for DRR and FPFAPR, respondents noted that the design placed undue risk on the provider, would discourage investment, and that the dependency on the success of the broader DS3 programme would only add to investor uncertainty.

3 respondents disagreed with the proposal. 1 respondent commented that there was a risk that 75% SNSP would not be achievable and that, even if it was, it was extremely difficult to predict the amount of time this level would be operated at annually. 1 respondent commented that the resulting volatility in revenue would result in higher financing costs, which would ultimately be passed on to the consumer. 1 respondent

asserted that the scalar should only be introduced post 2020 after investment has already occurred in the market.

This feedback should be considered in conjunction with the feedback on the Temporal Scarcity Framework component of the consultation on Enduring Tariffs, as summarised in the recommendations paper on DS3 System Services Tariffs for Regulated Arrangements.

TSO Recommendation for Regulated Arrangements

We recommend that a temporal scarcity scalar, based on a metric linked to the percentage of SNSP with regard to demand in a given trading period, should be implemented for FFR for Regulated Arrangements. Note: this recommendation differs to the proposal described in the consultation on Enduring Scalar Design.

The recommended design of this scalar is as follows:

Scalar Value	Criteria for Scalar Value Applicable to FFR
6.3	$\text{SNSP} > 70\%$
4.7	$\text{SNSP} > 60\% \text{ and } \leq 70\%$
1	$\text{SNSP} > 50\% \text{ and } \leq 60\%$
0	$\text{SNSP} \leq 50\%$

Figure 13 graphically illustrates the recommended design of this scalar.

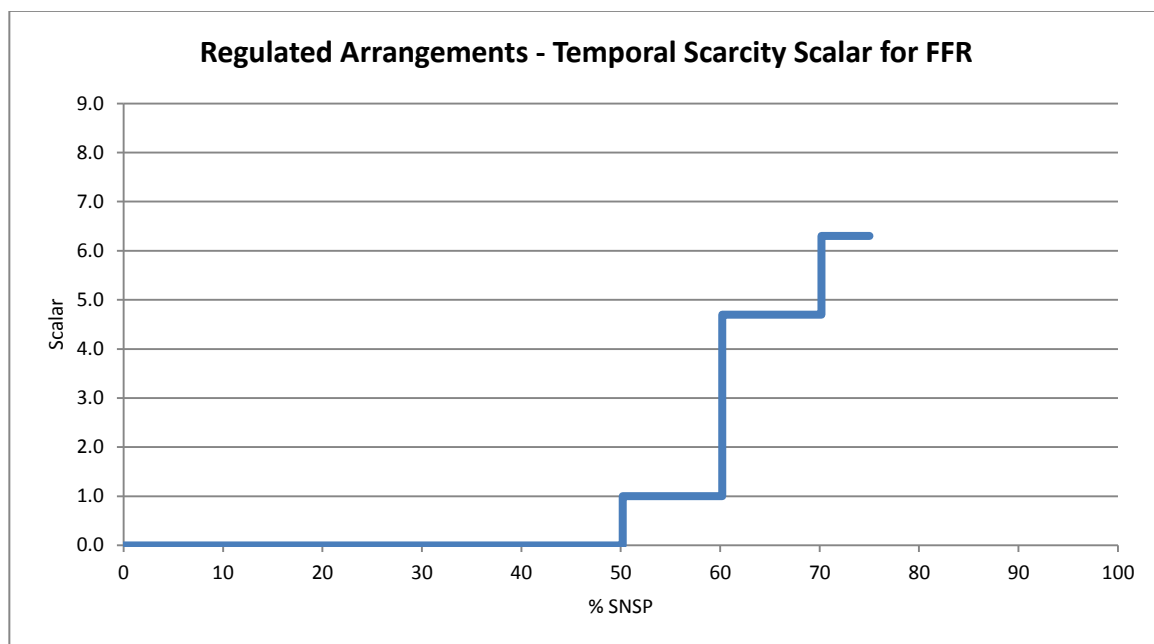


Figure 13: TSO Recommendation 2017 - Temporal Scarcity Scalar for FFR

Rationale for Recommendation

This recommendation should be considered in conjunction with the Scarcity Scalar Framework set out in the recommendations paper on DS3 System Services Tariffs for Regulated Arrangements.

In summary, that paper sets out the technical merits to incentivising the provision of FFR above 50% SNSP. The recommended downwards adjustment of the scarcity scalar values that are to apply above 60% and 70% SNSP are to offset the increased payment resulting from the additional step at 50% SNSP, as well as the 5% recommended increase to the base tariff rates.

2.9. Temporal Scarcity Scalar for 11 Existing System Services

Summary

This section sets out the TSOs' recommendation that a temporal scarcity scalar to incentivise the provision of all System Services except FPFAPR, DRR and FFR at high levels of SNSP – specifically when SNSP is greater than 60% – should be implemented for Regulated Arrangements.

Introduction

11 System Services, excluding FPFAPR, DRR and FFR, are currently being procured under Interim Arrangements and will continue to be procured under Regulated Arrangements.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that a temporal scarcity scalar, based on a metric linked to the percentage of SNSP with regard to demand in a given trading period, be implemented for the 11 existing Services for Regulated Arrangements.

The proposed scalar design was as follows:

Scalar Value	Criteria for Scalar Value Applicable to 11 Existing Services
8.5	SNSP > 70%
6.2	SNSP > 60% and ≤ 70%
1	SNSP ≤ 60%

This proposal should be considered in conjunction with the Scarcity Scalar Framework set out in the consultation on Enduring Tariffs.

Figure 14 graphically illustrates the proposed design of this scalar.

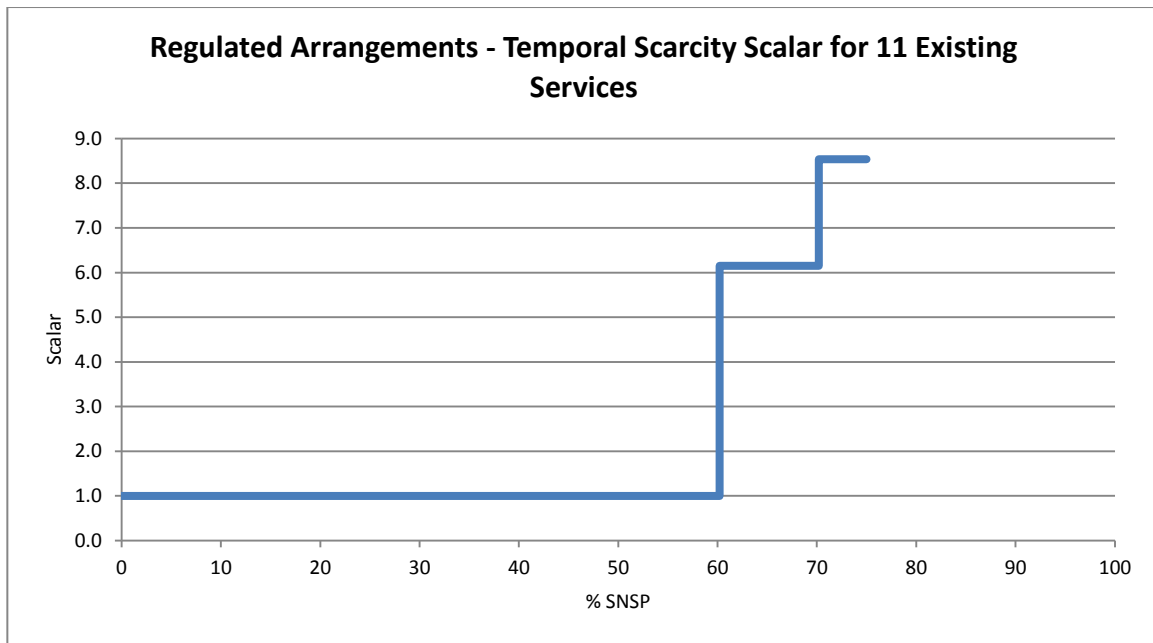


Figure 14: TSO Proposal 2017 - Temporal Scarcity Scalar for 11 Existing Services

Stakeholder Comments on the Temporal Scarcity Scalar for 11 Existing Services

The following question was asked in the consultation paper:

"Do you agree with our proposal to implement a Temporal Scarcity Scalar for 11 Existing System Services? If not, please specify why or identify what element of the scalar design you believe requires amendment?"

The majority of respondents were in favour of linking the payment for the 11 existing Services to an SNSP metric. 10 respondents agreed with the proposal without proposing changes to the design. 9 respondents agreed in principle with aligning the scalar to the SNSP metric, but disagreed with the specifics of the scalar design. Several respondents suggested additional steps to the 2 proposed in the consultation.

Respondents asserted that the design presented commercial uncertainty when assessing revenue from upper scalar values above 60% SNSP, as per the reasons outlined in response to the proposals for the other 2 temporal scarcity scalars. 1 respondent questioned how the upper values of 6.2 and 8.5 were arrived at.

2 respondents disagreed with the proposal. 1 respondent commented that there was a risk that 75% SNSP would not be achievable and that, even if it was, it was extremely difficult to predict the amount of time this level would be operated at annually.

This feedback should be considered in conjunction with the feedback on the Temporal Scarcity Framework component of the consultation on Enduring Tariffs, as summarised in the recommendations paper on DS3 System Services Tariffs for Regulated Arrangements.

TSO Recommendation for Regulated Arrangements

We recommend that a temporal scarcity scalar for the 11 existing Services, based on a metric linked to the percentage of SNSP with regard to demand in a given trading period, should be implemented for Regulated Arrangements. Note: this recommendation differs to the proposal described in the consultation on Enduring Scalar Design.

The recommended design of this scalar is as follows:

Scalar Value	Criteria for Scalar Value Applicable to 11 Existing Services
6.3	SNSP > 70%
4.7	SNSP > 60% and \leq 70%
1	SNSP \leq 60%

Figure 15 graphically illustrates the recommended design of this scalar.

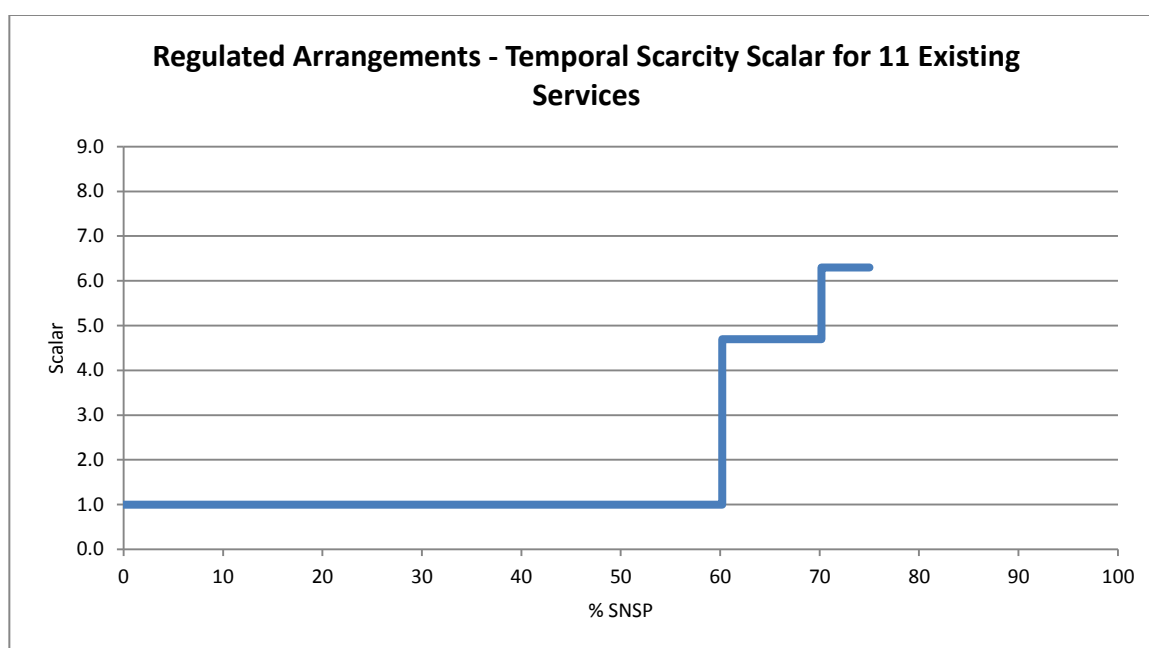


Figure 15: TSO Recommendation 2017 - Temporal Scarcity Scalar for 11 Existing Services

Rationale for Recommendation

This recommendation should be considered in conjunction with the Scarcity Scalar Framework set out in the recommendations paper on DS3 System Services Tariffs for Regulated Arrangements.

In summary, the recommended downwards adjustment of the temporal scarcity scalar value that is to apply above 60% and 70% SNSP is to offset a 5% recommended increase to the base tariff rates and the additional expenditure arising from the

recommended changes to the temporal scarcity scalar for FFR (see section 2.8 of this paper).

Given that the TSOs consider that the provision of the existing 11 System Services is important at all SNSP levels, the value of the scalar is to be 1 at low levels of SNSP, i.e. $\leq 60\%$.

2.10. Locational Scarcity Scalar for All System Services

Summary

This section sets out the TSOs' recommendation that a locational scarcity scalar to incentivise the provision of all System Services, or a subset of Services, in the future from to-be-determined geographical locations, should be implemented for Regulated Arrangements.

Introduction

This scalar was requested in the SEM Committee paper SEM-17-017 on the DS3 System Services Future Programme Approach¹³.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that a locational scarcity scalar for all System Services be implemented for Regulated arrangements.

The proposed scalar design was as follows:

Scalar Value	Criteria for Scalar Value Applicable to Any / All Services
>1	May apply to the provision of any System Service from to-be-determined geographical locations.
1	Default value for Regulated Arrangements.

Stakeholder Comments on the Locational Scarcity Scalar for All System Services

The following question was asked in the consultation paper:

"Do you agree with our proposal to implement a Locational Scarcity Scalar for All System Services? If not, please specify why or identify what element of the scalar design you believe requires amendment?"

¹³ SEM Committee DS3 System Services Future Programme Approach SEM-17-017:
<https://www.semcommittee.com/sites/semcommittee.com/files/media-files/SEM-17-017%20DS3%20System%20Services%20Future%20Approach%20Information%20Paper.pdf>

6 respondents agreed with the proposal without proposing changes to the design. 9 respondents generally agreed with the principle of the proposal, but disagreed on the scalar design. 1 respondent commented that not introducing the scalar for the foreseeable future appeared at odds with the recent SEMC decision on Locational Constraints.

Other respondents commented that the rationale for and implementation of the scalar must be made clear, be subject to consultation and approved by the Regulatory Authorities. 2 respondents raised specific considerations relating to DSUs and DSO constraints. 1 respondent noted that a bilateral contract may be more appropriate than a scalar. 1 respondent commented on the market sensitivity of the application of any such scalar.

3 respondents disagreed with the proposal, for diverse reasons. 1 respondent commented that the scalar would not effectively deliver DS3 volumes in certain locations without creating market power issues amongst the generators that already exist in those areas. 1 respondent noted that the application of a locational scalar would impact negatively on other providers given the System Services expenditure cap.

TSO Recommendation for Regulated Arrangements

We recommend that a locational scarcity scalar for all System Services, as described in the consultation paper and repeated above, should be implemented for Regulated Arrangements

It is recommended that this scalar should be allowed for in contracts for the duration of Regulated Arrangements. However, we would only intend to apply a locational scarcity scalar value greater than 1 to any System Service should a specific need be identified in the future. Any future implementation would be subject to the TSOs establishing a strong requirement for incentivising the provision of Services from particular locations, as well as approval by the Regulatory Authorities.

Rationale for Recommendation

The SEM Committee paper SEM-17-017 on the DS3 System Services Future Programme Approach, with reference to the decision paper SEM-16-081 on Capacity Remuneration Mechanism Locational Issues¹⁴, details the rationale for this scalar.

¹⁴ SEM Committee I-SEM Capacity Remuneration Mechanism Locational Issues SEM-16-081 <https://www.semcommittee.com/sites/semcommittee.com/files/media-files/SEM-16-081%20CRM%20Locational%20Issues%20Decision%20Paper.pdf>

3. Scalars Not Recommended for Regulated Arrangements

The TSOs recommend that the following scalars should not be implemented for the duration of Regulated Arrangements:

- Locational scarcity scalar for SSRP
- Product scalar for enhanced delivery of DRR with more reactive current
- Product scalar for enhanced delivery of SSRP with a PSS
- Product scalar for SIR with Reserve
- Product scalar for Faster Response of FPFAPR
- Temporal scarcity scalar for Reserve Products
- Temporal scarcity scalar for SIR
- Volume scalar

The following sections describe the proposals made in the consultation paper on Enduring Scalar Design and the rationale for our recommendation not to implement these scalars for Regulated Arrangements.

3.1. Locational Scarcity Scalar for SSRP

Summary

This section sets out the TSOs' recommendation that a locational scarcity scalar specifically for the SSRP Service should not be implemented for Regulated Arrangements.

Introduction

The TNEI / Pöyry report originally suggested that the TSOs consider the introduction of this scalar. No specific question was asked in the consultation paper relating to this proposal.

TSO Recommendation for Regulated Arrangements

We recommend that a locational scarcity scalar for all 14 System Services should be implemented for Regulated Arrangements, not simply for SSRP. Please refer to Section 2.10 of this paper on the Locational Scarcity Scalar for All System Services.

Rationale for Recommendation

The SEM Committee paper SEM-17-017 on the DS3 System Services Future Programme Approach, with reference to the decision paper SEM-16-081 on Capacity Remuneration Mechanism Locational Issues, details the rationale for a locational scarcity scalar for all 14 System Services.

3.2. Product Scalar for Enhanced Delivery of DRR with more reactive current

Summary

This section sets out the TSOs' recommendation that a product scalar for the enhanced delivery of DRR with more reactive current should not be implemented for Regulated Arrangements.

Introduction

The TNEI / Pöyry report originally suggested that the TSOs consider the introduction of this scalar.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that a product scalar for the enhanced delivery of DRR with more reactive current not be implemented for Regulated Arrangements.

Stakeholder Comments on the Product Scalar for the Enhanced Delivery of DRR with more reactive current

The following question was asked in the consultation paper:

"Do you agree with our proposal NOT to implement a Product Scalar for Enhanced Delivery of DRR with more reactive current? If not, can you provide rationale to support your views?"

A large majority of respondents agreed with this proposal or made no comment.

TSO Recommendation for Regulated Arrangements

We recommend that a product scalar for the enhanced delivery of DRR with more reactive current should not be implemented for Regulated Arrangements.

Rationale for Recommendation

We retain our previous rationale for not introducing this scalar, as set out in the consultation on Enduring Scalar Design: the complexity of implementing the scalar, together with the possibility of transient events occurring if providing units were to over-respond or under-respond based on incorrect set points or communication issues.

3.3. Product Scalar for Enhanced Delivery of SSRP with a PSS

Summary

This section sets out the TSOs' recommendation that a product scalar for the enhanced delivery of SSRP with a PSS should not be implemented for Regulated Arrangements.

Introduction

The TNEI / Pöyry report originally suggested that the TSOs consider the introduction of this scalar.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that a product scalar for the enhanced delivery of SSRP with a PSS not be implemented for Regulated Arrangements.

Stakeholder Comments on the Product Scalar for the Enhanced Delivery of SSRP with a PSS

The following question was asked in the consultation paper:

"Do you agree with our proposal NOT to implement a Product Scalar for Enhanced Delivery of SSRP with a PSS? If not, can you provide rationale to support your views?"

A large majority of respondents agreed with this proposal or made no comment. 1 respondent requested clarity on the rationale for not implementing the scalar. 1 respondent disagreed with the TSO proposal.

TSO Recommendation for Regulated Arrangements

We recommend that a product scalar for the enhanced delivery of SSRP with a PSS should not be implemented for Regulated Arrangements.

Rationale for Recommendation

We retain our previous rationale for not introducing this scalar, as set out in the consultation on Enduring Scalar Design: it does not meet the objective of a product scalar as set out in SEM-14-108; performance monitoring of SSRP can address any issues around PSS capability.

3.4. Product Scalar for SIR with Reserve

Summary

This section sets out the TSOs' recommendation that a product scalar for SIR with reserve should not be implemented for Regulated Arrangements.

Introduction

The TNEI / Pöyry report originally suggested that the TSOs consider the introduction of this scalar.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that a product scalar for SIR with reserve not be implemented for Regulated Arrangements.

Stakeholder Comments on the Product Scalar for SIR with Reserve

The following question was asked in the consultation paper:

"Do you agree with our proposal NOT to implement a Product Scalar for SIR with Reserve? If not, can you provide rationale to support your views?"

A majority of respondents agreed with this proposal or made no comment. 1 respondent requested clarity on the rationale for not implementing the scalar. 3 respondents disagreed with the TSOs' rationale.

TSO Recommendation for Regulated Arrangements

We recommend that a product scalar for SIR with reserve should not be implemented for Regulated Arrangements.

Rationale for Recommendation

We retain our previous rationale for not introducing this scalar, as set out in the consultation on Enduring Scalar Design: there is an inherent potential for this scalar to introduce the undesired outcome of potential providers deciding not to offer their true lowest possible Minimum Generation level.

3.5. Product Scalar for Faster Response of FPFAPR

Summary

This section sets out the TSOs' recommendation that a product scalar for faster response of FPFAPR should not be implemented for Regulated Arrangements.

Introduction

The TNEI / Pöyry report originally suggested that the TSOs consider the introduction of this scalar.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that a product scalar for faster response of FPFAPR not be implemented for Regulated Arrangements.

Stakeholder Comments on the Product Scalar for Faster Response of FPFAPR

The following question was asked in the consultation paper:

"Do you agree with our proposal NOT to implement a Product Scalar for Faster Response of FPFAPR? If not, can you provide rationale to support your views?"

A large majority of respondents agreed with this proposal or made no comment. 1 respondent proposed an alternative rationale for not implementing the scalar.

TSO Recommendation for Regulated Arrangements

We recommend that a product scalar for faster response of FPFAPR should not be implemented for Regulated Arrangements.

Rationale for Recommendation

We retain our previous rationale for not introducing this scalar, as set out in the consultation on Enduring Scalar Design: the introduction of this scalar would dilute the revenue from the FPFAPR product away from non-synchronous providers that may need to make material investment in order to provide the product.

3.6. Temporal Scarcity Scalar for Reserve Products

Summary

This section sets out the TSOs' recommendation that a temporal scarcity scalar for reserve products should not be implemented for Regulated Arrangements.

Introduction

The TNEI / Pöyry report originally suggested that further analysis be conducted on the potential benefits of implementing this scalar.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that a temporal scarcity scalar for reserve products not be implemented for Regulated Arrangements.

Stakeholder Comments on the Temporal Scarcity Scalar for Reserve Products

The following question was asked in the consultation paper:

"Do you agree with our proposal NOT to implement a specific Temporal Scarcity Scalar for Reserve Products? If not, can you provide rationale to support your views?"

A large majority of respondents agreed with this proposal or made no comment. 1 respondent requested more detail on the rationale for the proposal.

TSO Recommendation for Regulated Arrangements

We recommend that temporal scarcity scalars for FFR and the 11 existing System Services, which collectively account for all of the Reserve products, should be implemented for Regulated Arrangements. Please refer to Sections 2.8 and 2.9 of this paper.

3.7. Temporal Scarcity Scalar for SIR

Summary

This section sets out the TSOs' recommendation that a temporal scarcity scalar for SIR should not be implemented for Regulated Arrangements.

Introduction

The TNEI / Pöyry report originally suggested that the TSOs consider the introduction of this scalar.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that a temporal scarcity scalar for SIR not be implemented for Regulated Arrangements.

Stakeholder Comments on the Temporal Scarcity Scalar for SIR

The following question was asked in the consultation paper:

"Do you agree with our proposal NOT to implement a specific Temporal Scarcity Scalar for SIR? If not, can you provide rationale to support your views?"

A large majority of respondents agreed with this proposal or made no comment.

TSO Recommendation for Regulated Arrangements

We recommend that a temporal scarcity scalar for the 11 existing System Services, which includes SIR, should be implemented for Regulated Arrangements. Please refer to Section 2.9 of this paper.

3.8. Volume Scalar

Summary

This section sets out the TSOs' recommendation that a volume scalar should not be implemented for Regulated Arrangements.

Introduction

Previously, in the 2016 scalars consultation, we had proposed that a volume scalar be introduced – to be applied, where necessary, to regulated tariffs – in order to protect consumers from overpayment and allow the TSOs to manage the overall scale of payments for System Services.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed that a volume scalar not be implemented for Regulated Arrangements.

Stakeholder Comments on the Volume Scalar

The following question was asked in the consultation paper:

"Do you agree with our proposal NOT to implement a specific Volume Scalar for Regulated Arrangements? If not, can you provide rationale to support your views?"

A large majority of respondents agreed with this proposal or made no comment. 1 respondent disagreed with the proposal.

TSO Recommendation for Regulated Arrangements

We recommend that a volume scalar should not be implemented for Regulated Arrangements. The recommendations paper on DS3 System Services Tariffs for Regulated Arrangements describes alternative proposals to manage the scale of expenditure.

4. FFR Frequency Response Curves

Summary

This section sets out the TSOs' position relating to the implementation of frequency response curves as a means to define how the FFR Service is to be provided from diverse technologies with distinct capabilities. The feedback received to the proposal set out in the consultation on Enduring Scalar Design is summarised. The TSOs' latest thinking on the design of the response curves, together with the design of the product scalar for the enhanced provision of the FFR Service, is presented as part of the consultation on DS3 System Services Contracts for Regulated Arrangements.

Introduction

FFR is not being procured under Interim Arrangements. It is scheduled to go live on 1 September 2018.

For Regulated Arrangements, we recommend that product scalars should be implemented to further incentivise the effective delivery of FFR (see Section 2):

- Product Scalar for the Faster Response of FFR
- Product Scalar for the Enhanced Delivery of FFR [and POR, SOR and TOR1]
- Product Scalar for the Continuous Provision of Reserve from FFR to TOR1

In addition to the core product design and accompanying product scalars, given the fast-acting nature of FFR, we consider that frequency response curves are required to maximise the benefits of the Service to the system while also ensuring that system security is not compromised. These curves would allow for the TSOs to define how each contracted unit is to provide FFR based on system requirements and a unit's confirmed capabilities. The values derived from the curves would form an input to a unit's contracted values for Regulated Arrangements. The curves would also inform the design of the product scalar for the enhanced provision of FFR.

Consultation Paper Proposal

In the consultation paper on Enduring Scalar Design, we proposed 2 separate curves: 1 for dynamic (as shown in Figure 16) and 1 for static resources (as shown in Figure 17). The candidate curves were the outcome of a focused simulation study.

Control parameters applicable to the curves – which it was proposed would be assigned to providing units during the procurement process for Regulated Arrangements, based on their capability and system requirements – were to include, but not limited to:

- The frequency trigger set points (both in response to an event and in recovery);
- The response slope (akin to a droop characteristic);
- The number of discrete steps;
- Energy recovery profiles;
- MW output.

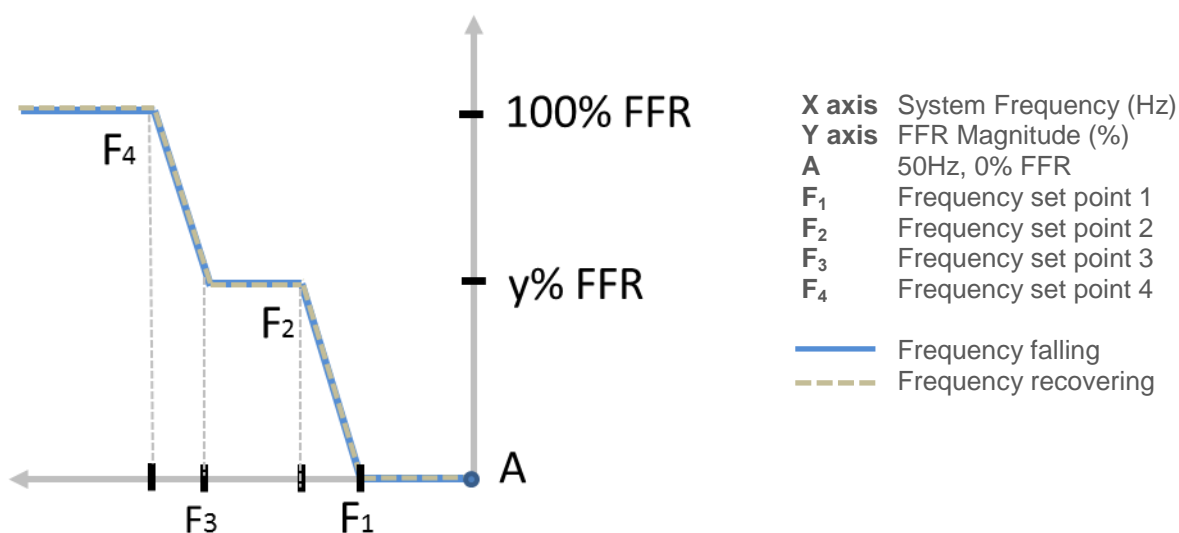


Figure 16: Frequency Response Curve - Dynamic Capability

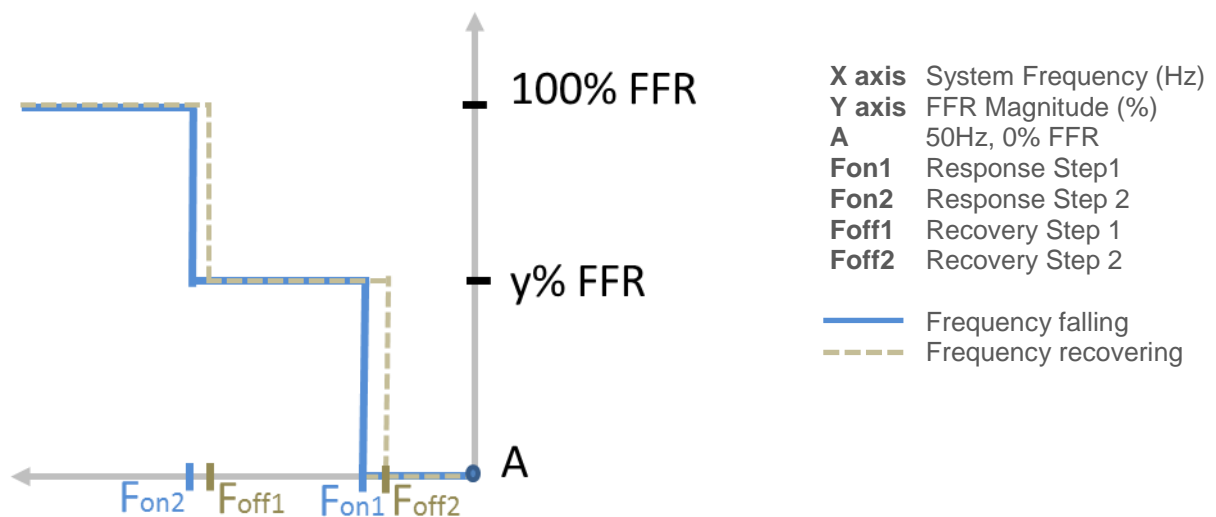


Figure 17: Frequency Response Curve - Static Capability

Stakeholder Comments on Frequency Response Curves

The following question was asked in the consultation paper:

“Do you agree with our proposal to implement Frequency Response Curves to define the provision of the FFR Service? If not, please specify why or identify what element of the curve design you believe requires amendment?”

There was a generally favourable response to the proposal to implement frequency response curves for the definition of the FFR Service. Many respondents requested further information on the various parameters and setpoints applicable to the curves, as these may inform design and investment decisions for providing units.

6 respondents agreed with the proposal without making any additional comments relating to the intended design of the curves.

9 respondents agreed with the proposal in principle and made additional suggestions relating to the design of the intended curves. These included: that consideration should be given to the fact that the design of a battery factors in unit degradation; that special consideration should be given to DSUs, including allowing for flexibility in recovery and a proposal that a hybrid of dynamic and static capability might be an appropriate categorisation for DSUs; that benefits to providers from incentives toward higher sensitivity in responses should not be reversed if the TSOs then subsequently favour lower sensitivity.

1 respondent also commented on the apparent divergence in the definition of dynamic and static capability compared to the Product Scalar for Enhanced Provision of FFR, POR, SOR and TOR1.

Further Consultation

We continue to develop the proposal to define the provision of the FFR Service through the utilisation of parametrisable frequency response curves.

In acknowledgement of industry requests for further information from the TSOs on this measure, an expanded proposal on the design of the parametrisable curves and the product scalar for the enhanced provision of FFR is set out in the consultation on DS3 System Services Contracts for Regulated Arrangements. Please also see section 2.3 of this paper.