Consultation on DS3 System Services Volume Capped Competitive Procurement

DS3 System Services Implementation Project

29 March 2018

Disclaimer

Glossary of Terms

Availability: the payment basis for DS3 System Services. If a volume of a given system service, from a DS3 System Services contracted party, is technically realisable in a trading period, then that volume is deemed 'available' for that trading period and is eligible for remuneration. This applies irrespective of the TSOs' real-time requirement for that service.

Locational Scalar: A scalar which will be applied to System Services remuneration to create marginal incentives for providers to physically position themselves at areas of the network where they offer higher value.

Maximum Export Capacity (MEC): in respect to a connection point, the maximum amount of electricity which is permitted to flow into the Transmission or Distribution System

Maximum Import Capacity (MEC): in respect to a connection point, the maximum amount of electricity which is permitted to flow out of the Transmission or Distribution System

Non-Synchronous Technologies: any technologies that are mainly focused on system services provision as opposed to participation in the energy and capacity markets. It is assumed that such devices are connected to the system via power electronics and are thus non-synchronous.

Product Scalar: A scalar which will be applied to System Services remuneration to incentivise increased capability in the delivery of services.

Separate Grid Connection: An individual connection point for a providing unit to the distribution or transmission system, also known as a 'feeder'.

Temporal Scarcity Scalar: A scalar which will be applied to System Services remuneration to create marginal incentives for providers to make themselves available during periods of scarcity, therefore enhancing the performance of the system where it is most needed.

Executive Summary

In 2011, we established our ‘Delivering a Secure Sustainable Electricity System (DS3)’ programme. The objective of the 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.

In their decision SEM-17-080, the SEM Committee decided that fixed term and fixed tariff contracts would be issued to providers for a sub-set of services. This mechanism was proposed by the TSO in order to establish contractual arrangements which provide an element of revenue certainty which would be suitable for new System Service providers. This mechanism would be competitive in nature and is deemed ‘Volume Capped’, meaning that an upper limit will be applied to the volume of relevant services.

This consultation presents the results of further consideration on a range of design details for the volume capped competition process, including:

- General competition approach
- Applicant pre-requisites
- Format and assessment of bids
- Applications of tariff caps and scalars
- Other interactions.

Options and proposals are given with respect to the above. These proposals are based on the appropriate balance of considerations to meet the respective challenges and constraints associated with awarding fixed price and minimum length contracts, whilst respecting the investment need for certainty.

The proposals put forward for the volume capped procurement arrangements have been developed in line with the overarching SEM Committee direction and in particular, the linear increase in the DS3 System Services expenditure cap out to €235 million in 2020.

We propose to:

- Carry out a procurement exercise via a staged approach, awarding 100 MW in Stage 1
- Carry out future procurement stages to allocate up to a volume of 300 MW total, with an additional procurement round for 100MW anticipated in 2019
- Apply a range of selection criteria to filter valid applicants, including (and not limited to) technical capability, size, connection arrangements.
- Sort applicants on the price per MW for the bundled service being procured

In this consultation, we are seeking stakeholders’ views on the proposals. SONI and EirGrid welcome feedback on the questions posed within this paper, which will be used to inform the decision paper that will be submitted to the SEM Committee for approval.

Responses should be submitted to DS3@soni.ltd.uk or DS3@EirGrid.com before 11 May 2018 using the associated questionnaire template.

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1. Introduction and Background

1.1 EirGrid and SONI

EirGrid and SONI are the Transmission System Operators (TSOs) in Ireland and Northern Ireland. It is our job to manage the electricity supply and the flow of power from generators to consumers. Electricity is generated from gas, coal, peat and renewable sources (such as wind, solar and hydro power) at sites across the island. Our high voltage transmission network then transports electricity to high demand centres, such as cities, towns and industrial sites.

We have a responsibility to enable increased levels of renewable sources to generate on the power system while continuing to ensure that the system operates securely and efficiently. In 2010, we published the results of the *All Island TSO Facilitation of Renewables studies*[1]. Those studies identified a metric, the System Non-Synchronous Penetration (SNSP), as a proxy for the capability to operate the power system safely, securely and efficiently with high levels of renewable generation. SNSP is a real-time measure of the percentage of generation that comes from non-synchronous[2] sources, such as wind generation, relative to the system demand.

The studies identified 50% as the maximum level of non-synchronous infeed allowable on the power system until solutions could be found to the various technical challenges identified. Should this limit not be increased out to 2020, the curtailment of generation from installed wind could rise to over 25% per annum.[3]

1.2 The DS3 Programme

Our Delivering a Secure Sustainable Electricity System (DS3) programme seeks to address the challenges of increasing the allowable SNSP up to 75% by 2020, whereby the curtailment of wind would be reduced to approximately 5% per annum. Operating in

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[1] Al- Island TSO Facilitation of Renewables studies - http://www.eirgridgroup.com/site-files/library/EirGrid/Facilitation-of-Renewables-Report.pdf

[2] Non-synchronous infeed (generator output or High Voltage Direct Current (HVDC) imports) inject power into the electrical grid via power electronics. Power electronics are used to convert the injected current to match the frequency of the transmission network.

[3] DS3: System Services Consultation Finance Arrangements – http://www.eirgridgroup.com/site-files/library/EirGrid/System-Services-Consultation-Financial-Arrangements-December_2012.pdf

this manner should deliver significant savings to consumers through lower wholesale energy prices.

DS3 incorporates mutually reinforcing innovative technical, engineering, economic and regulatory initiatives. It is divided into three pillars:

- System Performance
- System Policies
- System Tools

DS3 is not only making the operational changes necessary to manage higher levels of renewable generation, but is also aiming to evolve the wider electricity industry and implement changes that benefit the end consumer. From the onset, the integration of wind generation presented a range of challenges previously unseen in the power sector. Through collaboration with the Regulatory Authorities and the wider electricity industry, DS3 has developed a number of innovative and progressive solutions.

The results of the programme are now beginning to deliver benefits to the consumer. In recent months the maximum SNSP level allowable has increased to 65% (on an operational trial basis). It is expected that similar trials will be conducted in the coming years with a view to achieving the overall goal of a maximum 75% SNSP limit by 2020.

1.3 DS3 System Services Process

A key workstream in the DS3 programme is the System Services work stream. The aim of the System Services work stream 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 infeed.

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)[4].

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

- Provide a framework for the introduction of a competitive mechanism for system services procurement;
- 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;

[4] DS3 System Services Procurement Design and Emerging Thinking Decision Paper (SEM-14-108): http://www.semcommittee.eu/GetAttachment.aspx?id=c0f2659b-5d38-4e45-bac0-dd5d92cda150

- Provide certainty to new providers of system services that the defined procurement framework delivers 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 renewables increases;
- 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 renewables on the electricity system, can be harnessed for the benefit of consumers;
- Provide assurance to consumers that they will not pay more for system services than the benefit accrued from System Marginal Price (SMP) savings arising from higher levels of marginally low-cost renewable generation[5].

1.4 Overview of System Services

EirGrid and SONI have licencing and statutory obligations to procure sufficient system services to enable efficient, reliable and secure power system operation. The contractual arrangements and payment rates in Ireland and Northern Ireland were harmonised following the introduction of the SEM, with 7 products (POR, SOR, TOR1, TOR2, SSRP, RRS, and RRD) procured under these Harmonised Ancillary Services (HAS) arrangements.

New services are required to support a move to higher levels of non-synchronous generation. Four services (SIR, RM1, RM3, and RM8) were introduced from 1 October 2016 following the commencement of the new DS3 System Services arrangements. The later 4 services, together with the former 7 services are referred to herein as the '11 existing services'. A further 3 services (FFR, DRR, FPFAPR), referred to herein as the '3 new services', will be introduced in 2018. All services are required to maintain the

[5] Note that 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.

resilience of the power system as the SNSP levels increase. Table 1 provides a high-level summary of the DS3 System Services products.

The Grid Codes do not oblige service providers to deliver the new services. Through the DS3 System Services tariff arrangements, the standards to which providers will offer these on a commercial basis are being developed. This will necessitate a consideration of a range of issues including standards, performance monitoring and settlement issues. These issues will be dealt with outside the scope of this paper.

Table 1: Summary of DS3 System Services[6]

Service Name	Abbreviation	Unit of Payment	Short Description
Synchronous Inertial Response	SIR	MWs^2h	(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
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 (MW) >90% within 250ms 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

[6] Further detail on the DS3 System Services can be found at: http://www.eirgridgroup.com/how-the-grid-works/ds3-programme/

1.5 DS3 System Services Tariffs and Scalars

In the SEM Committee High Level Design of DS3 System Services paper of 2014, it was outlined that there should be a glide path to an expenditure cap in 2020 for DS3 systems services of €235m. This expenditure cap was based on anticipated consumer benefits of the introduction of DS3 System Services and the enablement of much greater levels of renewable energy into the All - Island energy markets.

The SEM Committee in the March 2017 Future Approach paper outlined the straight line budget glide path out to a maximum expenditure by the TSOs of €235m in 2020 on DS3 System Services procurement.

The SEM Committee's annual cap "glide path" is shown in Figure 1 below. In its Information Paper, the SEM Committee sets out its position as follows:

- "the expenditure cap limits expenditure to a maximum level but does not guarantee that this level of monies will be spent; tariff rates will not increase for services where there is no additional system need and where additional investment is not required."
- "modifications to the payment rules and use of scarcity scalars may be required to ensure that monies are targeted to new investment while respecting the principle of technology neutrality."
- "the expenditure cap in a given year will not be reached unless it is required; and where it is required the budget will be allocated in such a way as to maximise consumer value."
- Tariffs would be reviewed and consulted on annually.

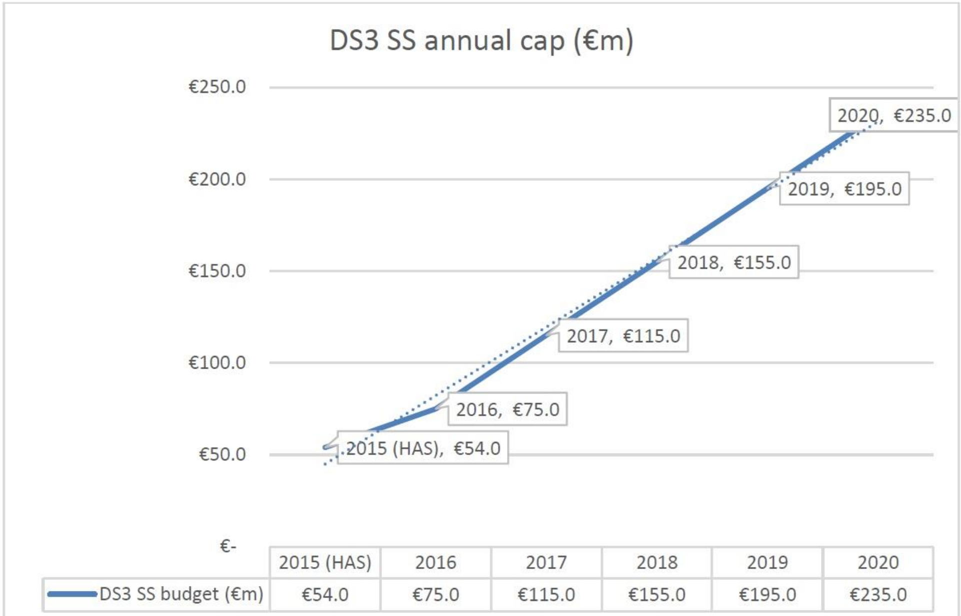

Figure 1: SEM Committee's DS3 System Services Annual Cap

In its SEM-17-80 decision paper, the SEM Committee confirmed that the annual expenditure cap of €235m will remain in place beyond 2020 and that any revision of the cap will be preceded by public consultation. In this decision, the SEM Committee also reaffirmed its view that the System Services arrangements should be consistent with the energy trading arrangements.

In the same paper the SEM Committee also agreed that a separate procurement of a subset of services from high-availability units by the TSOs will reduce the risk of over-expenditure, and that contracts awarded to high-availability units will be on the basis of competitive tender (where the volume cap has been reached).

1.6 Volume Capped Procurement

As outlined in the Consultation on DS3 System Services Enduring Tariffs[7], the TSOs sought to develop enduring tariff design in a way which was robust against a number of

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[7] Consultation on DS3 System Services Enduring Tariffs http://www.eirgridgroup.com/site-files/library/EirGrid/DS3-System-Services-Enduring-Tariffs-Consultation-Paper.pdf

risks which may result in over-expenditure beyond the “glide-path” expenditure set out by the SEM Committee for DS3 System Services.

These risks and mitigations were presented in the consultation, with Section 4.4.1 highlighting the risk that there may be an overinvestment in high availability technologies whose availability is not linked to energy dispatch such as Demand Side Units and Non-Synchronous Technologies.

Possible mitigation options were presented in the paper, one of which was to place a limit on the volume of high availability technologies that can qualify to provide services in order to encourage a phased approach in the introduction of the new technologies.

Based on further consideration of the most appropriate mitigation options, the TSOs proposed implementing a “Volume Capped” approach to address this risk of overinvestment of high availability technologies, which would pose an expenditure risk to the SEM Committee “glide-path”. This proposal was consulted on with the results provided in the DS3 System Services Contracts for Regulated Arrangements Recommendation paper[8] published in December 2017.

The proposed Volume Capped procurement would only apply to a subset of the DS3 System Services for which the TSOs have evaluated that an expenditure risk exists, namely the FFR, POR, SOR, TOR1 and TOR2 services.

After consultation with industry in the DS3 System Services Regulated Agreements (Volume Uncapped), the TSOs decided high availability units should not be restricted from participating in the Volume Uncapped Contracts.

As a result of feedback from this consultation it was also proposed that there will be different terms and requirements for Volume Capped which will be suitable for those parties looking to invest in new service providers. This means that contracts will need to provide a level of certainty on which new providing units can be built e.g. fixed length and certainty in remuneration.

In this decision paper it was noted that further consultation would be required in relation to the proposed Volume Capped arrangements – the purpose of this consultation.

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[8] DS3 System Services Contracts for Regulated Arrangements Recommendation paper http://www.eirgridgroup.com/site-files/library/EirGrid/DS3-System-Services-Contracts-Recommendations_final.pdf

1.7 Purpose of the Consultation Paper

The purpose of this consultation paper is to set out the principles, approach, rules and requirements which will be used to run the Volume Capped procurement competition.

Questions are provided for which the TSO requests responses by **11th May 2018**.

It should be noted that a consultation on the contract for this procurement exercise will follow, intended for July 2018.

1.8 Structure of the Consultation Paper

The remainder of this consultation is structured as follows:

Section 2 provides an overview of the timelines for this procurement process as well as an overview of the proposals which are contained within the rest of the consultation

Section 3 gives the characteristics of the service which is being procured as well as requirements for prospective service providers

Section 4 outlines the overall procurement approach, as well as applications of scalars during the contract lifetime.

Section 5 provides requirements in relation to industry frameworks, as well as considerations with respect to interactions with other markets

Section 6 proposes the mechanism by which applications will be assessed

Section 7 provides an overview of next steps and details the consultation questions.

Appendix I: Fast Frequency Response Product Characteristics for Volume Capped Competitive Arrangements

2. Volume Capped Procurement: Timelines and Overview of Proposals

2.1. Introduction

The following section provides information regarding the overall timelines and deadlines in relation to this Volume Capped procurement, as well as a high level summary of the proposals contained within this consultation. These proposals are explored in further detail in the subsequent sections of the document.

2.2. Procurement Timelines and general principles

It is intended for Volume Capped Procurement to contract for a subset of the DS3 System Services, (proposed in Section 3.1.1). Contracted providers will be required to provide all services in this subset, and submit competitive pricing per service as part of their tender. There will be an upper volume cap (limit of volume procured) on the contracts awarded to eligible providers (Section 4.1.4). It is intended for Volume Capped procurement to be undertaken during 2018, likely to begin in September 2018 with contract execution to take place in May/June 2019.

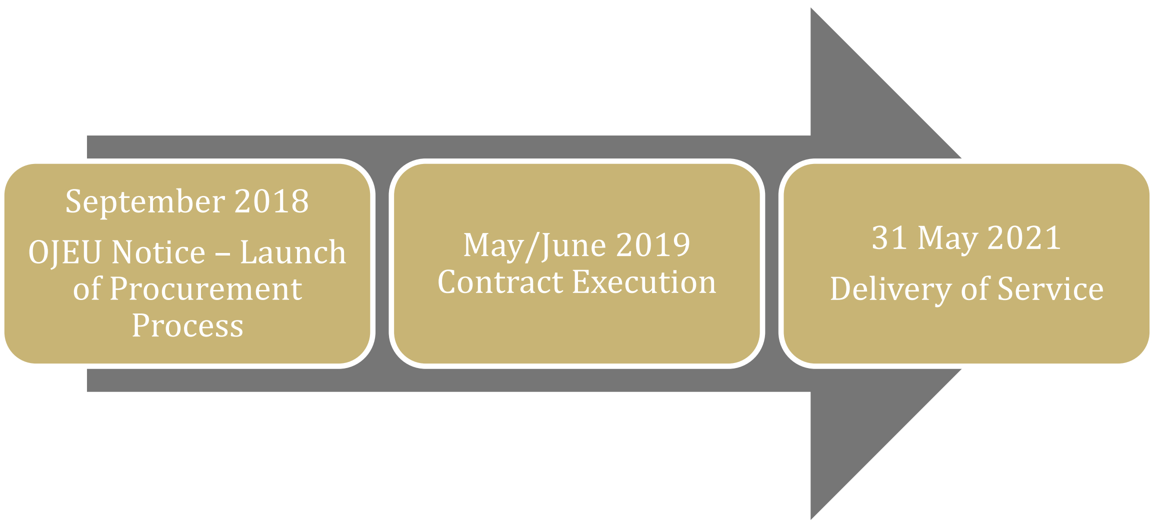
The terms and conditions of these contracts will differ from the Volume Uncapped DS3 System Services contracts and will require further development and consultation. They are intended to provide contractual arrangements for aspiring entrants, allowing time for a build phase before service provision commences.

Contracts of a guaranteed term of a maximum of 6 years' duration (with possible additional 2 years build phase)will be awarded for successful applicants. Contracts will be awarded based both on technical qualification (which is further explored in this consultation) and competitive price, both considered within the boundaries put in place for this procurement process.

A Providing Unit will not be able to simultaneously hold Volume Uncapped and Volume Capped contracts for the same DS3 System Service. Contract award is intended to take place in May/June2019) but successful Providing Units would have a period of time to satisfy the criteria for service provision (which in the case of new entrants will mean that they will need to be operational and capable of service provision by that date). It is proposed that a Providing Unit's contract term (6 years) will commence on the date of its first service provision, within time boundaries which are proposed within this consultation. In line with SEM Committee decision 17-080, arrangements will be proposed for units which are not able to go live at this date, outlined in the Performance Bond Section (4.2.3).

Term: In line with SEM-17-080, it is proposed that Volume Capped contracts will have a guaranteed term of 6 years commencing on the date of first service provision (from the contract award date with a flexible operational start date of up to 31st May 2021). The end date of these arrangements will be set for 6 years from the go-live date of each individual providing unit; 31st May 2027 at the latest.

Termination: Notwithstanding potential breaches of the Agreement, it is proposed that neither EirGrid nor SONI (as applicable) would have the right to unilaterally terminate this contract. Specific conditions in relation to breaches of the Agreement will be consulted on in the subsequent Volume Capped contracts consultation.



2.3. Overview of Proposals

The following table provides an overview of the proposals and options which are contained within this consultation. The proposals and options are explored in more detail in the subsequent sections, and are comprised of:

- product definition and service provider requirements,
- details of the procurement and scalar application approach, and
- rules related to industry frameworks and market interactions.

Table 2: Summary of Consultation Proposals

Section	Requirement	TSO Proposal
3.1.1	Service bundling	Providing Units are required to provide 5 DS3 System Services (FFR, POR, SOR, TOR1 and TOR2) and all to the same contracted volume level.
3.1.2	Product Characteristics	Technical requirements are laid out in this document which must be met by a providing unit. The provision of the service must follow the associated dynamic FFR response curve[9]
3.1.3	Over-Frequency Response Requirements	Over-frequency response will be required from applicants
3.1.4	Availability Requirements	The service availability obligation will be 97%, excluding periods of planned maintenance.
3.2.1	Grid Connection	Applicants must have entered into a valid legally binding connection offer or be in receipt of a connection offer suitable for a contract go-live date of 31st May 2021
3.2.2	Network Limitations	Options are provided with respect to confirmation from the DSO/TSO that the proposed location is suitable or for providers to bear the risk of network limitations
4.2.1	Procurement Approach	A staged approach will be undertaken. In the first phase 100MW will be procured.
4.2.2	Contract Start Date	Contracts should start no later than 31st May 2021.

[9] 'System Services Contracts for Regulated Arrangements Recommendations Paper' http://www.eirgridgroup.com/site-files/library/EirGrid/DS3-System-Services-Contracts-Recommendations_final.pdf

4.2.3	Bonding	Performance bonding of €12,000 will be required for all applicants based per MW size of service provision.
4.2.4	Bid Structure	As part of their bundled submission applicants are required to submit a price per System Service in order to allow necessary scalars and tariff caps to be applied. Prices will be assessed for the bundled service.
4.2.5	Tariff Cap and Floor	Bids should not exceed the tariff rates outlined in SEM-17-080
4.2.6	Price Determination	Pay-as-bid pricing will be used.
4.2.7	Acceptance of last tender	Whole bids only will be accepted in price order up to and not exceeding the total volume.
4.2.8	Maximum Size	A maximum volume of 30 MW is proposed per separate grid connection point.
4.3.1	Application of Scarcity Scalar	Scarcity Scalar will apply (based on typical or actual SNSP values)
4.3.2	Performance Scalar (linked to Availability)	Not meeting the availability obligations will be managed via application of the Performance Scalar. Availability signals will need to be put in place in order to monitor the service.
4.3.3	Product Scalar	Products Scalars will apply for speed of response
4.3.4	Locational Scalar	Locational incentive/scalar will not apply for the first stage of procurement.
4.3.5	Jurisdictional Volumes	No minimum volume per jurisdiction will be set.
5.1.1	Licensing and Grid Code Requirements	Grid Code or Distribution Code requirements must be met or derogated against as appropriate
5.1.2	Network Charging	Relevant network charges will be applicable.

5.2.1	I-SEM Interactions – balancing market	Service providers will be need to position themselves in order to meet their contracted availability and service provision.
5.2.2	I-SEM Interactions – unit recharge	Providers are responsible for positioning themselves in the market or utilising their trickle charge function to ensure they are re-charged.
5.2.3	I-SEM interaction – capacity market	Service providers will need to position themselves in order to meet their contracted availability and service provision.
6	Mechanism for evaluation of applications	The procurement process will be carried out in accordance with one of the prescribed procedures in the Utilities Directive

Significant further consideration is provided in the remainder of this consultation. We recognise that industry parties will have information of relevance to many of these proposals. Questions in relation to these proposals are provided at the end of this consultation, for which we welcome responses for by **11th May 2018**.

Subsequent to this, a recommendation paper will be published as well as a further consultation on the associated contract. It is envisaged that OJEU Notice (Launch of Procurement Process) will be undertaken in September 2018 with contract execution following in May/June 2019.

3. Product definition and service provider requirements

3.1 Product Definition and Technical Capability

It is important for both TSO and potential service provider to clarify the service characteristics which are being procured under these Volume Capped arrangements. The information provided in this section details the System Services which are to be procured, as well as additional characteristics in relation to how these services should be delivered.

3.1.1 Bundling of System Services

It was previously proposed in the DS3 System Services Contracts for Regulated Arrangements Consultation[10] that the Volume Capped competition is proposed to cover reserve products from FFR to TOR2, i.e. 2 seconds – 20 minutes.

We recognised in the resulting recommendations paper[11] the responses were mixed in relation to this proposal and committed to consult on this bundling further. The intention of the bundling proposal is to ensure that the arrangements will deliver the TSOs' requirements from a future system operation perspective and protect the consumer from over-expenditure. We do however note that a number of respondents to the Consultation on DS3 System Services Contracts for Regulated Arrangements indicated that they

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[10] '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

[11] 'DS3 System Services Contracts for Regulated Arrangements' http://www.eirgridgroup.com/site-files/library/EirGrid/DS3-System-Services-Contracts-Recommendations_final.pdf

believed that bundling out to TOR2 would stifle new entrants and reduce the volume of service each provider could offer.

The TSO has concerns that by not requiring TOR2 in the bundle, a critical service required for major frequency events will not be provided. A provider which can react with fast FFR (as proposed in Section 3.1.2) and maintain response out to TOR2 timescales will contribute significantly to the management of system stability, particularly as renewable levels grow. Incentivising service capability which will be increasingly needed is an objective of the Volume Capped procurement process..

Instances where system frequency falls below the frequency trigger and has not been recovered within the trigger point quickly after the event are anticipated to be infrequent. This is particularly the case in the timescales of the TOR1 service and even more so TOR2. Therefore, we propose that these services, TOR1 and TOR2, will be dispatcheable in order to ensure their usefulness and effectiveness. These may include instances post-event where the system frequency has returned within the proposed frequency trigger for FFR but has not recovered fully. Examples of the bundled service will be activated are provided as part of Section 3.1.2 in conjunction with the product characteristics.

That services such as TOR2 can be dispatched was noted in the response to the Consultation on DS3 System Services Contracts for Regulated Arrangements. If TOR2 was not included in the bundle then the capability for this service can nominally be dispatched elsewhere given the 5 minute period between frequency event and activation. As such, an alternative bundle of FFR-TOR1 could be procured instead.

There is also a query around whether tenderers should be allowed to offer differing levels of volume for each of the 4 or 5 system services. This would, in our view, add significant complexity not only to the procurement process itself, but also to the real-time operation of the system. As such, the TSOs view is that the service provision procured under these Volume Capped arrangements should represent a bundling of either 4 or 5 products for the same volume across all products.

We would welcome comments on the implications of the two bundling options for service providers, to enable an assessment regarding the most effective service provision to be taken. On balance, the TSO would propose that TOR2 is included in the bundle as it views the inclusion of this technical capability as contributing significantly to system security in the future.

Option 1: System Services bundled include FFR – TOR1

Option 2: System Services bundled include FFR – TOR2

TSO Proposal: Providing Units are required to provide 5 DS3 System Services (FFR, POR, SOR, TOR1 and TOR2) and all to the same contracted volume level.

Question 1: Do you have any comments on the two options for service bundling proposed and the TSO's preferred option?

3.1.2 Definition of Product Characteristics

With respect to the service bundling proposed above, further technical requirements are needed in relation to the providing units and the manner in which they provide the services.

These requirements should be read in conjunction with the supporting analysis provided in Appendix I. A number of requirements are provided below:

Table 3: Summary of Product Delivery Characteristics

Characteristic	**Requirements**
Dynamic response	Dynamic capability in response to a Reserve Trigger
Required minimum speed of response	150-300ms
Trajectory	0.3Hz
Required reserve trigger capability	49.8 Hz
Recharge limitations	Trickle recharge allowed post-event provided frequency has returned to within ±0.05Hz and remained there for 5 minutes

The response of a System Service Provider for the provision of FRR is detailed in Section 4.15 of the DS3 System Services Contracts for Regulated Arrangements

Recommendations Paper[12]. Whilst this paper provides the expected response curves of the FFR product for the Volume Uncapped procurement, it should be noted that different requirements could be set as part of this Volume Capped process. However, we propose that response is provided in line with the respective curves laid out in the aforementioned Recommendations Paper. The relevant diagram, ‘FFR Dynamic Capability – Frequency Response Curve’ is provided below, with supplemental information available within the Recommendation paper.

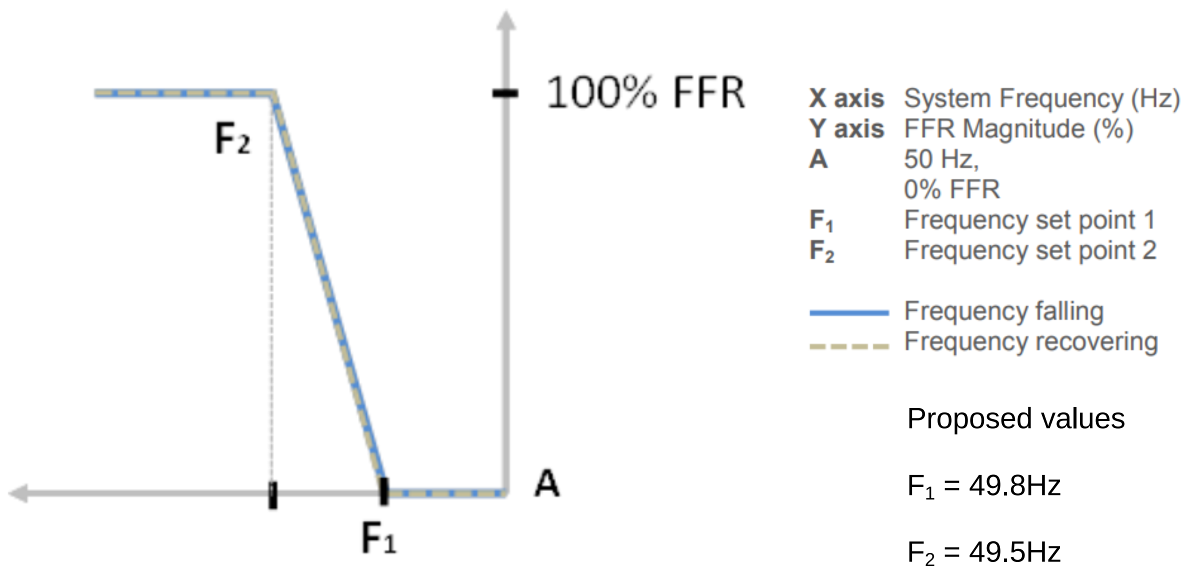

Figure 2: FFR Dynamic Capability Frequency Response Curve

Given the values provided in Table 3, in the above diagram F_1 would be 49.8Hz and F_2 49.5Hz. For the avoidance of doubt, a providing Unit’s provision of POR-TOR2 must continue its FFR response characteristics during the required timescales. In effect, the providing unit must have the capability of continuing along the trajectory of the applicable frequency response curve for the extended timeframes obligated of POR-TOR2, as

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[12] DS3 System Services Contracts for Regulated Arrangements Recommendations Paper http://www.eirgridgroup.com/site-files/library/EirGrid/DS3-System-Services-Contracts-Recommendations_final.pdf

required by the TSOs in response to a Reserve Trigger. This is notwithstanding the ability of the TSO to dispatch the TOR1 and TOR2 services as necessary.

In order to provide clarity on how the service will be activated, two examples are provided (assuming a bundle of FFR-TOR2 is procured as proposed in Section 3.1.1).

The first example illustrates an example of the FFR to TOR2 services being activated due to ongoing frequency deviation. The power output of the unit is triggered at the proposed threshold of 49.8Hz, reaching maximum output at 49.5Hz (as proposed in the frequency response curve in Figure 2). In this example, power output continues whilst frequency remains below the frequency threshold, with TOR1 and TOR2 activated in succession until frequency returns to 49.8Hz.

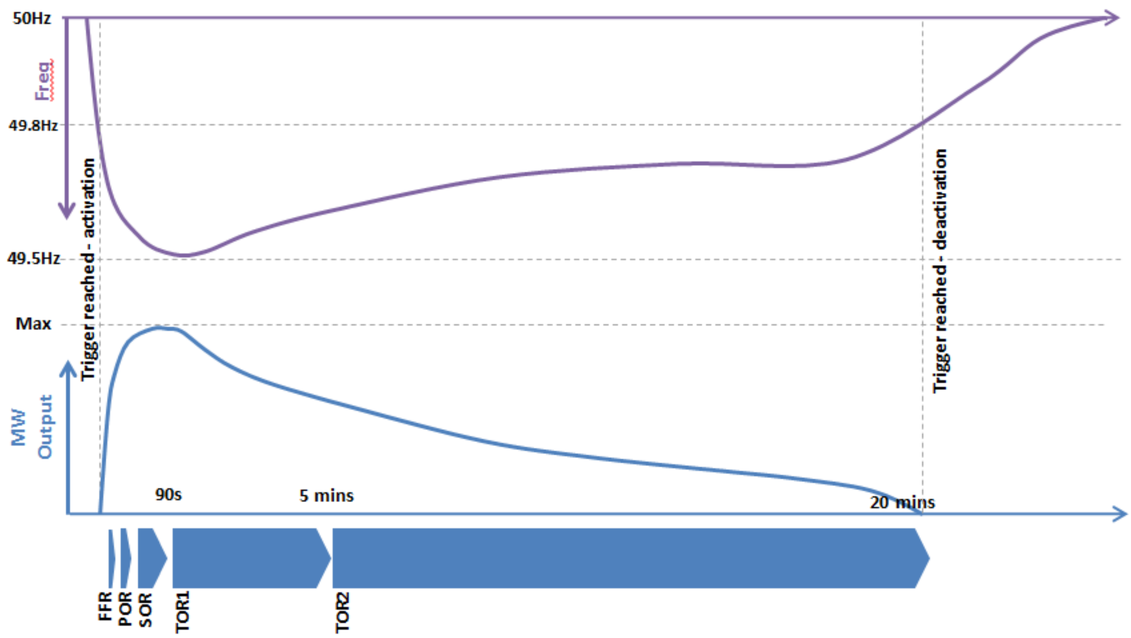

Figure 3: Providing unit output for ongoing frequency deviation

In summary, provided that system frequency remains below the threshold value, the response of the unit will continue along the response curve provided in Figure 2 out to TOR2 timescales.

A second example shows an instance of frequency going below the trigger frequency (49.8Hz) which is then recovered quickly. Subsequently however, TOR1 and TOR2 are dispatched by the TSO in order to manage the system after frequency has returned within the frequency threshold (as may be required in certain system conditions). In dispatching TOR1 and TOR2, the TSO instructs the providing unit to a set MW output up to its total capacity.

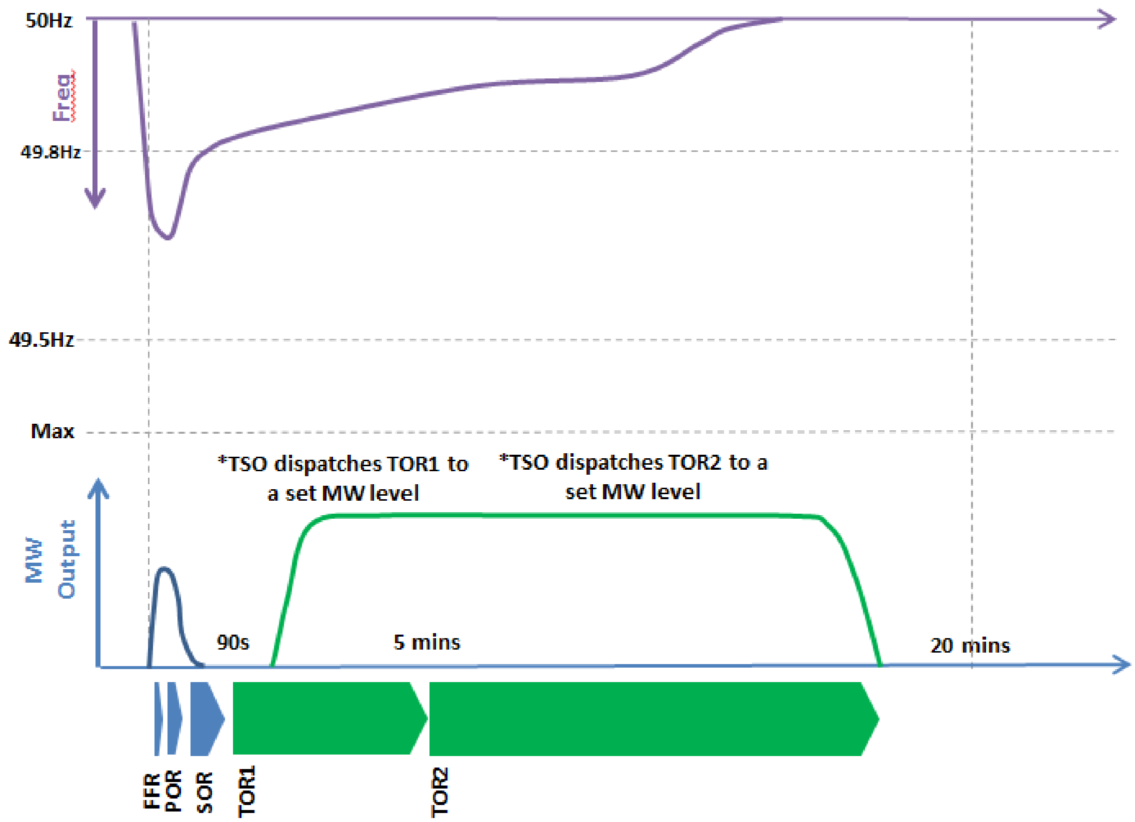

Figure 4: Providing unit output with dispatch of TOR1 and TOR2

In the example outlined in Figure 4, the MW output of the unit returns to 0MW as frequency returns to within the trigger frequency threshold. Subsequent to this the TSO instructs the unit to provide TOR1 and then TOR2, which in this instance, is maintained at a flat level. A similar example could be drawn where TOR2 only is dispatched.

For the sake of clarity, FFR-SOR will be activated only when the frequency is below the frequency threshold. Only TOR1 and TOR2 will be dispatcheable via instruction from the TSO, with MW level notified to the providing unit.

The TSO also proposed that a 'trickle recharge' capability is available to providing units. This means that they will be allowed to recharge at a slow rate during periods of system and frequency stability. This would be allowed post-event provided frequency has returned to within ±0.05Hz and remained there for 5 minutes.

TSO Proposal: The technical requirements laid out in this document must be met by a providing unit. The provision of the service must follow the FFR Dynamic Capability Frequency Response Curve laid out in the DS3 System Services Contracts for Regulated Arrangements Recommendations.

3.1.3 Over-Frequency Response Requirements

In addition to the above product and service delivery requirements, a separate requirement in relation to a unit's ability to provide over-frequency response is possible.

It is expected that the need for over-frequency response will increase in coming years, as the system operates at lower inertia levels, the level of interconnection grows and with increasing RES and lower curtailment facilitated. This is particularly the case for the contract timescales for this procurement exercise, out to 2027. If over-frequency response capability was not required from providing units, it could be viewed as a potential missed opportunity. By doing so, additional over-frequency response capability will be technically available at a point in the future where this has a system need. This could result in a more expensive solution being necessary at a later date.

Requiring such capability now however potentially adds additional complexity for an applicant. We understand that the capability to provide full over-frequency response can increase the technical requirements for a service provider, dependent on technology type. Adding these additional complexities could be seen as unnecessary, particularly for a technical requirement which is not presently required as part of the service being procured. This has the potential to reduce the economic efficiency of this procurement.

However, the TSO's view is that units providing the services being procured under this process will by their nature, be able to both import and export power. Given the potential length of the relevant contracts, it would appear sensible to include such technical requirements to ensure such capability exists in support of future system need.

As such, we propose that a unit should be capable of providing over-frequency response and welcome feedback on the characteristics of this response. These characteristics could be symmetrical to the under-frequency requirements (i.e. with the same Maximum Export Capacity, MEC) or be set at a certain lower percentage of the under-frequency requirements/MEC for the unit.

Option 1: Technical ability to provide over-frequency response is required from applicants

Option 2: Ability to provide over-frequency response is not required from applicants

TSO Proposal: Technical ability to provide over-frequency response is required from applicants.

Question 2: Do you have any view on the technical requirements proposed, including the requirement for over-frequency response?

3.1.4 Availability Requirements

A critical requirement for parties and projects applying to the competition is the necessary service availability from successful units. Given the system conditions in which the providers will be required to deliver (i.e. times at which the frequency is outside certain boundaries and the response of System Services is critical in maintaining stability), it is imperative that the TSOs have access to the full capacity of the providing unit when needed. It is our view therefore that availability of providing units must be as close to 100% as possible.

By setting a 100% requirement, we clearly indicate that units are obligated to maintain their capacity for the delivery of the contracted System Services. It is recognised however that from time to time, there are likely to be instances in which the unit may be unavailable due to maintenance or other issues which may occur. Therefore, a standard of 100% could be difficult for a unit to meet.

However, a significantly lower standard than 100% is viewed by the TSO as unacceptable. Such a reduction in standards would severely limit the ability of the TSO to rely on the service being procured and as such, reduce the efficiency and value of the competition.

In the case of maintenance, periods of unavailability could be longer. Within reason, if the TSO is notified ahead of time then it will be able to manage this unavailability. As such, we would propose to exclude any planned maintenance outages from any availability obligation. In doing this we will provide service providers with a set number of days per year where they are able to declare themselves unavailable for maintenance. A provider will be able to take these days for maintenance across a year as they see fit, and days will not be able to 'roll-over' to the next year. Specification as to what would be accepted as 'planned maintenance' would be outlined but would consist of a reasonable notice period with outages not exceeding a certain number of days. Providers would not be settled during these periods, but would not have any Availability linked Performance Scalar applied (as proposed in Section 4.3.2).

By excluding reasonable maintenance periods from the availability obligation, we do not think it is unreasonable to set stringent requirements. A standard of 97% measured on a monthly basis is proposed. This availability standard takes into account that short periods of unplanned unavailability are possible, but that these should total no more than 3%. Assessment of this availability could be conducted in line with the scalar assessment frequency as indicated in the 'DS3 System Services Protocol – Regulated Arrangements'[13] i.e. monthly. On a monthly basis, 3% would represent approximately 1 day of unplanned unavailability.

Further proposals on how availability requirements will be incentivised are included within Section 4.3.2. Consideration with respect to interactions with other markets and potential availability implications is provided in Section 5.2.

TSO Proposal: The service availability obligation will be 97% for all providers and will be assessed on a monthly basis. This obligation will exclude planned periods of maintenance outage.

Question 3: Do you have any comments on the availability obligation proposed?

3.2 Site and Network Requirements

The following section proposes conditions in relation to location and connection which must be fulfilled by prospective service providing units.). The selection criteria proposed in this consultation aim to ensure sufficient delivery by 2021 and ongoing availability through the lifespan of the contract.

[13] DS3 System Services Protocol – Regulated Arrangements http://www.eirgridgroup.com/site-files/library/EirGrid/DS3-System-Services-Protocol-Regulated-Arrangements_final.pdf

3.2.1 Grid Connection

A significant consideration necessary is whether new units must have a grid connection agreement/s in place to be considered eligible to submit an application into the Volume Capped tender. It should be noted that the process for grid connections are jurisdictional in nature and hence different in Ireland and Northern Ireland. However, across both jurisdictions four broad stages for a grid connection application exist at both a transmission and distribution level:

1. **On Hold**

   Application for connection has been received but is not progressing at present and there is no scheduled offer issue date.

2. **Processing**

   Application for connection is deemed complete and is being processed.

3. **Live Connection Offer**

   A connection offer has been made to a customer and it is with them for acceptance.

4. **Contracted**

   A customer and the TSO/DSO have entered into a legally binding connection agreement/offer.

A requirement for applicants to be in the 'Contracted' phase potentially would further ensure that applications are more likely to deliver the System Services required by the required contract go-live. Certainty of this nature is of critical importance for the process fulfilling its aim of providing services for the operational management of the system post-2020.

Conversely, if one of the earlier connection phases is accepted from applicants, the scope of potential participants is likely to be larger but may increase the risk of non-delivery.

With consideration of the above and whilst respecting the ongoing changes in the process, we propose three options for connection offer requirements:

Option 1 'Contracted phase' only: to increase the likelihood of project delivery, applicants must provide a valid legally binding connection agreement(s)/offer(s) for the site(s) in question. This would provide maximum certainty to the TSO that an applicant would be able to fulfil the target build completion date but would significantly limit potential applicants

Option 2: 'Contracted phase' and 'Live Connection Offer phase' only: both those applicants with a valid legally binding connection agreement(s)/offer(s) and those who are in receipt of a live connection offer (not yet legally binding) will be accepted. This would still provide a significant amount of certainty to the TSO whilst increasing the number of potential applicants

Option 3: 'Contracted phase', 'Live Connection Offer phase' and 'Processing phase': By the 'Processing phase', we mean those applicants who's connection requests have been deemed complete and are being processed. This would significantly widen the number of potential applicants to the competition. However, it could be seen to increase the risk of speculative bidding.

In the TSO's view, the objective requirement is that applicants should have connection offers which enables a build to be completed and contract go-live by 31st May 2021 latest. Given this, we would propose that providing units in the 'Live Connection Offer' and 'Contracted' stage only will be able to demonstrate an offer which will enable this contract go-live date and as such, we propose Option 2.

Option 1: applicants must provide a valid legally binding connection agreement(s)/offer(s) for the site(s) in question suitable for a contract go-live date of 31st May 2021.

Option 2: applicants must provide a valid legally binding connection agreement(s)/offer(s) or be in receipt of a connection offer for the site(s) in question suitable for a contract go-live date of 31st May 2021.

Option 3: applicants must provide a valid legally binding connection agreement(s)/offer(s) or be in receipt of a connection offer for the site(s) in question suitable for a contract go-live date of 31st May 2021, or be in the connection offer process with their connection request deemed complete.

TSO Proposal: Applicants must provide a valid legally binding connection agreement(s)/offer(s) or be in receipt of a connection offer for the site(s) in question suitable for a contract go-live date of 31st May 2021.

3.2.2 Network Limitations

In consideration of the availability requirements proposed in Section 3.1.4, the impact of potential network constraints must be evaluated. Whilst a unit may itself meet the availability obligations outlined above, network constraints could mean that this capacity is not available to the TSO. This would significantly increase the risk of non-delivery, which could require additional System Services to be procured at increased expense or at worst, result in unavailability in instances of system need.

Given that a unit which is located frequently behind a constraint is of less value to system stability, it could be justifiable that this should negatively impact the amount paid by the TSO to this provider. By ensuring that units are liable for this loss in payment it could act as a significant incentive for projects to locate in appropriate parts of the network (e.g. areas with less network congestion).

However, financial liability for constraints could add significant revenue uncertainty for providers which in turn, could make it more problematic for applicants to gain the financing necessary for such projects. It could be considered therefore that if a provider was unavailable as a result of network constraints, the TSO should manage this risk and the providing unit will not experience a loss of remuneration as a consequence.

For this risk to sit with the TSO, requirements as to where units must connect to the network would need to be imposed. This would significantly reduce the risk of non-availability due to network limitation, enabling the TSO to manage this risk on a day to day basis. A reasonable level of confidence would be evident if the provider was to connect to:

i) A connection point on the Transmission System for which they have confirmation from the TSO that they expect this location to meet the availability requirements.

ii) A connection point on the Distribution System for which they have confirmation from the DSO that they expect this location to meet the availability requirements.

We anticipate that the TSO or DSO will provide this evidence based on the best system knowledge available to them at the time, whilst respecting that given the timescales over which the contracts will be awarded and the lifespan of the projects themselves, it will not be possible to guarantee the location will remain suitable. Such confirmation therefore should not be viewed as assurance but as indication that for the TSO to enter into such a contract is reasonable based on latest information.

Alternatively, without this assurance the risk of non-delivery would be too high and as such, providers would only be remunerated when available. Service providers would bear the risk of such instances. This could be seen as an incentive for service providers to connect to parts of the system where network limitations are less likely.

We recognise that more detail on the process via which an applicant would seek and receive this confirmation from the TSO or DSO would be beneficial and will endeavour to provide this in due course. Based on the options as outlined at this point, we seek feedback from respondents on the two options, including preferred option (with rationale) and any appropriate additional considerations.

Option 1: Connecting providers would need to provide confirmation from the TSO/DSO that network limitations will not prohibit service availability. Providers will be remunerated if unavailable due to network limitations.

Option 2: Providing units will not be remunerated in the event of unavailability due to network limitations.

Question 4: Do you have any comments on pre-requisites with respect to Connection Offers?

Question 5: Do you have a view on the two options provided with respect to managing network limitations?

4. Procurement design and contract payment

4.1 Introduction

This chapter will present and evaluate options related to the procurement process. The volume capped competition offers a unique opportunity for new investment directly related to addressing a specific technical scarcity which has been identified by the TSO in a power system with high renewables. Careful consideration is therefore needed of how best to run this process in order to drive the best value to the electricity consumer.

The chapter will discuss options for two possible approaches for procuring the volume capped service provision, options for how the eventual price will be set, and other details in relation to the competition process itself. We also consider the application of scalars and their necessity within the bounds of this specific procurement exercise.

4.2 Procurement Design and Approach

Proposals are given below as to how the volume capped assesment exercise could be undertaken. These include high level design decisions such as whether a staged approach should be used, the resulting start date of any contract, details on bid structure and information on price determination and tariff caps.

4.2.1 Staged Procurement Approach

It is intended that a maximum of 300MW of services will be procured via the volume capped procurement exercise and that this procurement exercise should be set up in a way to enable investment for new providers (whilst not precluding the participation of existing providers). In designing the procurement options to enable this new investment, there are two broad procurement approaches possible for the competition. These are:

- Procure the full volume of services in single procurement exercise; or
- Procure the full volume of services through multiple procurement stages.

There are positives and negatives to both of these approaches.

Procuring the full volume of services in a single stage gives the opportunity for a faster rollout of these services. Rather than building in a staged approach through multiple rounds of procurement, a single procurement would assist in ensuring that the total capped volume is in place by 31st May 2021. This allows the successful providers to benefit the system earlier and assist the power system in facilitating increased levels of renewables in line with public policy objectives.

By taking a staged approach we would not presuppose the portfolio required in order to achieve increased levels of renewables and instead, could stimulate investment in required service provision as necessary. As such, while we would look to procur up to 300MW via the volume capped process, this could be less if it was decided that such a volume was not necessary. A multi-staged procurement also provides the opportunity for the TSO to learn from the previous competitions which would help to limit risk when procuring the next allotted volume of services. The TSO, and ultimately the consumer, may bear a higher risk if procurement of all services through a one-off competition occurs.

Furthermore, a staged approach would reduce pressure on market participants to have a project ready for entering the competition this year.

Pursuing a staged approach will also allow the benefit of possible future technology capital cost reductions to be factored into the competition process. A single approach would result in all bids this year basing their bid prices on current technology capital costs. It would not allow for adjustments to bid prices to reflect decreasing technology capital costs over the course of the contract. A multi-staged approach gives the benefit of providers factoring in decreasing capital costs into each annual procurement bid.

On consideration of these arguments, and weighing up the benefits of obtaining a faster rollout of new technologies with a single procurement approach, against a more competitive staged approach, we are persuaded that a staged approach to procuring volume capped system services would be advantageous. The benefits of a staged approach, where learnings can be gained from each successive stage, outweigh the benefits of a single approach in our opinion.

When recommending a staged approach to the competition, we must also consider what size of staged approach would be of most benefit to the electricity system and drive value for the consumer. This must be considered in the context of a total volume capped system services procurement of up to a maximum of 300MW. In Section 4.2.8 we propose a maximum amount per separate connection point of 30MW. In the first procurement stage, we would propose 100MW of volume to be procured, representing a minimum of 3 providers if units are close to the maximum 30MW size (and more if smaller). The remainder of up to 200MW (if necessary) can be procured in subsequent procurement rounds, providing more time for investors to build a business case for one or more of these competitions. It also provides sufficient time for the TSO to learn from each stage and incorporate learnings into subsequent stages. At this point we would envisage that a second procurement stage for 100MW volume will take place next year.

TSO Proposal: A staged approach to procuring volume capped System Services will be undertaken. In the first round 100MW will be procured, with a limit of 30MW per connection point (proposed in Section 4.2.8)

Question 6: Do you have a view on the staged approach proposed for procurement under the volume capped arrangements?

4.2.2 Contract Start Date

The DS3 System Services Tariffs and Scalars SEM Committee Decision[14] indicates that contract arrangements for volume capped procurement should be "set at a maximum of 6 years from 1st September 2018, with a flexible operational start date of up to 31st August 2020, and that the end date of these arrangements will be set for 6 years from the go-live date of each individual providing unit, therefore this will range from 2024-2026".

The timelines outlined in Section 2.2 have shifted later than initially envisaged in the SEM Committee decision, though the principles outlined above are maintained. That is: a flexible contract start date two years after contract execution, with 6 years contract beginning on the start date. This ensures that projects which are ready to go-live and begin contract fulfilment earlier than this point can do so and will be remunerated for it. This rewards and incentivises projects for being available early, and offers the opportunity for the TSO to integrate the new providers and service provision in a more phased manner.

The TSO therefore proposes to stipulate that contracts should start no later than 31st May 2021, and that these contracts will be set for 6 years from the go-live date of each

[14] 'DS3 System Services Tariffs and Scalars SEM Committee Decision' https://www.semcommittee.com/sites/semcommittee.com/files/media-files/SEM-17-080%20DS3%20SS%20SEMC%20Decision%20Paper%20Regulated%20Arrangements%20Tariffs%20and%20Scalars%20Final%20version.pdf

providing unit. This is in line with the relevant SEM Committee decision. The following section (4.2.3) also details provisions for projects which experience delay/s and are unable to meet this contract go-live date.

For projects that do not meet this date, the Performance Bonds proposed in the next section (4.2.3) shall be used to manage these circumstances. In all cases (in line with the SEM Committee decision), the latest date on which contracts will end is 31st May 2027.

TSO Proposal: Contracts should start no later than 31st May 2021 and will end no later than 31st May 2027

4.2.3 Bonding

It is proposed that performance bonds will be used in the volume capped procurement process. A Letter of Credit from a qualified bank, a deposit to the Company or a Parent Company Guarantee will form acceptable methods of bonding.

Performance Bonds

The consultation describes a performance bond as “a financial security provided by the potential bidder to the procuring party which may be called up by the procuring party:

- in whole, where a successful applicant abandons a development,
- in whole, where a successful applicant substantially fails to meet Performance Milestones or the Go-Live Date, or
- in part, where a successful applicant fails to meet Performance Milestones by the due dates.”

Where a successful applicant abandons a development, depending on how much notice is given before the Go-Live Date, the TSO may grant a reduction in the bond made liable.

Performance Milestones and associated due dates will be provided by the TSOs in an Implementation Agreement. This Implementation Agreement will provide for the progress and monitoring of the build in line with the timeline of the Go-Live Dates. Generally these milestones will include specific dates for:

- Where applicable, Connection Agreement Effective Date (noted by acceptance of the Connection Offer)
- Where applicable, award of all required consents and permits (end of Planning Period)

- Connection works Completion Date
    - Completion of Construction Period of Providing Unit
    - Completion of Construction of Connection Assets
- Energisation Date (end of Commissioning Period)
- Operational Date (end of Testing Period)
- Go-Live Date (When the Provider is expected to start the service).

The Implementation Agreement will include the obligations to provide regular and detailed progress reports, occasions where part of the bond will be called up and ultimately for termination where there is substantial failure or abandonment. The TSOs will require quarterly updates and updates when a Performance Milestone has been reached. Details of what constitutes substantial failure will be on a case by case basis and will be consulted on in the contracts consultation.

In circumstances where a successful applicant is unable to meet a Performance Milestone as a result of a delay arising from a fault of the DSO or the TSOs, no bond shall be made payable and future due dates and the Go-Live Date will be adjusted accordingly.

It is envisaged that performance bonding requirements as outlined above will be put in place to reduce the risk of project non-delivery. The TSOs propose that a €12,000 Per MW Bond will be required.

Further details including detail for each Performance Milestone will be consulted on in the contracts consultation noted in Section 1.7.

TSO Proposal: Applicants will be required to submit a performance bond on the date of execution of the contract, chargeable in the event of non-delivery. The size of the performance bond will be based on the contracted service MW volume of the applicant.

4.2.4 Bid Structure

The format and requirements for applicant bids in this competition must be considered, particularly given the nature of the service being procured (reflecting a bundle of System Services of equal volume).

It would be advantageous to keep the submission and assessment of bids as simple as possible. This will make both the application process and assessment process as simple and transparent as possible. However, we must consider the interactions of the bid submissions with tariff caps (outlined in Section 4.2.5) and the various potential scalars (Section 4.3).

Single bundled bid price versus bid price per service

It should also be stated that in all circumstances, the intention of this procurement exercise is to award contracts for the provision of the bundled service alone (i.e. not splitting contracts into individual services). By taking this approach, sufficient incentive and certainty should be provided for any new entrants wishing to provide services.

Given the proposal for a bundled service (Section 3.1.1), two broad options are apparent: prices submitted per service or one price submitted for the bundled service. There are advantages and disadvantages to both options.

A requirement to submit one price for the overall bundled service provides a potentially much simpler route to assessing tender submissions. As all services within the bundle are required to the same volume, and these are required with the same high availability obligation, no divergence is anticipated between the availability of the individual System Services within the bundle. A single price for a bundle can very easily be compared against other bids.

However, if one price only is submitted a number of complexities arise. As outlined in Section 4.2.5, it is proposed that the bid price for this competitive procurement will be capped by the relevant service tariff for each individual service. As these tariffs are defined on a per System Service basis, further consideration would be necessary to determine how they could be applied for a bundled System Service.

This is also true in consideration of the various scalars which may be applied, as outlined in Section 4.3. These scalars are also defined on a per System Service basis, with application on a bundled price very difficult.

As such it is the TSO’s view that a single price for a bundled service, while advantageous in its apparent simplicity, is not feasible in itself when considered with the other inter-dependencies outlined above. As such, a MWh value per System Service should be submitted to enable the relevant scalars to be applied and to ensure the proposed tariff limits are respected.

TSO Proposal: Prices should be submitted for each System Service within the bundle to enable the relevant scalars to be applied and to ensure the proposed tariff limits are respected.

Assessment of prices

Whilst it is proposed that a price should be submitted per System Service, it is the intention for contracts to be awarded based on the least cost of the overall bundle.

It is proposed that for each applicant, the prices submitted for each service would be assessed over the course of a typical year to determine overall remuneration (with scalars applied as required as outlined in Section 4.3). This typical year will be made available to applicants before tender submission with the assessment assuming 100% availability over the year. The total price per service would be summed into a total remuneration cost for the bundle. This cost would be divided by the volume to give a per MW price for each application. These prices per MW would be compared to determine the successful applicants.

Remuneration of providers

Subsequently it can be considered how this remuneration should actually be calculated on an ongoing basis.

The rewarding of availability during times of high system need/SNSP is approved by the SEM Committee in the DS3 System Services Tariffs and Scalars Decision Paper[15]. As such, the method above could be used to calculate a price on which to determine successful bids, with remuneration paid based on actual SNSP (and associated scarcity scalar value) at the time. This is aligned with the aim of providing higher remuneration at times of system scarcity (i.e. in high wind months/years, providers will better remunerated) but potentially would provides less certainty to investors on likely remuneration. In order to address this, a cap and floor could be implemented as outlined in the following section (4.2.5).

Given a total per MW remuneration cost will be calculated for the purposes of assessment (as outlined aboved), a second option could be for successful providers to be remunerated over the course of the contract based on the average, modelled MWh value used in the assessment of bids (which already has scalars factored into its calculation). This would provide certainty of remuneration for providing units, particularly those aspiring entrants to the market. This would also provide certainty to the TSO, removing the requirement for a tariff cap or floor (Section 4.2.5) and assist in the management of DS3 System Services expenditure. However, given the same remuneration figure would be used regardless of SNSP, service provision at times of higher system need would not be rewarded. On balance though, the TSO believes this would maximise investability to participants whilst providing stability of remuneration to

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[15] 'DS3 System Services Tariffs and Scalars SEM Committee Decision Paper' https://www.semcommittee.com/sites/semcommittee.com/files/media-files/SEM-17-080%20DS3%20SS%20SEMC%20Decision%20Paper%20Regulated%20Arrangements%20Tariffs%20and%20Scalars%20Final%20version.pdf

the TSO, which will be beneficial in the management of DS3 System Services expenditure.

In the case where the tender assessment requires the calculation of remuneration over a 'typical' wind year, visibility of this wind year would be necessary. In the 'Consultation on DS3 System Services Enduring Tariffs,'16 the circumstances for calculating the appropriate tariffs rates were presented. In this paper both low and high wind scenarios were presented, with a base case of 31% wind capacity factor using the 2009 wind time series data. The TSO anticipates a similar set of data would be used for a typical wind year, and will provide further information in due course.

We provide two options for consideration.

Option 1: Bids will be assessed based on an overall bundled price, based on the calculated remuneration for each System Service for a typical year. Ongoing remuneration will be based on real system conditions.

Option 2: Bids will be assessed based on an overall bundled price, based on the calculated remuneration for each System Service for a typical wind year. Ongoing remuneration will be based on this calculated value.

TSO Proposal: Bids will be assessed as outlined above with ongoing remuneration based on a typical wind year at contract award stage.

4.2.5 Tariff Cap and Floor

In the SEM Committee decision SEM-17-080 it was noted that in relation to the volume capped arrangements "Competitive bid prices will therefore be required as part of a high availability technology provider's proposed offering, with the bid price cap set by the relevant service tariff for the individual service".

The price cap for each relevant service is given in the SEM Committee Decision SEM-17-80 and is provided below:

[16] 'Consultation on DS3 System Services Enduring Tariffs' http://www.eirgridgroup.com/site-files/library/EirGrid/DS3-System-Services-Enduring-Tariffs-Consultation-Paper.pdf

Table 3: Recommended Service Tariff

Service Name	Unit of Payment	Final Rate €
Fast Frequency Response (FFR)	MWh	2.16
Primary Operating Reserve (POR)	MWh	3.24
Secondary Operating Reserve (SOR)	MWh	1.96
Tertiary Operating Reserve (TOR1)	MWh	1.55
Tertiary Operating Reserve (TOR2)	MWh	1.24

With reference to Section 4.2.4, where a price is submitted per System Service (as proposed) such a cap would be easier to implement (given they are defined per System Service). If an approach where one bundled price is submitted was taken, the interpretation and suitability of the tariff cap will need to be considered. However, given the proposal for a price to be submitted per service, we consider the tariff rates in Table 3 set the appropriate tariff caps.

In response to industry feedback, the SEM Committee decided that the revenue floor should be set at a level “that ensures annual revenues do not fall below the expected revenues of a low wind year (24% wind capacity factor)”[17]. Conversely, it was noted that a high wind year represented one of the conditions within which over-expenditure could arise. As such, a cap was proposed in order to mitigate the risk of over-expenditure in the instance of a high wind year. Specifically, this was a condition where “there is a wind capacity factor year of 33% or greater”. This tariff cap and floor would be required to limit remuneration only if actual SNSP is used to determine scarcity scalar which is applied to ongoing remuneration (see options in Section 4.2.4). This information on potential cap and floor in relation to wind volatility so that this option can be considered, though it is recognised that further details will be required in relation to how this will be implemented (should this option be chosen)

If a cap and floor is needed, we would propose that this should be set by the remuneration expected for a high and low wind year respectively. In line with the years used to determine high and low wind years in the development of the tariffs, we would

[17] DS3 System Services Tariffs and Scalars SEM Committee https://www.semcommittee.com/sites/semcommittee.com/files/media-files/SEM-17-080%20DS3%20SS%20SEMC%20Decision%20Paper%20Regulated%20Arrangements%20Tariffs%20and%20Scalars%20Final%20version.pdf

propose that the cap and floor would be set by remuneration for a year with wind capacity factors of 33% and 24% respectively.

TSO Proposal: The recommended service tariffs set the tariff cap for bids. Prices submitted should therefore not exceed these rates on a per System Service basis.

4.2.6 Price determination

There are two main mechanisms which are generally used in electricity markets/auctions to determine price: pay-as-bid and pay-as-clear. In the former, a successful applicant will be paid the price which they submitted as part of their bid. In pay-as-clear, all successful applicants will be paid the price of the most expensive successful applicant (i.e. the clearing price).

Various frameworks across Europe use both mechanisms and in theory, both pay-as-bid and pay-as-clear should produce similar results. This, however, assumes sufficient competition, which in the case of this volume capped procurement exercise may not be the case.

A pay-as-bid mechanism is generally seen as preferable in market power scenarios i.e. where market liquidity is relatively low. Conversely, pay-as-clear pricing is generally seen as a more 'market like' approach and given this, is generally favoured by European Framework Guidelines as the means by which to determine a price for services.

Whilst we consider either option as a credible mechanism by which to determine remuneration for successful applicants, the specific circumstances proposed for this procurement exercise mean that pay-as-bid would be more easily implementable. As outlined in Section 4.2.4, it is proposed that applicants will be required to submit prices for each System Service within the bundle in order to enable the relevant scalars to be applied and to ensure the proposed tariff limits are respected. The total remuneration cost of the bundle will then be calculated to determine the applicants providing the overall lowest cost.

If a clearing price was determined by the most expensive successful applicant's bundle price (if pay-as-clear were to be used), it is unclear whether this price-setting bundle would determine the price per service for all successful applicants also. In such circumstances, this has the potential to significantly change the make-up of an applicant's bid and could even reduce the price paid for certain services (if the price setting bundle contained an individual service at a lower cost than another successful applicant).

We do not believe setting a clearing price per individual service is viable given the success of bids will be determined on overall bundle price.

We propose that each applicant should have the ability to determine the make-up of their submission by setting the price for each service within their bundle (for the purposes of enabling the relevant scalars to be applied). Pay-as-clear is not easily implementable for such an arrangement and therefore, we propose the pay-as-bid mechanism.

Option 1: Pay-as-clear pricing is used

Option 2: Pay-as-bid pricing is used

TSO Proposal: Pay-as-bid pricing will be used for the volume capped procurement exercise.

4.2.7 Acceptance of last tenderer

It is necessary to consider the conditions related to the acceptance of the most expensive successful tenderer. For example: suppose a volume of 100MW was procured and the first 5 tenderers constitute a total of 80 MW. If the next lowest price tender is sized at 30 MW, it needs to be considered whether it should be accepted or rejected.

One solution would be to reject bids which take the volume over the required amount and instead move to the next least expensive bid which fulfils the remaining amount. This, however, could prove extremely complicated, with situations where small MW amounts are unfulfilled as the next least expensive units are too large and are rejected. The price paid for these final MWs could prove much more expensive given the need to run through multiple bids with increasing price to find a suitable amount of MW.

Another solution could be for applicants to indicate a capacity floor in their tender submission i.e. should they be the last successful tender, what is the minimum number of MW for which they would contract for. This floor would only be used in the event that they were the last successful bid. Such requirements could however significantly increase the complexity of bid submission as well as the awarding of successful bids.

In contrast, the last bid could be accepted for its full amount taking the total amount awarded over the required volume. Given the proposal for staged procurement rounds, any volume awarded over the anticipated amount could be deducted from subsequent procurement rounds. However, this does create an additional risk with regard to the over-procurement of MW in the initial procurement round.

The preferred option is for whole bids only to be accepted, in price order up to and not exceeding the total volume. By whole bids we consider that an applicant will be accepted for the whole amount which they have applied for or rejected, and that a lesser amount will not be sought in the case of last successful tenderer. This reduces the risk of over-expenditure and keeps the rules for awarding of bids simple. Should this produce a volume under the total target volume, this may be procured in future stages under the proposed staged approach.

TSO Proposal: Whole bids only will be accepted in price order up to and not exceeding the total volume.

Question 7: Do you have a view on the proposed bid pricing requirements and the mechanism for assessing bids, determining price and remunerating providers?

4.2.8 Maximum Size of Provider

In examining the maximum MW capacity of contracts which will be awarded via this procurement process, we consider several options. By maximum MW capacity of contracts we propose this is set at each separate grid connection (also known as feeder). Setting a contract upper limit per provider provides a potential route to diversify projects and locations in order to reduce the risk to the TSO of non-delivery. By risk of non-delivery, we consider this in terms of both overall project delivery as well as ongoing operational delivery.

For the sake of clarity, it should be noted that the proposals in this section relate to the maximum size of contract which will be awarded. A provider may have a higher capacity than this value but will be expected to provide the services up to the maximum contract size only (with equivalent remuneration).

At the lower end, it could be considered advantageous to place a maximum capacity limit of <10 MW per separate grid connection/feeder, as this value would enable participants to remain below the threshold at which full market participant conditions are obligatory. This could simplify the provision of the contracted services by mitigating or removing the obligations outlined in Section 5.3. A cap of <10 MW would mean that even in the circumstance of a staged approach, where a limited amount of capacity is procured in the first instance (e.g. 100MW), a large number of sites and providers would be needed which would reduce the risk of non-delivery (both in terms of project build and operational availability).. This would, however, mean that a relatively small capacity contract is awarded per separate grid connection, which could limit the potential payments for service providers and as such, discourage potential providers from participating. It may also limit the benefits of economies of scale which could be gained by increasing the capacity at each separate grid connection and as such, make each project and the market at large less cost-effective.

In contrast, a significantly larger upper limit of 100 MW per separate grid connection could be set. This would provide a larger incentive to take part in the procurement exercise for a larger reward, with fewer providers likely to be awarded contracts. This could potentially result in a single service provider being successful in a first procurement stage (if 100MW is procured as proposed). This may offer significant benefits to service providers in terms of economies of scale in developing larger sites. However, there are significant disadvantages of having such large projects, particularly with respect to risk exposure in the case of one or more projects failing to deliver, or where a service provider is unavailable in operational timescales due to maintenance or a system issue.

A maximum contract capacity limit between these two points could, therefore, be considered to manage the risk of provider non-delivery while minimising the negative effects associated with the lower and upper thresholds outlined. When considering what size this would be, it is notable that similar competition in Great Britain (for Enhanced Frequency Response 'EFR') set a maximum limit of 50MW, though this market has significantly higher levels of system demand than Ireland and Northern Ireland.

We, therefore, consider 3 options for maximum size per separate grid connection: <10MW, 30MW and 100MW. The TSO proposes a maximum contract size of 30MW per separate grid connection bidding in the procurement exercise is preferable for the Ireland and Northern Ireland system. This value is set such that the incentive is considered large enough to stimulate competition in the procurement exercise, whilst ensuring that a number of providing units will be successfully awarded contracts and the risk related to non-delivery and/or unavailability of a single site is sufficiently reduced. Setting the maximum size to 30MW will allow the TSO to assess if such a size is sufficient to balance the risks of the maximum and minimum thresholds. These learnings can be taken into subsequent procurement stages should a staged approach to the competition be recommended.

Option 1: Maximum size <10MW per separate grid connection

Option 2: Maximum size 30MW per separate grid connection

Option 3: Maximum size 100MW per separate grid connection

TSO Proposal: A maximum contract volume of 30 MW is proposed per separate grid connection

Question 8: Do you agree with the proposed maximum contract volume proposed per separate grid connection?

4.3 Application of Scalars

The design of System Services at large has included the concept of 'Scalars' which could be applied to payments to increase or decrease them depending on a number of variables.

In the DS3 System Services Scalar Design Recommendations Paper[18], the scalars listed below were recommended for implementation for the 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

We review the appropriate application of these scalars with regard to this volume capped procurement. These competitive arrangements are different to the volume uncapped arrangements for which the scalars were developed, in that contracts are for a fixed amount of time and at a fixed price. These certainties are necessary to ensure the contracts are appropriate to enable investment by new providing units. As noted in SEM-17-080 "All contracts (with the exception of the fixed-high availability contracts for a subset of reserve services) will allow for a tariff review to be initiated by the TSOs subject to RA approval". This means that there is no capacity for the TSO to review the tariffs being remunerated under the volume capped arrangements.

The volume capped arrangements are also fundamentally different in that they define relatively narrow selection requirements for a limited number of services, and that availability obligations are proposed at 97% (i.e. close to 100%). The impact of scalar

[18] 'DS3 System Services Scalar Design Recommendations Paper' http://www.eirgridgroup.com/site-files/library/EirGrid/OPI_INN_DS3-System-Services-Scalar-DesignFinal_231017.pdf

application within this more limited service provision, as well as within the context of the required investment certainty outlined above, should be considered.

4.3.1 Application of Scarcity Scalar

The System Service procurement framework introduces a temporal scarcity scalar in order to incentivise service availability during times of high SNSP. This scalar is set such that during periods in which SNSP is above certain thresholds, payments are increased to reflect the increased system need.

Given the high availability obligations proposed for applicants under the volume capped arrangements, such a scalar could be viewed as unnecessary in that it provides an incentive which is not required. Under the proposals laid out in this document, units are obligated to be available to provide capacity at minimum 97% of the time and be available regardless of SNSP.

However, the tariffs proposed in Section 4.2.5 (and proposed in the same section to set the bid price cap) were set on the provision that scarcity scalars would apply, and we therefore propose they should be applied. However, as outlined in 4.2.5 this could be applied in two ways.

The scarcity scalar introduces payment volatility in that it directly links payment for services to wind conditions. A year of particularly high wind could, therefore, result in significantly higher payment and conversely, low wind could result in payments less than applicants had forecast. Therefore, as outlined in 4.2.5, the scarcity scalar could be applied over a ‘typical year’ (e.g. 31% capacity factor) with providers remunerated based on this, regardless of actual conditions. This would not only provide certainty of revenue for providers but also certainty of payments for the TSO.

As also outlined in 4.2.5, with respect to SEM Committee decision SEM-17-080 it could be seen as preferable to apply the Scarcity Scalar and, with regard to the impact on price volatility, apply a revenue cap and floor to provide certainty of remuneration in either direction (as outlined in 4.2.5). In the same decision it is indicated that a floor could be set based on a standard low wind year i.e. wind factor of 24%, and a cap could be set based on a high wind year with wind capacity 33%.

One balance, whilst the TSO recognises the aims of the SEM Committee decision (in that services should be rewarded during periods of higher SNSP) we do believe there are advantages to basing remuneration on a typical year. We present both options for consideration.

Option1: Apply Scarcity Scalar based on ‘typical’ wind year to remuneration

Option2: Apply Scarcity Scalar based on actual SNSP to remuneration and impose cap and floor

4.3.2 Availability linked with Performance Scalar

It is proposed in Section 3.1.4 that the availability requirements for service providers should be high, with a figure of 97% recommended (excluding planned periods of maintenance). It should be noted that providers will not be remunerated for periods of unavailability and that the performance scalar proposed below will incentivise service availability as per the obligations expected for providers under these arrangements.

To impose an availability requirement such as that proposed in Section 3.1.4, an incentive mechanism could be put in place to reward sufficient availability to deliver, reflected in a service provider’s performance scalar. The scalar could be structured to restrict payments should the availability obligation not be met (excluding planned periods of maintenance). It would be practical that this structure should reflect grades of availability, and that a provider which is under the availability obligation by a relatively small amount should not be penalised as heavily as one which was significantly under.

The performance scalar for service providers could, therefore, be set incrementally. This could be measured and applied on the basis of the same scalar assessment frequency as indicated in the ‘DS3 System Services Protocol – Regulated Arrangements’ i.e. monthly.

Taking into account the high degree of availability required by the TSO, we propose that the availability performance scalar structure in Table 4 would apply. This structure should provide the TSO with confidence that the successful bidder will provide the contracted services when required. Given that we exclude planned periods of maintenance from this scalar, we believe it is appropriate to set the scalar with a steep reduction in payments for lack of availability.

Table 4: Application of Performance Scalar linked to Availability

Availability	Performance Scalar
<60%	0%
≥60% <70%	25%
≥70% <80%	50%
≥80% <90%	70%
≥90% <95%	85%
≥95% <97%	95%
≥97%	100%

TSO Proposal: The Performance Scalar outlined in Table 4 will be applied in order to incentivise availability.

4.3.3 Product Scalar

In the DS3 System Services Scalar Design Recommendations Paper a number of ‘Product Scalars’ are proposed in order to incentivise service delivery with characteristics of increased benefit.

The relevant ‘Product Scalars’ are listed below with consideration regarding their applicability in the volume capped arrangements. Whether these scalars should be applied must be considered both for each scalar and also on a combined basis.

Product Scalar for the Faster Response of FFR – proposed to incentivise the faster provision of FFR up to an upper threshold of 0.15 seconds following a frequency event

The requirements for FFR speed of response laid out in this consultation is between 300ms and 150ms. Taking the definition of this product scalar, this would provide a Product Scalar of 2.57 for 300ms, rising to 3 for 150ms.

We propose that this scalar should apply as defined. However, consideration must be given as to whether this scalar should be applied in the calculation of remuneration cost for the purposes of assessment price outlined in Section 4.2.4 (or not) and the incentive this may or may not provide. A number of options are available.

The first option is for the product scalar to be applied as part of this price determination. Should two providers submit the same price; the provider with a faster speed of response will have a higher scalar applied. Their remuneration will, therefore, be higher meaning the provider offering the slower response would be successful (with everything else equal). We would expect the provider with the faster response to reduce their bid price to mitigate this higher scalar which would be applied. This method has the benefit of simplicity for contract award and remuneration but offers no incentive for providers to offer a speed of response faster than 300ms.

The second option is to include the product scalar only in the actual remuneration cost (and not in the cost used to assess bids). By this mechanism, all bids would be compared on an equal footing with no product scalar applied. Successful providers who can provide a faster service will, however, have the scalar applied to their actual remuneration, to reward them for this additional capability. This would act to incentivise fast service provision in a way which uses the scalars already defined. Applicants can take this into account in their bids as the scalar will be applied in their remuneration.

Finally, the speed of FFR response could be assessed as an additional criterion prior to price assessment. The assessment process could group providers into two speed of response – under 200ms and under 300ms for example. The first group could take precedence over the second group in the awarding of successful contracts.

We provide the options below for consideration.

Option1: Product Scalar for faster response is applied in the calculation of bundle price for the basis of assessment

Option2: Product Scalar for faster response is applied after assessment i.e. in actual remuneration only

Option3: Applicants are sorted on speed of response with those faster than 200ms prioritised over those which are slower

Product Scalar for the Enhanced Delivery of FFR, POR, SOR and TOR1 – to incentivise capability to react to a frequency trigger

This scalar works down from a base level of 1, decreasing with lack of capability. Given we are setting requirements with regard to frequency trigger which will be a pre-requisite for successful applicants, it does not appear reasonable to penalise this technical requirement via this scalar. Consequently, we would suggest it is not applied.

TSO Proposal: The product scalar for Enhanced Delivery will not be applied

Product Scalar for the Continuous Provision of Reserve from FFR to TOR1 – to incentivise the continuous provision of FFR to TOR1

Given this continuous provision is required as a pre-requisite for applicants, it could be viewed as not required (similar to the scalar for enhanced delivery). Accordingly, we propose that this scalar is not applied.

TSO Proposal: The product scalar for Continuous Provision of Reserve from FFR to TOR1 will not be applied

4.3.4 Locational Scalar

In addition to a scarcity scalar, the opportunity exists for a locational scalar to be applied to reward projects which locate in areas with higher need. This could provide significant benefits with respect to service provision of reactive power or for congestion management purposes.

Given the proposals outlined in this paper with respect to network limitations (section 3.2.3), it may be possible to set requirements for suitable location during the application process. Additional locational incentives could therefore be viewed as unnecessary in these circumstances given that each provider will be connected at a point where they expect to be able to meet the availability obligations outlined within this document.

For other arrangements with regard to network limitation, locational scalars could be used to incentivise connection in more beneficial parts of the network. This however, would add significant additional complexity, particularly given these scalars have not been utilised in other System Services arrangements up until this point.

Given the additional complexity with respect to payments this could introduce, we would propose that a locational incentive or scalar is not necessary at this time. We believe this could be reviewed for future procurement stages (dependent on the learning from a first stage) and based on the ongoing need for such locational signals.

TSO Proposal: Locational incentive/scalar should not be applied for delivery of services under this initial stage of volume capped procurement arrangements (though may be used in the future if such a locational signal is necessary).

4.3.5 Jurisdictional Volumes

In addition to whether it is necessary to incentivise a specific location on the system, the potential requirement for an amount of service provision in the jurisdictions of Ireland and Northern Ireland could be imposed.

It is intrinsic in the DS3 System Services Programme and the volume capped competition that activities are conducted across both jurisdictions, with the involvement of stakeholders and regulators in Ireland and Northern Ireland. With respect to the cross-jurisdictional nature of this project is could be considered appropriate that successful units comprise of applicants from both Ireland and Northern Ireland.

However, given that the bundle product proposed is necessary for frequency stability purposes and with frequency as a common characteristic across the system, the technical justification for requiring a certain volume in each jurisdiction is seen as low. We do not, as such, propose a jurisdictional volume requirement be set at this point.

TSO Proposal: No minimum volume per jurisdiction will be set.

Question 9: Do you have a view on the proposed application of performance, scarcity, product and locational scalars?

5. Relevant Industry Frameworks and Market Interactions

5.1 Introduction

In this section, we aim to provide clarity regarding a number of obligations and interactions which exist outside of this volume capped procurement exercise, but which potential providers will be required to be mindful of. This includes interactions with existing industry framework (e.g. Grid Code) and interactions with I-SEM Energy and Capacity markets.

5.2 Relevant Industry Frameworks

This following section sets out requirements in relation compliance with existing industry frameworks, namely Grid Code/Distribution Code and network charging obligations. We do not envisage any changes to how these frameworks are set out and applied as part of this volume capped procurement exercise. In summary, therefore, we propose that these should apply as per current obligations.

5.2.1 Licensing and Code Obligations

It should be noted that the Grid Code or Distribution Code standards which a provider is required to meet may be of a higher technical specification than the characteristics which are required to deliver the service outlined. This discrepancy exists across technology types.

We note that the Grid Code and Distribution Code requirements may differ between Ireland and Northern Ireland, though we do not expect any discrepancy to be problematic with regard to these volume capped arrangements.

It is our expectation that all prospective providers under the volume capped arrangements will meet the necessary Grid Code or Distribution Code requirements for their appropriate size, connection point and class of technology. Such units will, however, be required to operate under technical specifications reflecting the System

Services which they are providing. In effect, the units must be able to operate in either ‘Grid Code mode’ or ‘System Services mode’.

TSO Proposal: Service providers must meet the applicable Grid Code or Distribution Code requirements for their connection.

5.2.2 Network Charging

In common with the Grid and Distribution Code requirements outlined above, it should be noted that applicants will be subject the relevant network charges for their connection. This will include payments for the respective Maximum Export Capacity (MEC) and Maximum Import Capacity (MIC). The process for this application and charging exists entirely outside of the requirements for this volume capped procurement competition and will be progressed as per the existing relevant process.

TSO Proposal: Service providers will be subject to the network charges applicable to their connection.

5.3 I-SEM Interaction

It is critical that any interactions between the volume capped arrangements and the energy and capacity markets are considered by both the TSO and any prospective applicant. Should interdependencies exist which are in contradiction of each other, this could unduly expose the TSO to non-delivery of services when required and/or affect the availability of the providing unit. This is particularly the case for units which are above 10 MW and as such, are subject to market conditions and potential dispatch within the energy market.

5.3.1 I-SEM Interactions - Balancing Market

Units above 10 MW are required to register in the market. As such, units of this size providing the service outlined in this document must bid in the balancing market. If a unit was to be dispatched on in the balancing market, their availability for the provision of the System Service for which they were contracted would reduce. Given the high availability obligations proposed in Section 3.1.4, this would be unacceptable for the TSO given that the primary reason for the procurement is System Services provision.

It would be our view that the simplest solution would be for providing units to manage their position within the balancing energy market to ensure they are not called upon in such a way which would mean they were unable to provide the System Services for which they were contracted under these arrangements. If the providing unit managed this effectively this would significantly reduce the risk of these units being called upon in the energy market. This option was utilised to avoid equivalent concerns when implementing the similar EFR service in Great Britain. It should be clear that the TSO cannot dictate the how a service providers bids in the energy market, but that we would expect the providing unit to manage this themselves in accordance with their licence obligations.

Even with such an expectation, it should be recognised that the TSO may dispatch units in balancing timescales for purposes other than energy provision, e.g. congestion management. Where a providing unit is dispatched for such requirements, we would not count such instances as non-fulfilment of availability for the contracted services.

TSO Proposal: Service Providers should manage their own positions in the energy market to ensure they can fulfil the service and availability outlined in their contract.

5.3.2 I-SEM Interactions – Re-charge after Activation

Providers will be expected to take responsibility ensuring they re-charge in a timely manner after activation. Providing units may do this via utilisation of their trickle charge capability (as proposed in Section 3.1.2). This trickle charge capability will only be possible where frequency has returned to within ±0.05Hz of 50Hz for at least 5 minutes. For the sake of clarity, recharging via this mechanism should stop immediately should the frequency return outside of this threshold.

Units may also recharge more quickly by bidding in the balancing market, in order to make themselves available again after an event. If a unit positions themselves in the market succesfully, the units will receive a dispatch instruction from the TSO in order to re-charge (as per standard process).

It should be noted that periods of re-charge will be counted when considering fulfilment of availability obligations.

TSO Proposal: Service providers must adjust their balancing bids to recharge after an event or may utlise their trickle recharge function (within the appropriate frequency conditions).

5.3.3 I-SEM Interactions – Capacity Market

Consideration must be given regarding the ability for units providing System Services under these arrangements to participate in the I-SEM Capacity Market. There remains a question as to whether units successful under the volume capped procurement process are able to get a Reliability Option (RO) contract through the Capacity Remuneration Method (CRM) and the impact on the availability obligation in Section 3.1.4 should a unit be called upon to provide this capacity.

Similar to the proposal for participation in the balancing energy market, the most viable option currently is for the service provider to take responsibility for their participation in the Capacity Mechanism, in order to ensure they are able to meet their System Service availability obligations.

Under current arrangements, it would be problematic to impede providers from competing in the Capacity Market given their obligation to do so. This mandatory participation could be investigated by the Regulatory Authorities as an alternative mitigation mechanism.

TSO Proposal: Service Providers should manage their own positions in the capacity market to ensure they can fulfil the service and availability outlined in their contract.

Question 10: Do you have a view on the market interactions outlined here and the proposed mechanism for mitigating?

6. Mechanism for evaluation of applications

With respect to the requirements laid out in this document, the mechanism by which applications will be assessed to decide on successful bids is needed. An overall general principle for how this is undertaken is given below. This is high level for the purposes of this consultation only and is subject to change based on the final requirements of the services being procured and the procurement procedure selected.

Step 1: Application deadline: only applications received by the TSO by the set deadline will proceed to Step 2.

Step 2: Assessment of submission completeness: only applications containing required information will proceed to Step 3.

Step 3: Feasibility requirements (binary yes/no): the feasibility conditions as proposed in this document will be used to filter viable and non-viable applications. Only viable applications will proceed to Step 4.

Step 4: Viable applications will be sorted on price: individual service bid prices will be applied to a typical year to give a price per service which will be combined to give an overall price for the bundle.

Step 5: Bids compared on a price per MW basis and contracts awarded up to (and not exceeding) volume available in the first stage.

Question 11: Do you agree with the proposed mechanism for assessing applications?

7. Next Steps

7.1 Summary of Consultation Questions

Question 1: Do you have any comments on the two options for service bundling proposed and the TSO's preferred option?

Question 2: Do you have any view on the technical requirements proposed, including the requirement for over-frequency response?

Question 3: Do you have any comments on the availability obligation proposed?Question 4: Do you have any comments on pre-requisites with respect to Connection Offers?

Question 5: Do you have a view on the two options provided with respect to managing network limitations?

Question 6: Do you have a view on the staged approach proposed for procurement under the volume capped arrangements?

Question 7: Do you have a view on the proposed bid pricing requirements and the mechanism for assessing bids, determining price and remunerating providers?

Question 8: Do you agree with the proposed maximum contract volume proposed per separate grid connection?

Question 9: Do you have a view on the proposed application of performance, scarcity, product and locational scalars?

Question 10: Do you have a view on the market interactions outlined here and the proposed mechanism for mitigating?

Question 11: Do you agree with the proposed mechanism for assessing applications?

7.2 Consultation Responses

SONI and EirGrid welcome feedback on the questions posed within this paper, which will be used to inform the payment rates that are submitted to the RAs for approval.

Responses should be submitted to DS3@soni.ltd.uk or DS3@EirGrid.com before 11th May 2018. It would be helpful if answers to the questions include justification and explanation and where submitted within the questionnaire template provided with publication of this consultation If there are pertinent issues that are not addressed in the questionnaire, these can be addressed at the end of the response.

It would be helpful if responses are not confidential. If you require your response to remain confidential, you should clearly state this on the coversheet of the response. We intend to publish all non-confidential responses.

Appendix I: Fast Frequency Response Product Characteristics for Volume Capped Competitive Arrangements

AI.1 Objective

The objective of this analysis is the following:

“Establishing the appropriate values of trigger set-point, trajectory and response time for the volume capped competitive arrangements, to ensure a reasonable exhibition of technology validation, while ensuring system stability.”

A1.2 Assumptions & limitations

The analysis presented has the following assumptions and limitations:

- A uniform frequency is encountered by all the buses in the system with local variations ignored
- Frequency variations owing to small load/generation changes on the system are not modelled. The study, therefore, is not suitable for providing any insights on the impact of FFR on frequency regulation
- The possibility of low-frequency oscillations on the system has not been exclusively investigated. Establishing a conservative frequency trigger for FFR has been considered as a failsafe measure.
- The FFR resource has been considered to be entirely dynamic as per the consultation on DS3 system service volume capped arrangements[19]

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[19] Consultation on DS3 system services volume capped arrangements, January 2018.

https://buzz.grid.ie/sites/ops/DS3/SS%20Delivery/Regulated%20Tariff/Enduring%20Tariffs/Volu

- Available FFR volume is considered to be 100 MW all activated at the same settings, however, in reality, smaller individual resources with possibly varying settings can be used. The analysis, therefore, represent a more onerous situation
- The FFR volume has not been dispatched separately as a part of the traditional unit commitment/economic dispatch and has been utilised in addition to existing reserves. This again makes for a more onerous situation.
- All 100 MW of FFR is assumed to be provided through non-synchronous dynamic resources

A1.3 Methodology

The analysis methodology is based on running various combinations of infeed loss, response time, trigger set-point and trajectory values (in accordance with the proposed FFR product scalar ranges as set out in DS3 system services contracts), as shown in Figure 1.

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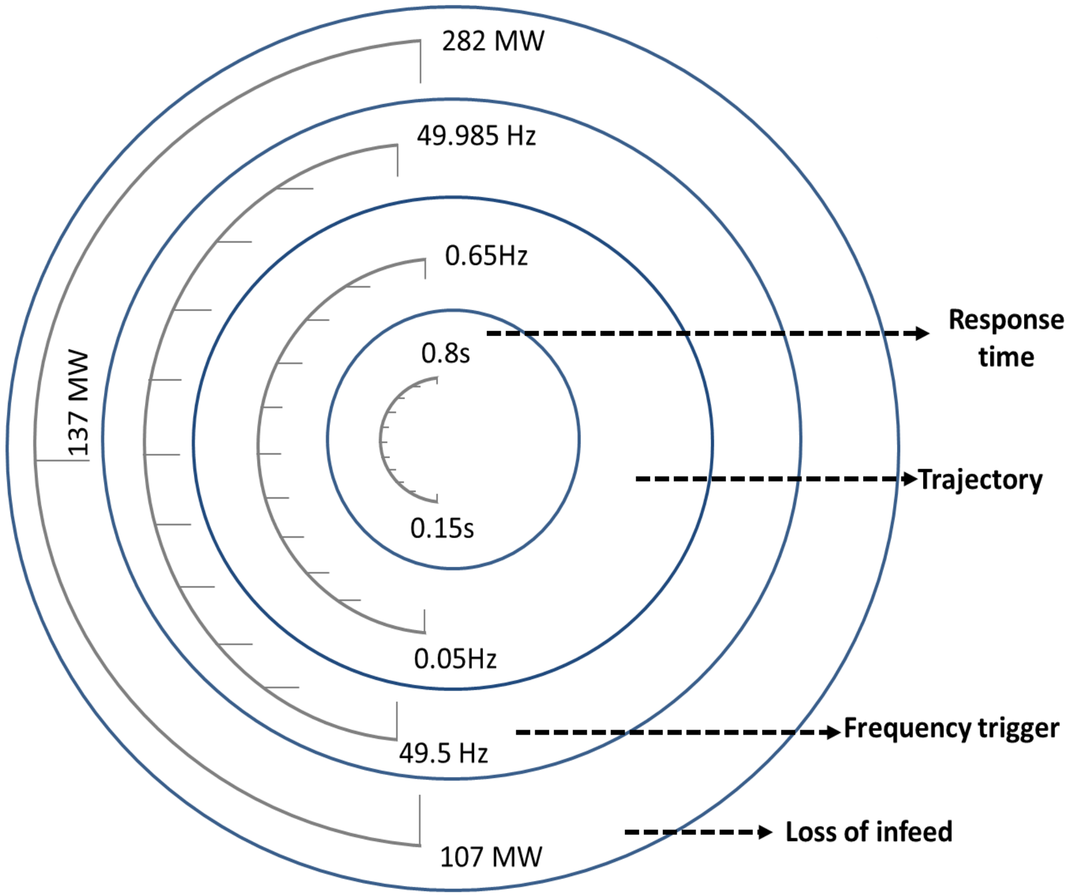

Figure 1: Range of FFR product characteristic combinations examined for analysis

While aggressive settings result in quicker response and thereby arresting the system frequency quicker in the event of a significant loss of MW, these settings can potentially result in oscillations for smaller loss of MW owing to over-provision of fast reserve. The analysis, therefore, has been carried out on a system snapshot from 2017, with the system inertia being at the lowest yearly value. The rationale behind using a low inertia system is to base the analysis on a worst cases scenario from a system “lightness” point of view, where the system is most likely to encounter oscillations owing to ultra-aggressive settings.

All combinations of settings are validated through varying loss of infeed magnitudes simulated using a single bus model of the Irish system. The resulting frequency curves have been analysed and conclusions drawn accordingly.

A1.4 Results

Based on the criteria mentioned in the previous section, there are 2730 cases in total simulated for this analysis with various combinations as per Figure 1.

Figure 2 shows the frequency profiles for all the cases, categorised as per the magnitude of infeed loss. As expected, a larger infeed loss generally is producing worse nadirs. However, it can also be observed that for larger infeed loss scenarios, the likelihood of oscillations developing is also low, as confirmed by Figure 3. This is due to the fact that a larger infeed loss entails a system requirement for a higher MW response, with the frequency deviating further from nominal and taking longer to recover, thus limiting the potential for overly quick provision of FFR.

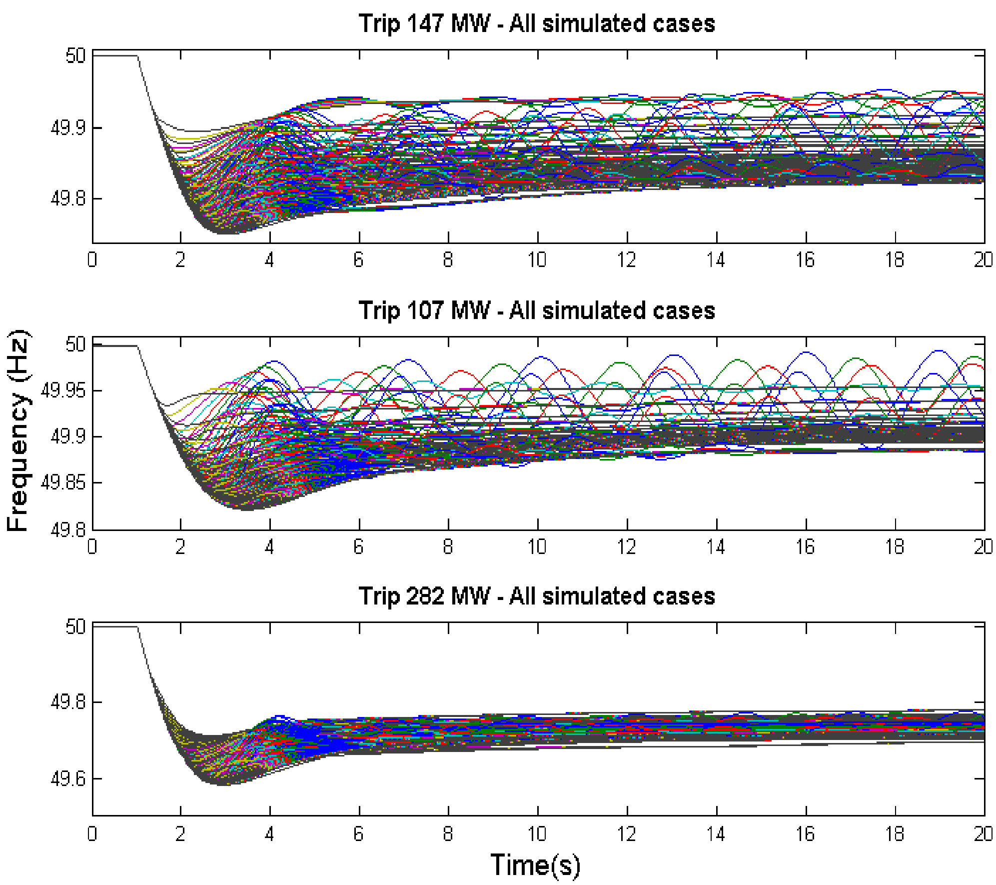

Figure 2: Frequency profiles for all simulated cases

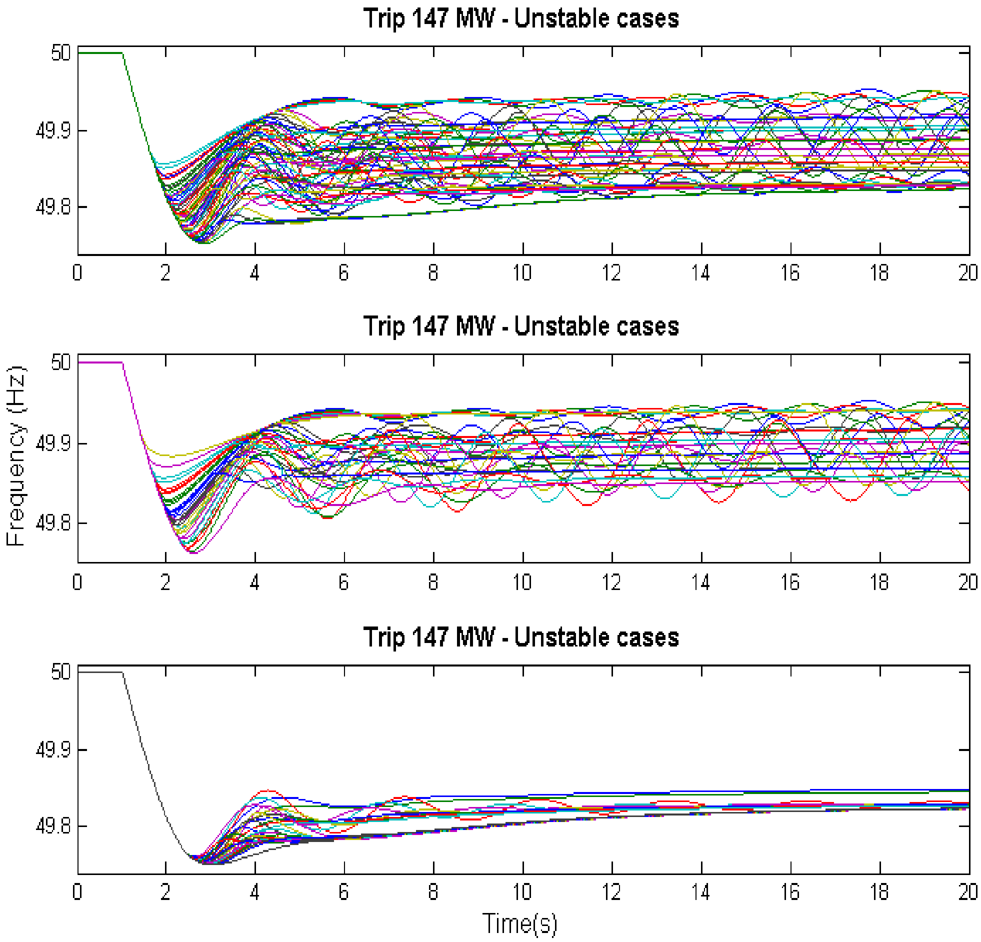

Figure 3: Frequency profiles for unstable cases

A1.4.1 Impact of trajectory change

Analysing the simulated cases further, it can be observed that a small trajectory value, coupled with small infeed loss and large response times can result in oscillations. This trend can be seen in Figure 4. As seen here, considering all possible combinations of FFR product design settings and MW trip magnitudes, the largest trajectory value to still result in an oscillation is 0.25 Hz. The oscillation in this case results owing to a large response time and small infeed loss.

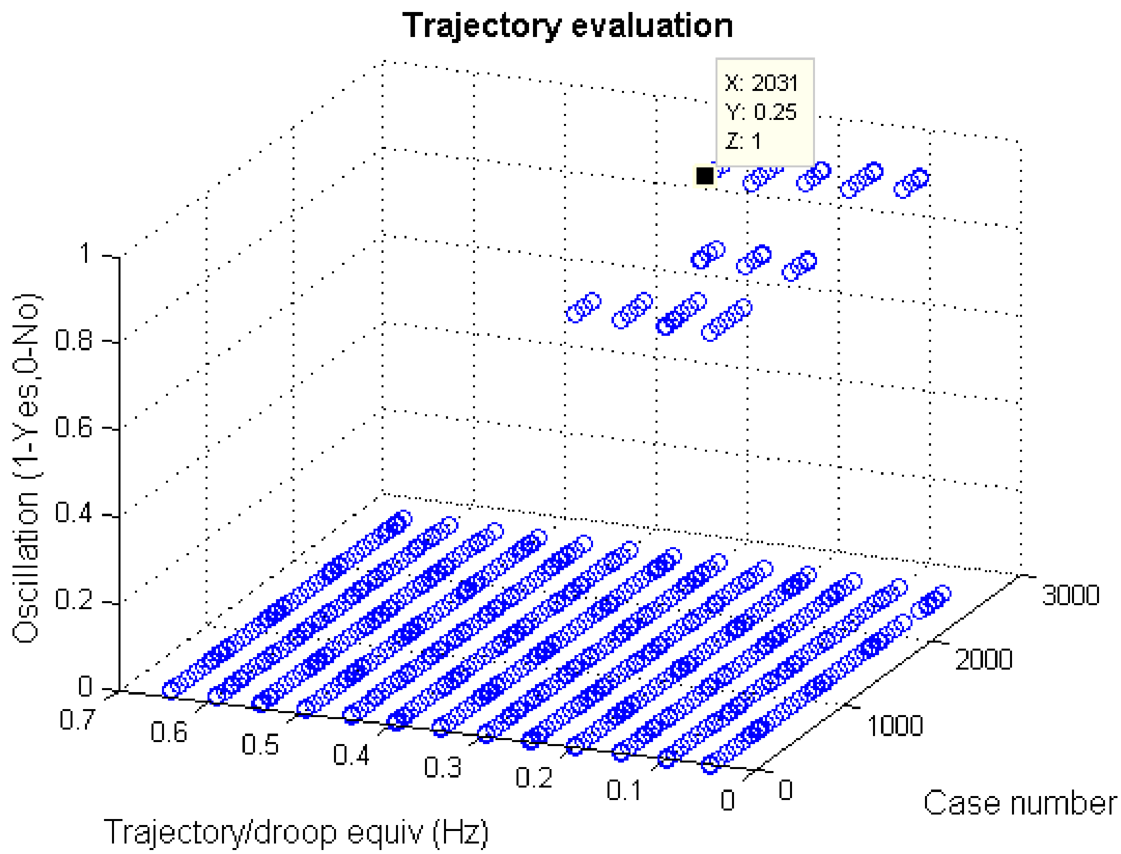

Figure 4: Impact of varying trajectory on system stability

It can, therefore, be deduced that a prudent value for the trajectory of FFR resource up to 100 MW is 0.3 Hz.

A1.4.2 Impact of response time

Response time of an FFR resource plays a very important role in determining whether the system remains stable following FFR provision. It has been observed generally that smaller response time lessens the likelihood of an oscillation. In Figure 5, it can be observed that out of all the simulated scenarios, only one case with oscillations is detected when the FFR response time is as low as 200ms. This case is the worst cases scenario with the smallest values of trajectory and trigger point. In reality, however, a larger trajectory value will be able to accommodate FFR sources with large response times as seen in Figure 4 previously.

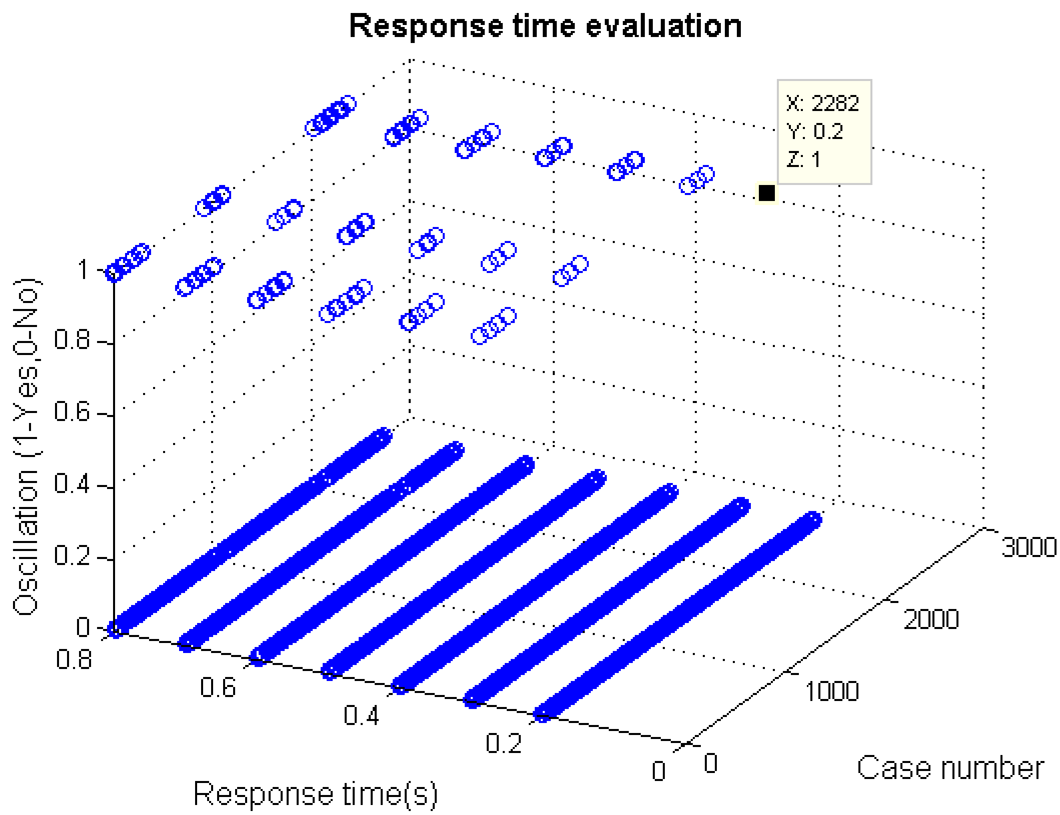

Figure 5: Impact of varying response time on system stability

A1.4.3 Impact of frequency trigger set-point

Trigger set-point on its own is not a critical parameter from the oscillatory stability point of view. For a very small trajectory and large response time, oscillations can develop in any case, regardless of the trigger set-point. However, it must be noted that trigger set-point is important to distinguish between the frequency regulation and contingency reserves. Moreover, a very high trigger point (closer to nominal) is likely to be problematic for some FFR resource providers, since in that case a continuous service provision will be required very frequently resulting in high duty cycles and increased degradation of resources such as batteries. Figure 6 establishes that there is no clear correlation between oscillations and trigger set-point.

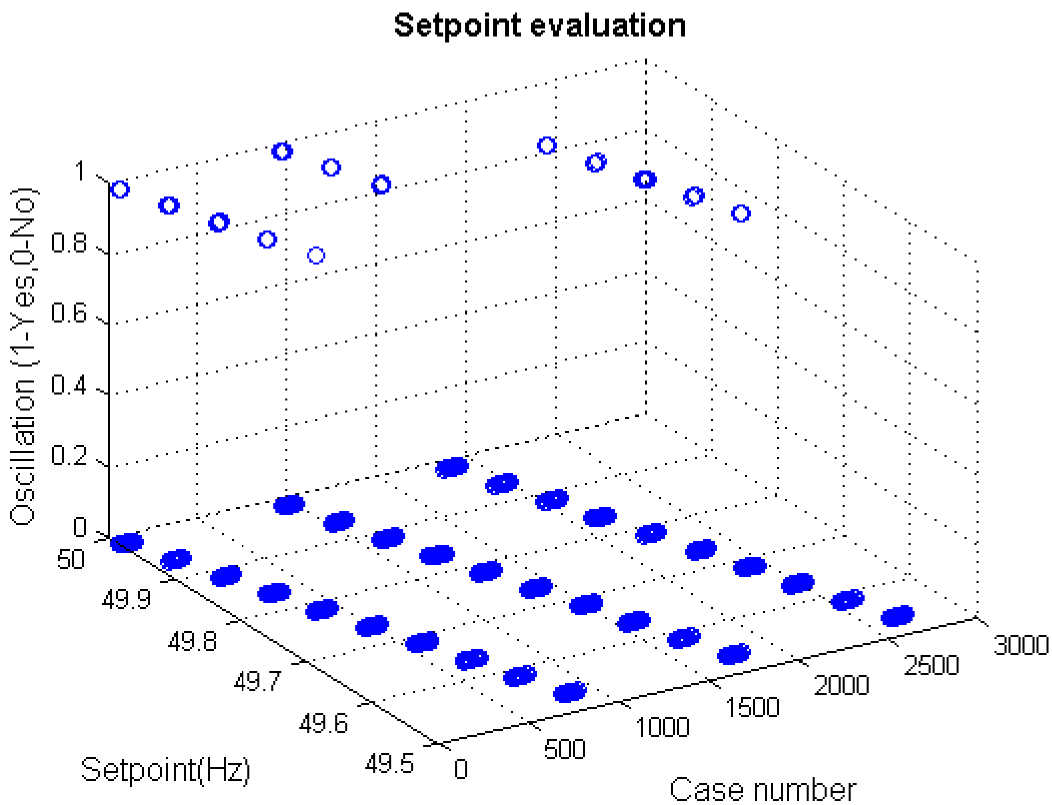

Figure 6: Impact of varying set-point on system stability

A1.5 Recommendations

The development of oscillations for certain combinations of trigger set-point, trajectory and response times is a possibility for infeed loss magnitudes comparable to available FFR volume. The occurrence of an oscillation is most likely for large response times, and small trajectory values. In view of these observations, the following recommendations are being made:

1) The trajectory value for volume capped competitive arrangements be kept at 0.3 Hz
2) A smaller response time should be incentivised. Response times larger than 300ms should be discouraged
3) Trigger set-point should be kept at 49.8 Hz to avoid frequency triggering of FFR and further augment mitigation measures against the development of oscillations
4) In case of FFR resources with smaller volumes (less than 100 MW), further analysis be done concerning whether uniform settings for all FFR resources are optimal from a financial point of view.
5) Operating all FFR resources with uniform settings for the competitive arrangements, provided the recommended settings are put in place, is technically feasible.