

# Consultation on DS3 System Services Protocol Document

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8 April 2020



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## **EXECUTIVE SUMMARY**

The purpose of this paper is to provide an opportunity for stakeholders to provide feedback on the proposals to amend the DS3 System Services Protocol document – Regulated Arrangements, Version 2.0, published 1<sup>st</sup> May 2019.

This paper should be read in conjunction with the accompanying redlined Protocol document. The Protocol document specifies the Compliance Requirements which a service provider must satisfy before qualifying for remuneration for DS3 System Services in respect of its Providing Unit(s), as well as the Performance Monitoring procedures to be applied and the unit(s)' Operational Requirements. The document forms part of the DS3 System Services contractual arrangements.

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# 1. INTRODUCTION

## 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.

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. Our Delivering a Secure Sustainable Electricity System (DS3) programme seeks to address the challenges of increasing the allowable System Non-Synchronous Penetration (SNSP) up to 75% in 2021.

A key component of the DS3 programme is the System Services work stream. Its aim is to put in place the correct structure, level and type of services in order to ensure that the system can operate securely with these higher levels of non-synchronous generation.

## 1.2. 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. DS3 System Services are the contractual arrangements in Ireland and Northern Ireland for twelve system services (SIR, FFR, POR, SOR, TOR1, TOR2, SSRP, RRS, RRD, RM1, RM3, and RM8).

These 12 system services are required to support a move to higher levels of nonsynchronous generation. The FFR service was introduced from 1 October 2018 and a further two services (DRR and FPFAPR), are in the process of being introduced at a future procurement gate. Table 1 provides a high-level summary of the current and proposed DS3 System Services.

**Table 1: Summary of DS3 System Services<sup>1</sup>**

Service Name	Abbreviation	Unit of Payment	Short Description
Synchronous Inertial Response	SIR	MWs <sup>2</sup> h	(Stored kinetic energy)*(SIR Factor – 15)
Fast Frequency Response	FFR	MWh	MW delivered between 2 and 10 seconds
Primary Operating Response	POR	MWh	MW delivered between 5 and 15 seconds
Secondary Operating Response	SOR	MWh	MW delivered between 15 to 90 seconds
Tertiary Operating Response 1	TOR1	MWh	MW delivered between 90 seconds to 5 minutes
Tertiary Operating Response 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

<sup>1</sup> Further detail on the DS3 System Services can be found at: <http://www.eirgridgroup.com/how-the-grid-works/ds3-programme/>

### **1.3. Purpose of Document**

The purpose of this consultation paper is to set out the proposed amendments to the Protocol document as contained in the marked up version associated with this consultation. The Protocol document specifies the Performance Monitoring procedures to be applied by the TSOs. It also contains operational requirements, specifying minimum standards that Providing Units must meet in order to receive payments for these services.

Following queries from industry, additional text has been included in this consultation to clarify the provision of the FFR service (Protocol document, section 3.4). The context for these changes has been included in section 2.1 of this document.

In order to reduce the number of units that are entering into the Data Poor Performance Scalar assessment category, a proposal has been made to reduce the threshold used to determine when to performance monitor FFR, POR, SOR and TOR1. This will enable an increase in the number of assessments being carried out and therefore reduce the number of units being impacted by the Data Poor Performance Scalar. The threshold used to determine when to performance monitor FFR is proposed to be reduced from 1MW to 0.2MW. The threshold used to determine when to performance monitor POR, SOR and TOR1 is proposed to be reduced from 1 MW to 0.5 MW. These proposals are detailed in section 2.2.

Minor modifications have been proposed to the Protocol document to ease the understanding of, and further develop the requirements and procedures being presented.

Lastly, there a number of areas of change that will be proposed in future consultations and these are presented in Section 3 to enable industry to consider their impact at an early stage.

### **1.4. Proposed Consultation Process**

- Section 2 of this paper presents an overview of the main differences between the DS3 System Services Protocol – Regulated Arrangements, 1<sup>st</sup> May 2019, Version 2.0 and the proposed marked up version accompanying this paper.
- Section 3 of this paper presents Protocol document changes that may be proposed in future industry consultations.
- A number of consultation questions address the proposed modifications and future changes to the Protocol document. These are spread throughout sections 2 and 3 and repeated in summary form at the end of the paper.

## 2. Overview of changes to the Protocol document

### 2.1 FFR Provision

Following queries from industry, a clarification has been included in this consultation in relation to FFR provision (section 3.4).

System Services are, in so far as is possible, technology neutral in terms of both their design and their delivery of flexibility to the system by various technologies. Providers are assessed, contracted, scheduled and performance monitored in a consistent and equitable manner to ensure a level of technology neutrality is maintained across all providers and technologies. The manner in which System Service providers are assessed is described in the service provision sections of the DS3 System Services Protocol document. Following feedback from industry, a clarification has been included in this consultation paper in relation to the response characteristics of Providing Units when availability to provide services is declared to a value lower than their contracted volume.

Most Service Providers providing the POR, SOR and TOR1 services provide a consistent and predictable reserve characteristic in response to a frequency transient. The expected response is calculated in accordance with sections 5.8.2.3, 5.9.2.2 and 5.10.2.2 of the protocol document utilising a “Declared Governor Droop” characteristic and a calculated “Governor Droop Demanded” response. These service providers utilise a Governor Control system to ensure the unit responds in a proportionate and predictable manner in response to system transients. The underlining response philosophy in the logic of these controllers is the provision of a set (but parameterisable) percentage droop, or equivalent MW/Hz characteristic.

The equivalent section of the Protocol document detailing the performance assessment of the FFR service, Section 5.14.1, does not explicitly state an expected “Governor Droop Demanded” response, instead, requiring the service to be delivered and assessed on a per sample point basis as per Section 5.14.1.1. The characteristics of reserve provision for this service are specified in Sections 3.4.1 and 3.4.2 respectively. While Sections 3.4.1 and 3.4.2 currently do not specify the specific nature of the reserve characteristics expected when a Providing Unit is not fully available, it should be noted that the Protocol document requires Providing Units contracted for FFR to mirror their response characteristics. If contracted for POR, SOR and TOR1 the Providing Unit must have the capability to maintain its FFR response in line with the applicable Frequency Response Curve of those services.

The TSOs propose to amend the Protocol document to provide clarity to industry regarding the expected response characteristics of FFR (Protocol document, Section 3.4) when the service is declared to a value lower than the Providing Unit’s contracted volume. This will bring the FFR service in line with the expected response characteristics of POR, SOR, and TOR1 as detailed in the current version of the Protocol document.

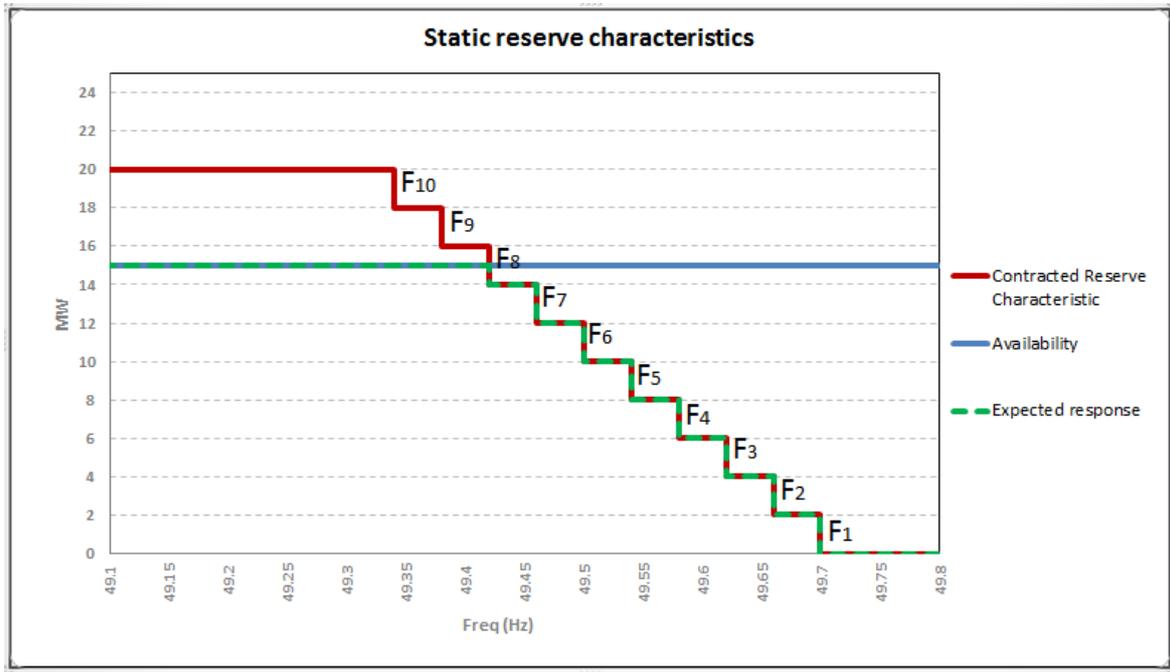


Figure 1. Expected Response Characteristic

Industry has asked for clarity regarding what the response characteristics of a Providing Unit whose services are declared to an availability value lower than their contracted volume should be.

The TSOs’ requirement for a constant percentage droop, or constant MW/Hz characteristic, from system service providers is imperative for a number of reasons. Firstly, from a scheduling perspective, a constant percentage droop, or constant MW/Hz ensures that the response profile of the Providing Unit is predictable regardless of its availability declarations. Changes in availability result in a single axis movement in its reserve curve (a reduction in the MW expected to be delivered with no change to the expected MW/Hz characteristic of the unit up to that point).

This in turn results in like for like scheduling of the services at system level, whereby a reduction in availability of one unit can be addressed by the TSO by scheduling or dispatching another unit for a like for like service. This principle is

fundamental to the economic scheduling and dispatch of services as well as ensuring fairness and consistency in terms of assessment and performance monitoring.

Secondly, reserve provision, and in particular reserve provided by FFR and POR providers, is critical for arresting the system frequency during a low frequency transient. As the proportion of non-synchronous generators increases the power system will experience higher RoCoF values for a given event. Events of up to 1 Hz/s may occur and thus it is imperative that the quality of the FFR provision provided is fully understood and is as good as it can be for the value the consumer is ultimately paying for.

.More generally the TSOs schedule sufficient levels of reserve and inertia to ensure that the system frequency recovers following a transient event. Simultaneously we ensure that excessive volumes are not unduly scheduled to prevent otherwise undue dispatch and balancing costs arising. The studies undertaken by the TSOs to ascertain the correct level of reserve to schedule, as well as the real time tools used by the TSOs to assess system stability, use models of the system and providing units which include the reserve characteristics of the various system service providers.

One of the key fundamentals of reserve characteristics is that it is produced proportionally with the frequency drop. This is a legacy of continuous acting governor droop determined in Grid Codes in Ireland and Northern Ireland. If the TSOs were to utilise service providers who do not maintain a proportionate response across their range of reserve provision significant additional information would be required. This information would necessitate new scheduling and dispatching systems to manage appropriately. Without having these systems we would be unable to ensure that RoCoF standards were being met. While security of supply could be addressed through the scheduling of additional levels of reserve it is not cost effective at this time.

Nevertheless, the TSOs do acknowledge the value that all service providers can give to ensure the stability of the overall system. We will endeavour to work with and integrate new technologies as much as possible; however considerations must also be given to the technical and commercial constraints of scheduling and utilising these services. The introduction of a dynamically variable droop characteristic adds an additional layer of complexity to an already complex optimisation problem. While the TSOs will look at facilitating service providers with dynamically variable droop characteristic in future it must be noted that the facilitation of such providers would likely require modifications to scheduling and modelling software as well as to the performance monitoring tools. Facilitating large volumes of service providers with such characteristics could also result in a need to carry additional volumes of

reserve to ensure the system wide RoCoF compliance in the event of a transient. Additional studies looking at the overall system benefits would need to be conducted before the TSOs could consider contracting with service providers with variable droop characteristics.

The TSOs are updating the Protocol document to provide clarity, such that all service providers controllers should be set to provide a non-variable (but parameter setting) droop or MW/Hz characteristic, and that the response characteristic should be truncated in instances where the unit is unavailable to provide services at a level equal to their contracted volume, i.e. when services availability is reduced or declared down due to outages, technical issues, insufficient head room etc.

**Question 1:** Do you have any comments in relation to this clarification regarding the provision of the FFR service?

## 2.2 Threshold for Performance Monitoring of FFR, POR, SOR and TOR1

In order to reduce the number of units that are entering into the Data Poor Performance Scalar assessment category a proposal has been made to reduce the threshold used to determine when to performance monitor FFR, POR, SOR and TOR1. This will result in an increase in the number of assessments being carried out and therefore reduce the number of units that otherwise would have unnecessarily been impacted by the Data Poor Performance Scalar. The threshold used to determine when to performance monitor FFR is proposed to be reduced from 1 MW to 0.2 MW. The threshold used to determine when to performance monitor POR, SOR and TOR1 is proposed to be reduced from 1 MW to 0.5 MW.

The change has been made to the Protocol document for the POR service (Section 5.8.2.6), the SOR service (Section 5.9.2.5) and the TOR1 service (Section 5.10.2.5).

With regards to the threshold for performance monitoring the FFR service, the reason why a lower metric, 0.2 MW, is proposed is due to higher resolution of data being available for performance assessment of FFR. This change is detailed in Section 5.14.1.2 of the Protocol Document.

**Question 2:** Do you have any comments on the proposal to reduce the threshold used to determine when to performance monitor FFR, POR, SOR and TOR1?

## 2.3 Additional changes

1. **Section 6.23** Process for Performance Assessment of FFR and **Fig 7** Process Flowchart for Performance Assessment of FFR. Changes have been made to the text in **Section 6.23** and the Process Flowchart in **Fig 7** in order to provide clarity to the process which is to be carried out following a Performance Incident. The text in **Section 6.23** and the process flowchart in **Fig 7** both now state that the TSO shall issue a template to the Providing Units following a Performance Incident, this template is to be completed by the Providing Unit and sent to the TSO at FFRMonitoring@eirgrid.com. Failure to provide a completed template may lead to a FAIL record for the Performance Incident. Clarification is also given on the provision of an incorrectly completed template. If the template has been completed incorrectly by the Providing Unit the TSO shall notify them to resubmit their data in the correct format. Failure to provide this information may lead to a FAIL record for the Performance Incident.

References to the two services (DRR and FPFAPR), which have yet to be procured, have been removed from **Section 6.23**. The process for performance assessment of DRR and FPFAPR will be included in future Protocol consultations in advance of their procurement.

2. **Section 3.1** General DS3 System Services Operational Requirements. An additional requirement states 'The Providing Unit must ensure that the data quality of real-time signals is maintained to the required standards for the duration of the Agreement'.
3. **Section 3.4.1** and **Section 3.4.2** 'At times of high Frequency, where the Providing Unit is providing an over frequency response, the Frequency Response Curve design is the same (the control parameters may differ) except **rotated** about the Nominal Frequency'. To provide clarity the word rotated has been used to replace 'mirrored'.

**Question 3:** Do you have any comments on the additional changes in the Protocol document as detailed in Section 2.2.1?

### 3. Future Proposals

The consultation process to make changes to the Protocol document takes place between DS3 System Services procurement gates. As this window of opportunity to present changes is relatively short the TSOs have identified a number of areas in this consultation where potential modifications are being considered for future consultations. These modifications allow the current needs to be met but also steer the long term needs with regards to Compliance Requirements and Performance Monitoring procedures of DS3 System Services.

The areas of change are listed below with the proposed modifications set out at a high level. The TSOs are seeking industry's feedback on these proposed future changes before they are considered and progressed thus allowing adequate time to reassess and implement any changes at a subsequent gate.

The first three proposals relate to changes to the performance assessment of the POR service. The requirement for these potential changes has been observed as experience has been gained during the analysis of the POR service following a Performance Incident. The fourth proposal relates to a review of the Ramping Margin Performance Assessment methodology.

#### 3.1. Removing POR Inertia Credit

POR Inertia Credit parameters were established on a per unit basis in advance of the introduction of the SIR and FFR services. Their purpose was to recognise the initial inertial response being delivered by synchronous generating units in advance of the POR timeframe. They were applied through the Harmonised Ancillary Services Agreements which predated DS3 System Service Agreements. Their effect was to lower the expected POR requirement for some conventional units during events.

Retaining the POR inertia credits in the assessment of DS3 SS is no longer necessary as Providing Units can now avail of payment for the SIR and FFR services when they provide reserve in advance of the POR timeframe. The TSOs believe it is necessary for them to be removed both in the interest of technology neutrality and also in the interest of system security with respect to scheduling the POR service. Removing the POR inertia credit allows the TSOs to have a more representative value of POR when scheduling reserve on the system.

#### 3.2. Removing the Alpha and Beta Governor Droop Multiplier parameters

Alpha and Beta Governor Droop Multiplier parameters were established on a per unit basis as part of conventional generator testing. Their purpose was to recognise

that a Providing Unit's output may lag behind the theoretical droop response due to the physical reaction of the unit. Their effect was to lower the expected POR requirement for some conventional units in events where there is a higher Rate of Change of Frequency (RoCoF). This allowed Providing Units to provide larger volumes of the POR service, whilst acknowledging that in certain circumstances (particularly higher RoCoF) the Providing Unit would not be expected to deliver the full contracted volume.

Like POR inertia credits, they were applied through the Harmonised Ancillary Services Agreements which predated DS3 System Service Agreements.

Retaining the use of Alpha and Beta Governor Droop Multipliers in the assessment of DS3 SS is no longer valid. The TSOs believe it is necessary for them to be removed both in the interest of technology neutrality and also in the interest of system security with respect to scheduling the POR service. Removing Alpha and Beta Governor Droop Multipliers allows the TSOs to have a more representative value of POR when scheduling reserve on the system.

### 3.3. Redefinition of POR and thus the assessment of the POR service

As the level of inertia scheduled on the system has decreased over recent years, and the maximum allowed RoCoF increased, frequency nadirs have begun to move closer to the time zero of the Frequency Event. The POR service and its definition is somewhat a legacy service in that the product has been brought forward from Harmonised Ancillary Services Agreements and its definition unchanged.

When the POR definition was first compiled it would have been uncommon to have a frequency nadir occur in a sub 5 second timeframe due to higher system inertia. Thus performance assessment based on a singular data point at the event nadir would have been deemed appropriate. With RoCoF of up to 1Hz/s now expected, events will occur with nadirs in a sub 1 second timeframe from time zero. In many cases the fast acting response of service providers will not only have arrested the fall in frequency before the 5 second POR assessment period but will also have returned system frequency to a nominal state.

An assessment of POR based upon a nadir in a 5-15 second period is no longer appropriate and as such the TSOs propose amending the assessment of the DS3 SS POR service to align with the assessment methodology for the SOR and TOR services. This would take the form of an assessment of the average provision requirements between 5 and 15 seconds.

The proposals in Sections 3.1 to 3.3 all impact on the definition and assessment of the POR service and therefore it is appropriate that these are considered as one potential change when providing a response to this consultation.

**Question 4:** Do you have any comments on the proposals to modify the performance assessment of the POR service in a future Protocol consultation?

#### 3.4. Review use of Ramping Margin Performance Assessment methodology

Following feedback from industry, the current Ramping Margin Performance assessment methodology is under review as the fail sync process which is currently employed is thought to be inadequate. An assessment methodology which provides a thorough evaluation of a Providing Unit's ramping performance is currently being investigated and will be presented in a future consultation.

**Question 5:** Do you have any comments on the proposal to review the use of the ramping assessment methodology in a future Protocol consultation?

## 4. Summary of Consultation Questions

**Question 1:** Do you have any comments in relation to this clarification regarding the provision of the FFR service?

**Question 2:** Do you have any comments on the proposal to reduce the threshold used to determine when to performance monitor FFR, POR, SOR and TOR1?

**Question 3:** Do you have any comments on the additional changes to the Protocol document as detailed in Section 2.2.1?

**Question 4:** Do you have any comments on the proposals to modify the performance assessment of the POR service in a future Protocol consultation?

**Question 5:** Do you have any comments on the proposal to review the use of the ramping assessment methodology in a future Protocol consultation?

## 5. Next Steps

SONI and EirGrid welcome feedback on the proposed changes to the Protocol document. Responses should be submitted to DS3@soni.ltd.uk or DS3@EirGrid.com by 14 May 2020. It would be helpful if responses to the questions included justification and explanation.

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. Please note that, in any event, all responses will be shared with the Regulatory Authorities.