

DS3 System Services Protocol – Interim Arrangements

DS3 System Services Implementation Project

21 April 2016



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1 Introduction

This DS3 System Services Protocol document is supplementary to the DS3 System Services Framework Agreement. It provides information on compliance and performance monitoring requirements that need to be satisfied by Service Providers and their respective Providing Units as part of the DS3 System Services contractual arrangements. It is one of two supplementary documents referenced in the main framework agreement, the other being the DS3 System Services Statement of Payments. An overview of the documents is given in Figure 1 below.

It is intended to update the detail contained in this protocol document as performance monitoring requirements are developed for DS3 System Services. This version of the protocol document and the associated governance arrangements for changes to the document apply to the Interim Arrangements only. The approach to be taken for the Enduring Arrangements will be consulted on as part of the Enduring Contract consultation.

The equation below, included in the DS3 System Services Framework Agreement, sets out how payment is calculated for each service. Each of the terms is defined in the Framework Agreement.

$$\text{Trading Period Payment} = \text{Available Volume} \times \text{Payment Rate} \times \text{Scaling Factor} \times \text{Trading Period Duration}$$

The payment rates will be included in the DS3 System Services Statement of Payments once finalised and following the Interim Tariffs consultation.

Depending on the service, the Scaling Factor consists of one or more scalar types including the Product Scalar and Performance Scalar. Product Scalars shall be defined in the Framework Agreement. The methodology for calculating DS3 System Services Performance Scalars on a service by service basis is included in this document.

This document also specifies the compliance requirements which must be met by service providers contracted to provide DS3 System Services detailed by technology type and DS3 System Service.

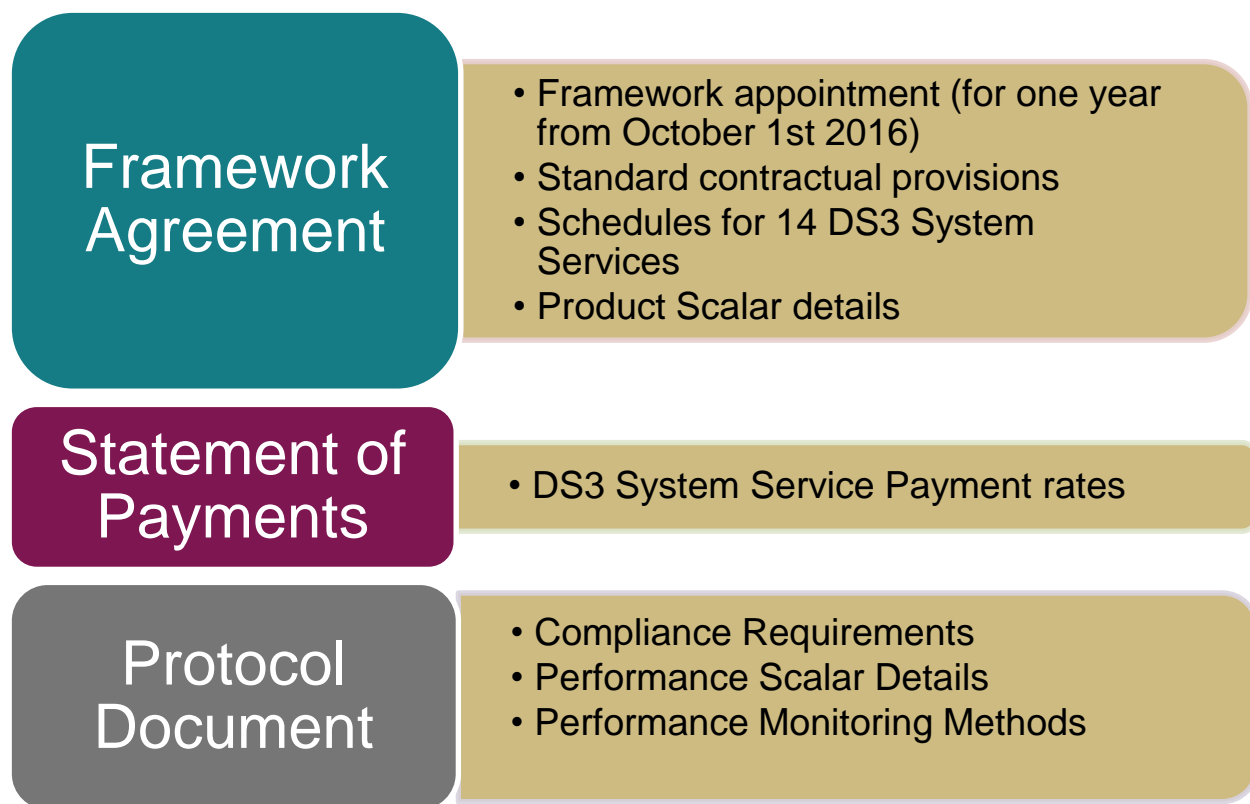


Figure 1: Overview of Framework Agreement and associated documents

2 Governance

For the Interim Arrangements, *[it is proposed that, subject to regulatory approval]*, this protocol document is a regulated document to which the TSOs may propose changes on a quarterly basis (end December, end March, end June and end September) with the approval of the Regulatory Authorities. It will not be subject to industry consultation except where a material change is proposed. The most recent version of this document will be published on the Company's website (www.eirgridgroup.com).

[For the Enduring Arrangements, we envisage that the governance will be different. It may be more appropriate to consult annually on the Performance Scalar methodology.]

[The Pass Rate Methodology outlined at a high-level in this draft document is at the time of writing out for consultation as part of the TSOs' Consultation on DS3

System Services Scalar Design and its use is assumed both in the DS3 System Services Framework Agreement and in this protocol document. This is not intended to in any way pre-judge the outcome of the Scalar Design consultation, which is focused on the Enduring Arrangements. Due to the parallel timeline constraints of the Scalar Design consultation and the DS3 System Services Contracts Design consultation, it was necessary to make this interim proposal.].

3 Compliance Requirements

Compliance Requirements, in the context of this document, means a high-level description of the assessment that will be needed to determine that a service provider satisfies the TSOs' criteria for providing a given DS3 System Service. This document will not exhaustively detail test procedures. The relevant departments in EirGrid and SONI will handle DS3 System Service testing procedures. Compliance Requirements on a per DS3 System Service basis are presented in Table 1.

Please note that the compliance requirements set out in this paper are separate from and in addition to the technical requirements assessed in the Interim Arrangements procurement process.

Table 1: DS3 System Services Compliance Requirements

System Service acronym	System Service	Compliance Requirements for Existing Ancillary Service Providers using existing contract values	Compliance Requirements for Existing Ancillary Service Providers proposing to use revised contract values	Compliance Requirements for New Providers that have not previously provided Ancillary Services
SIR	Synchronous Inertial Response	Must be a synchronous machine. H constant must be confirmed.	Must be a synchronous machine. If proposing to change H constant, the change must be validated (using testing if necessary).	Must be a synchronous machine. H constant must be validated (using testing if necessary).
FFR	Fast Frequency Response	Service will be procured through trials for Interim Arrangements. Compliance requirements to be determined.	Service will be procured through trials for Interim Arrangements. Compliance requirements to be determined.	Service will be procured through trials for Interim Arrangements. Compliance requirements to be determined.
DRR	Dynamic Reactive Response	Service will be procured through trials for Interim Arrangements. Compliance requirements to be determined.	Service will be procured through trials for Interim Arrangements. Compliance requirements to be determined.	Service will be procured through trials for Interim Arrangements. Compliance requirements to be determined.
RM1	Ramping Margin 1 Hour	Compliance assessment will be based on historical data. No additional testing will be required.	Compliance assessment will be based on historical data if it exists for newly proposed contract values (revised either up or down). Outside of these limits, additional testing will be required.	Compliance assessment will be based on testing using dispatch instructions.
RM3	Ramping Margin 3 Hour	Compliance assessment will be based on historical data. No additional testing will be required.	Compliance assessment will be based on historical data if it exists for newly proposed contract values (revised either up or down). Outside of these limits, additional testing will be required.	Compliance assessment will be based on testing using dispatch instructions.
RM8	Ramping Margin 8 Hour	Compliance assessment will be based on historical data. No additional testing will be required.	Compliance assessment will be based on historical data if it exists for newly proposed contract values (revised either up or down). Outside of these limits, additional testing will be required.	Compliance assessment will be based on testing using dispatch instructions.
FPFAPR	Fast Post-Fault Active Power Recovery	Service will be procured through trials for Interim Arrangements. Compliance requirements to be determined.	Service will be procured through trials for Interim Arrangements. Compliance requirements to be determined.	Service will be procured through trials for Interim Arrangements. Compliance requirements to be determined.

System Service acronym	System Service	Compliance Requirements for Existing Ancillary Service Providers using existing contract values	Compliance Requirements for Existing Ancillary Service Providers proposing to use revised contract values	Compliance Requirements for New Providers that have not previously provided Ancillary Services
SSRP	Steady-State Reactive Power	Compliance assessment will be based on historical data. No additional testing will be required.	Compliance assessment will be based on historical data if it exists for newly proposed contract values (revised either up or down). Outside of these limits, additional testing will be required.	Compliance assessment will be based on testing using dispatch instructions.
POR	Primary Operating Reserve	Compliance assessment will be based on historical data. No additional testing will be required.	Compliance assessment will be based on historical data if it exists for newly proposed contract values (revised either up or down). Outside of these limits, additional testing will be required.	Compliance assessment using frequency injection testing (where appropriate) will be required.
SOR	Secondary Operating Reserve	Compliance assessment will be based on historical data. No additional testing will be required.	Compliance assessment based on historical data if it exists for newly proposed contract values (revised either up or down). Outside of these limits, additional testing will be required.	Compliance assessment using frequency injection testing (where appropriate) will be required.
TOR1	Tertiary Operating Reserve 1	Compliance assessment will be based on historical data. No additional testing will be required.	Compliance assessment will be based on historical data if it exists for newly proposed contract values (revised either up or down). Outside these limits, additional testing will be required.	Compliance assessment using frequency injection testing (where appropriate) will be required.
TOR2	Tertiary Operating Reserve 2	Compliance assessment will be based on historical data. No additional testing will be required.	Compliance assessment will be based on historical data if it exists for newly proposed contract values (revised either up or down). Outside of these limits, additional testing will be required.	Compliance assessment using frequency injection testing (where appropriate) will be required.
RRD	Replacement Reserve (De-Synchronised)	Compliance assessment will be based on historical data. No additional testing will be required.	Compliance assessment will be based on historical data if it exists for newly proposed contract values (revised either up or down). Outside of these limits, additional testing will be required.	Compliance assessment using frequency injection testing (where appropriate) will be required.
RRS	Replacement Reserve (Synchronised)	Compliance assessment will be based on historical data. No additional testing will be required.	Compliance assessment will be based on historical data if it exists for newly proposed contract values (revised either up or down). Outside of these limits, additional testing will be required.	Compliance assessment using frequency injection testing (where appropriate) or dispatch instructions will be required.

4 Performance Monitoring

Performance Monitoring, in the context of DS3 System Services, means a method to determine whether a specified DS3 System Service has been delivered in the required manner and within the specified timelines.

Depending on the given DS3 System Service being monitored, service provider performance may be monitored following a dispatch instruction or a transient event and/or a fault disturbance.

The best source of information available to the TSOs for performance assessment will be used (which will include metering, SCADA, Phasor Measurement Units (PMUs) and event recorders as appropriate and available).

[For the Interim Arrangements, the minimum data provision requirements will be set out in this document once finalised].

4.1 Performance Assessment

In the context of DS3 System Services, Performance Assessment means the evaluation of a service provider's delivery of a given DS3 System Service following a dispatch instruction or a transient event and/or a fault disturbance, as appropriate to the given system service.

[As noted in the Introduction, a Pass Rate Methodology for scalar determination is proposed.]

4.2 Pass Rate Methodology

The Pass Rate methodology is based on a simple binary assessment of a unit's performance following a dispatch instruction or a transient event and/or a fault disturbance, as appropriate. The Providing Unit's achieved response to an event/dispatch is calculated and compared to its expected value, allowing for tolerances where applicable. If the achieved response is greater than or equal to the expected value then the DS3 System Service is deemed to have delivered the service ("**Pass**"), and if below, to have not delivered the service ("**Fail**").

The percentage of events that the Providing Unit passed within the assessment period (as defined in the Framework Agreement) is calculated to give the Providing Unit's percentage **Reliability**. This value determines the **Performance Scalar** using a straight line equation based on the SEM decision, where:

IF Reliability \leq 50%, **Performance Scalar** = 0

IF Reliability \geq 90%, **Performance Scalar** = 1

IF Reliability $> 50\%$, $< 90\%$ **Performance Scalar** = $(\text{Reliability} - 50\%) / (90\% - 50\%)$

Reliability (%) = $\text{Count}_{n \text{ events}}(\text{IF}[\text{Achieved Response} > \text{Expected}]) / n$

Expected = Level of service response expected

Achieved = Level of service response deemed to be provided

[It is intended to specify the method of performance monitoring on a service by service basis in the following section. These details are still in development, but will include:

1. *Statement of how the service performance will be measured.*
2. *Whether performance is measured following a Dispatch instruction/Transient Event/ Fault Disturbance?*
3. *Description of measurement process.*
4. *Applicable Tolerances*
5. *Criteria used to determine if the performance is assessed as Pass or Fail.]*

4.3 Performance Scalars - Interim Arrangements

This section outlines EirGrid's proposed methodologies for developing performance scalars during the Interim Period.

At a high level, the 14 DS3 System Services can be split into 5 categories as shown below in Figure 2.

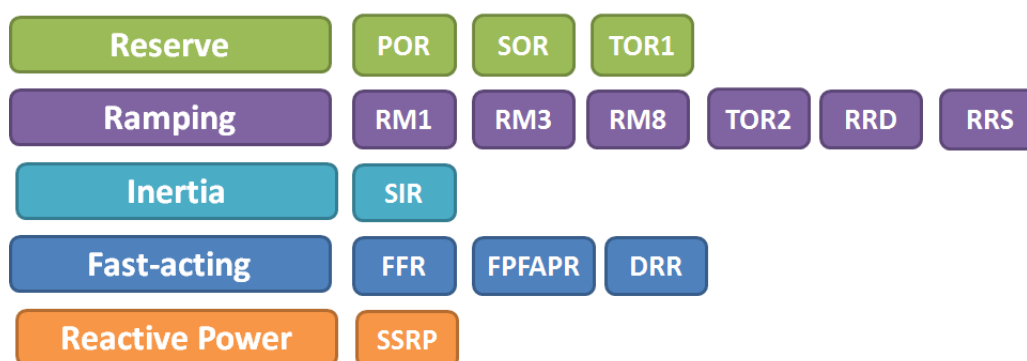


Figure 2: Categorisation of the 14 DS3 System Services

The overall philosophy for the Interim Arrangements performance monitoring is to base performance assessment on an event / fault disturbance / dispatch-based approach using the average of a number of performance records to develop a performance scalar (where a performance record is a data record of performance during a transient event, fault disturbance or following a dispatch instruction, as appropriate).

To develop meaningful performance scalars, it is important that performance is based on a sufficient number of performance records. In this regard, we believe that a scalar should only be based on an individual Providing Unit's performance if there are a minimum number of performance records available with which to calculate it. Where the minimum number of performance records is not available, it will be necessary to use alternative approaches to develop a performance scalar for each Providing Unit.

We propose that, where possible, performance should also be assessed on the most recent data available. To account for this, we propose that there should be an upper limit on the number of performance records needed to develop a useful performance

scalar and a cut-off time after which data becomes no longer relevant for the assessment of performance.

These concepts are defined in the following section.

4.4 Proposed Methodology for Interim Performance Scalars

Table 2 summarises the proposed methodology for calculating the interim performance scalars. Explanations of the terms used in the table are given on page 14.

It is proposed to base performance scalars on an individual Providing Unit basis for all DS3 System Services (except SIR for which no performance scalar will be calculated).

Table 2: Proposed Interim Performance Scalar Calculation Methodology

Definition	DS3 System Services Category				
	Ramping	Reserve	Reactive	Inertia	Fast-acting
Data Source	EDIL Sync Instructions	SCADA – IE PMUs- NI	Annual Grid Code Compliance Test	N/A	N/A
Data Record	A Providing Unit's response to any synchronisation dispatch instruction issued	A Providing Unit's operating reserve response to any under frequency event below 49.5 Hz			
Assessment Criteria	See below*	See below**	Compliance Requirements Satisfied	N/A	N/A
Data Rich vs. Data Poor	5 performance records minimum	5 performance records minimum	If scheduled and awaiting test	N/A	N/A
Data Start date	1 st June 2016	1 st June 2016	1 st June 2016	N/A	N/A
Data Backstop Limit	Last 10 Performance records	Last 10 Performance records	N/A	N/A	N/A
Data Backstop Timeframe	6 month rolling timeframe	12 month rolling timeframe	12 month rolling timeframe	N/A	N/A
Scalar Assessment Frequency	Static for initial three months of settlement and monthly thereafter	Static for initial three months of settlement and monthly thereafter	Monthly	N/A	N/A
Application per category	Flat	Own	Own	N/A	N/A

Definitions

- **Data Source:** The source of the data used for the performance scalar calculation.
- **Performance Record:** A data record for each category based on the defined data source upon which a performance scalar can be based.
- **Assessment Criteria:** The minimum threshold criteria upon which performance is deemed to Pass / Fail.
- **Data Rich vs. Data Poor:** relates to the minimum number of performance records needed for a given Providing Unit in order to be able to calculate a useful performance scalar. “Data Rich” refers to Providing Units which have the necessary minimum number of performance records or above. “Data Poor” refers to Providing Units which have less than the minimum number of required performance records to establish a useful performance scalar.
- **Data Start date:** The date from which performance records are used to calculate performance scalars.
- **Data Backstop Limit:** The maximum number of performance records used to calculate a performance scalar (for Data Rich scenarios only). The principle behind this is that performance scalars should be based on the most recent performance records available.
- **Data Backstop Timeframe:** The cut-off date prior to which historical performance records are no longer deemed to be relevant for use in the calculation of a performance scalar.
- **Scalar Assessment Frequency:** How often it is anticipated that we will reassess a performance scalar.
- **Application per category:** This outlines whether the performance scalar will be applied equally (**‘Flat’**) to all DS3 System Services within each category outlined in Figure 1 or whether each individual DS3 System Service within a category will have its own performance scalar(**‘Own’**).

4.5 Performance Scalar Methodology on a per Category basis

Fast-acting Category

The three new fast-acting DS3 System Services (FFR, FPFAPR and DRR) will not be subject to the interim performance monitoring arrangements outlined in the previous section. (These services will be procured through qualification trials.)

Reactive Power Category

The Steady-State Reactive Power (SSRP) performance scalar will be set equal to 1 if the Providing Unit has satisfied the compliance requirements, proving their ability to provide the service. Otherwise the SSRP performance scalar will be set equal to 0. Providing Units' performance scalars will be updated monthly to account for Providing Units passing compliance requirements during the relevant month.

Inertia

It is not proposed to apply a performance scalar for Synchronous Inertial Response during the interim period.

Ramping

Reliability Metric*:

$$\text{Reliability} = \frac{(\sum \text{Total Sync Instructions} - \sum \text{Fail to Sync})}{\sum \text{Total Sync Instructions}}$$

Definitions of Sync instructions and what is deemed to be a Fail to Sync are outlined in the EirGrid Grid Code sections SDC2.4.2.11 and SDC2.A.4.1 and SONI Grid code section GD1. Defined Terms

Proposed Data Poor Resolution for Ramping Services:

If there are less than 5 performance records available for a given Providing Unit from the lesser of the Data Backstop timeframe or the Data Start Date, then the providing unit is deemed to be “Data Poor” and it is proposed to base its performance scalar on the industry average of all Providing Units from the lesser of those two dates.

Reserve

Reliability Metric**:

Pass Criteria 1: $Reserve\ Achieved \geq (90\% \text{ of } Reserve\ Expected)$ (1)

Pass Criteria 2: $(Reserve\ Achieved - Reserve\ Expected) \leq 1MW$ (2)

Pass = if Pass Criteria 1 or Pass Criteria 2 are achieved (3)

$$Reliability = \frac{\sum Pass}{\sum Events\ while\ dispatched\ on} (4)$$

Definitions of reserve for POR, SOR and TOR1 are outlined in the EirGrid Grid Code V6.0 section OC4.6.3 and SONI Grid code section OC3.4.2.

Proposed Data Poor Resolution for Reserve Services:

If there are less than 5 performance records available from the lesser of the Data Backstop Timeframe or the Data Start Date, then the Providing Unit is deemed to be “Data Poor” and it is proposed to base performance on the industry average of all Providing Units from the lesser of those two dates.

Appendix 1: References to the Protocol in the DS3 System Services Framework Agreement

The following appendix details references made to this Protocol document in the DS3 System Services Framework Agreement.

4 Payment

4.2 Payments

4.2.1 In consideration of the provision of the DS3 System Service(s) pursuant to this Agreement the Company shall pay the Service Provider the payments (“**DS3 System Service Payments**”) as calculated in accordance with the Schedule(s) relating to the Relevant DS3 System Service(s) provided always that the Service Provider has passed all Compliance Requirements as set out in the Protocol.

5 Monitoring and Metering

5.1 The Company may use Metering Equipment and Monitoring Equipment to ensure that the Service Provider is complying with its obligations to provide the Relevant DS3 System Services from the Providing Unit both in accordance with the Grid Code or Distribution Code or the Protocol where applicable and in accordance with the terms of this Agreement.

“**Compliance Requirements**” has the meaning given to it in the Protocol;

“**Fail**” has the meaning given to it in the Protocol;

“**Pass**” has the meaning given to it in the Protocol;

“**Performance Assessment**” has the meaning given to it in the Protocol;

“Performance Scalar” has the meaning given to it in the Protocol;

“Protocol” means the document entitled “DS3 System Services Protocol” as published on the Company’s website (www.eirgridgroup.com);