Consultation on

DS3 System Services Scalar Design

DS3 System Services Implementation Project

11 March 2015

EIRGRID SONI

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Executive Summary

The consultation paper on DS3 System Services Scalar Design is being delivered as part of the Product Design and I-SEM workstream. Key deliverables of this workstream involve the design and implementation of scalars to be applied to the remuneration rates for the 14 System Services. The SEM Committee decision paper SEM-14-108 directed that scalars should be implemented to incentivise flexibility, reliability, value for money and performance. Scalars are categorised under four categories: Performance, Scarcity, Product and Volume.

This paper looks at how scalars could be implemented for each category and provides our proposed approach on how these would be best implemented. It provides stakeholders with an opportunity to feed into the process through consultation.

The scalar design and implementation considerations set out in this paper have been developed in the context of implementation as part of the enduring arrangements (go-live on 1 October 2017). We acknowledge that some of the scalars described in this paper may also be required or desirable as part of the interim arrangements (go-live on 1 October 2016). For some scalars, it may not be practicable to implement them for the interim arrangements. Further details on the applicability of scalars for the interim arrangements are set out on a scalar by scalar basis in the paper.

TSOs' views on TNEI / Pöyry Product, Scarcity and Volume Scalar recommendations

We commissioned TNEI and Pöyry to conduct an analysis on the implementation of the Product, Scarcity and Volume Scalars. Their report on this analysis, "High Level Principles of Scalar Design for DS3 System Services", is published along with this paper. In this consultation paper, we provide our views with regard to the recommendations made in the TNEI / Pöyry report. The TNEI / Pöyry report considers a 'long-list' of scalars although only a subset of these is recommended for implementation without further analysis or consideration.

At a macro level we believe that a balanced approach must be taken to scalar design. Therefore we are minded to only implement scalars where they can be shown to add value either in terms of operational flexibility to the system or value for money for consumers. We are not proposing to implement the scalars outlined in the report where only marginal benefits are expected from their implementation. This will avoid added complexities, thus reducing risk for System Services investment.

Our minded-to position is to introduce the following scalars:

- Product scalar for the faster response of the FFR product;
- Product scalar for the enhanced delivery of the FFR, POR, SOR and TOR1 products;
- Product scalar for the enhanced delivery of the SSRP product with an AVR;
- Scarcity scalar for both the DRR and FPFAPR products; and
- Volume scalar to protect consumers from overpayment and allow the TSOs to manage the overall scale of payments.

We propose that the product and volume scalars should be based on an annual ex-ante (forecast) approach for the purposes of simplicity. We propose to base the scarcity scalar on ex-post calculations.

Other scalars are discussed in the TNEI / Pöyry report for us to consider, although none of these are recommended by TNEI / Pöyry for implementation without further analysis. Rationale is provided as to why we do not intend to introduce other scalars at this time. Implementation of some of these scalars may be re-examined in the future after the enduring arrangements go live on 1 October 2017.

We also outline our thoughts on the specific design features of the scalars and how these scalars should be implemented to efficiently incentivise the required flexibilities. The consultation questions presented in this paper focus primarily around these design features.

TSOs' views regarding Performance Scalar design

Separate to the work carried out by TNEI and Pöyry, we have conducted our own analysis on the design and implementation of the performance scalar. The SEM Committee decision paper SEM-14-108 set out the outline design of the performance scalar. Our analysis focuses on the details and the implementation of the scalar.

In this paper we discuss options for calculating the performance scalar, and we present our view as to why we believe the scalar should be calculated based on pass rate.

Finally we present our thoughts on the specific design features of this scalar and how we believe it should be implemented to efficiently incentivise the required levels of performance.

Stakeholder Engagement

Views and comments are invited on all aspects of this document. Responses to the consultation should be sent to:

DS3@eirgrid.com or DS3@soni.ltd.uk by 22 April 2016

Responses should be provided using the associated questionnaire template. It would be helpful if answers to the questions include justification and explanation. If there are issues pertinent to System Services 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. Please note that, in any event, all responses will be shared with the Regulatory Authorities.

Contents

1 Introduction

1.1 Purpose of Document

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.

One of the key work streams in the DS3 Programme is the System Services (or Ancillary 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 renewable generation (up to 75% instantaneous penetration). Operating in this manner will reduce the level of curtailment for wind farms and should deliver significant savings to consumers through lower wholesale energy prices.

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) referred to hereafter as 'the Decision Paper'[1].

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

- Provide a framework for the introduction of a competitive mechanism for procurement of system services;
- Provide certainty for the renewables industry that the regulatory structures and regulatory decisions are in place to secure the procurement of the required volumes of system services;
- Provide certainty to new providers of system services that the procurement framework provides a mechanism against which significant investments can be financed;
- Provide clarity to existing providers of system services that they will receive appropriate remuneration for the services which they provide;
- Provide clarity to the TSOs that the required system services can be procured from 2016 onwards in order to maintain the secure operation of the system as the level of wind increases;
- Provide clarity to the Governments in Ireland and Northern Ireland (and indeed the European Commission) that appropriate structures are in place to assist in the delivery of the 2020 renewables targets;
- Ensure that Article 16 of Directive 2009/EC/28 is being effectively implemented (duty to minimise curtailment of renewable electricity);
- Provide assurance to consumers that savings in the cost of wholesale electricity which can be delivered through higher levels of wind on the electricity system, can be harnessed for the benefit of consumers;

[1] 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 assurance to consumers that they will not pay more through system services than the benefit in terms of System Marginal Price (SMP) savings which higher levels of wind can deliver.

One of the central work streams included in the DS3 System Services Project Plan is Workstream 6 – Product Design and I-SEM. A key deliverable from this workstream involves the design and implementation of scalars to be applied to the remuneration rates for the 14 DS3 System Services products. Table 1 shows the key milestones for Workstream 6.

Key Milestones	Date
Consultation on scalar design	March 2016
Decision on final scalar design by SEMC	June 2016
Go-live of scalars for Enduring Arrangements	October 2017

Table 1: DS3 System Services Workstream 6 - Key milestones

1.2 Four Categories of Scalars

The SEM Committee decision paper SEM-14-108 established four scalar categories and described their purpose, as reproduced in Table 2.

Scalar	Purpose of the scalar as set out by the SEM Committee
Performance	*"To reward and incentivise high levels of performance" and "to ensure lower payments from the consumer for a lower level of performance"*
Scarcity	*"To create marginal incentives for providers to make themselves available during periods or in locations of scarcity, therefore enhancing the performance of the system where it is most needed"*
Volume	*"To ensure consumers are protected from unnecessarily high prices and maintain the integrity of the overall procurement process"*
Product	*"Incentivising both the more effective delivery of a service and for faster response times for certain services."*

Table 2: Purpose of the four scalars as set out by SEM Committee

1.3 TNEI and Pöyry report on Product, Scarcity and Volume Scalars

To assist us in the design element of this workstream, we commissioned TNEI and Pöyry to conduct an analysis on the implementation of the product, scarcity and volume scalars. The results of that analysis are published in their report, "High Level Principles of Scalar Design for DS3 System Services", which accompanies this paper.

In their report TNEI and Pöyry set out the principles and proposed high level design for a number of scalars which they have recommended for implementation. Additionally they set out a number of other scalar concepts for us to consider, although none of these are recommended for implementation without further analysis.

The TNEI / Pöyry report recommends adoption of two product scalars, a single scarcity scalar, and a single volume scalar.

The report also recommends further analysis of another scarcity scalar, and consideration of six further product scalars and three further scarcity scalars. TNEI / Pöyry produced this 'long list' of potential scalars by considering the materiality and applicability of each type of scalar to each system service.

We provide comments on each of the scalars described in the TNEI / Pöyry report in the following sections of this paper and give our views regarding our minded-to position on both the implementation and detailed design of the respective scalars.

1.4 Our Analysis of Performance Scalars

In parallel to the work carried out by TNEI and Pöyry, we conducted our own analysis on the implementation of a performance scalar. The outcome of this analysis is presented in Section 4 of this paper.

1.5 Our Approach to the Design of Scalars

We believe that the implementation of the scalars, in an informed and structured manner can assist in ensuring that the required flexibilities and levels of performance will be incentivised and delivered. Additionally we believe that the use of scalars should ensure that the service providers will be remunerated appropriately for the value these services provide to the system. This is in keeping with the primary objectives for the four scalars set out in the SEM-14-108 decision paper and further elaborated on in the TNEI / Pöyry report.

We believe that a balance must be achieved between seeking greater granularity in payments and keeping the design and implementation simple and clear. We would intend therefore to only implement scalars that would provide demonstrable benefits in terms of operational flexibility or savings for the energy consumer, and are relatively easy to implement and to understand.

1.6 Application of Scalars

The scalar design and implementation considerations as set out in this paper have been developed in the context of implementation as part of the enduring arrangements. Figure 1 illustrates how scalars will apply to regulated tariffs.

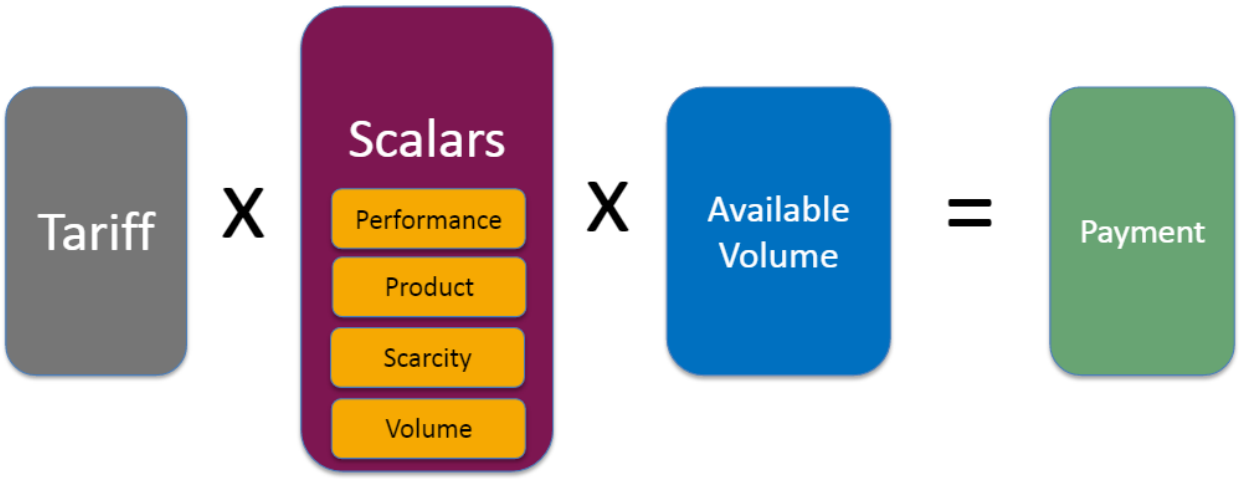

Figure 1: Application of scalars to regulated tariffs

In considering how scalars might impact on future payments the following should be considered:

- The performance scalar is within the control of the service provider. Reliable provision of the service will yield the highest scalar value.
- The product scalars will be based on the characteristics of the plant providing the service and will be known in advance of procurement and contracting for those services.
- There are two options proposed by TNEI / Pöyry for the volume scalar. Our preferred approach is to calculate the Volume Scalar annually ex-ante, so the scalar will be known before each tariff year. Under the proposed auction design, there will be no requirement for a volume scalar for services procured through the auction.
- The scarcity scalar is proposed for two products only: FPFAPR and DRR. The proposed scalar design will introduce uncertainty in revenues for these two products for some plant.

We acknowledge that some of the scalars described in this paper may also be required or desirable as part of the interim tariff arrangements. For some scalars, it may not be practicable to implement them for the interim arrangements. Further details on the applicability of scalars for interim arrangements are set out on a scalar by scalar basis in the following sections.

1.7 Interaction with Auction

It is relatively simple to understand how scalars would work with regulated tariffs. However, careful consideration is required for how scalars would work with auctioned services, particularly in relation to long-term contracts awarded via auction.

The applicability of performance scalars and product scalars to auctioned services should have minimal impact on investment certainty for new providers. Performance is within the control of the service provider while product scalars will be known ex-ante. As mentioned above, under the proposed auction design, there will be no requirement for a volume scalar for services procured through the auction. The one scalar type that could potentially be problematic is the scarcity scalar, although this may be acceptable if there is good visibility of both the scalar

values and the nature of the variation. The application of scarcity scalars to auctioned services will need to be considered on a case-by-case basis.

In addition to application to settlement and payments after the auction has been run, how scalars are accounted for in bids and/or in the price-setting algorithm will need to be considered during development of the detailed auction rules and associated contracts. The TNEI / Pöyry report sets out two initial options for how product scalars could be handled in the auction and it would appear that they should not pose a significant issue. However, the TNEI / Pöyry report has largely been written in the context of procurement with the regulated tariff.

2 Product, Scarcity and Volume Scalars Proposed by TSOs

2.1 Product Scalar for Faster response of FFR

Fast Frequency Response is defined as the additional increase in MW output from a generator or reduction in demand following a frequency event that is available within two seconds of the start of the event and is sustained for at least eight seconds.

The TNEI / Pöyry report recommends the implementation of a product scalar for faster response of the FFR product; for a speed of response quicker than 2 seconds a scalar greater than 1 should be applied on a sliding scale.

We agree with these recommendations. Ongoing work within the DS3 Rate of Change of Frequency (RoCoF) workstream, which aims to deliver a revised RoCoF standard of 1 Hz/s, will enable us to securely operate the power system with higher levels of non-synchronous renewable generation. In doing so, however, the system may on occasion experience frequency events where RoCoF values as high as 1 Hz/s (calculated over a 500 ms timeframe) could occur. Our analysis has indicated that a response faster than 2 seconds, down to 0.5 seconds, will be of value in stabilising the frequency in such events.

We note that a wide range of technologies could potentially provide this service and acknowledge the challenges relating to reducing the total time required to measure, analyse and finally respond to a frequency event in a robust and reliable manner. Noting these challenges, we are proposing that an FFR product scalar for a faster response be implemented in the form shown in Figure 2 below.

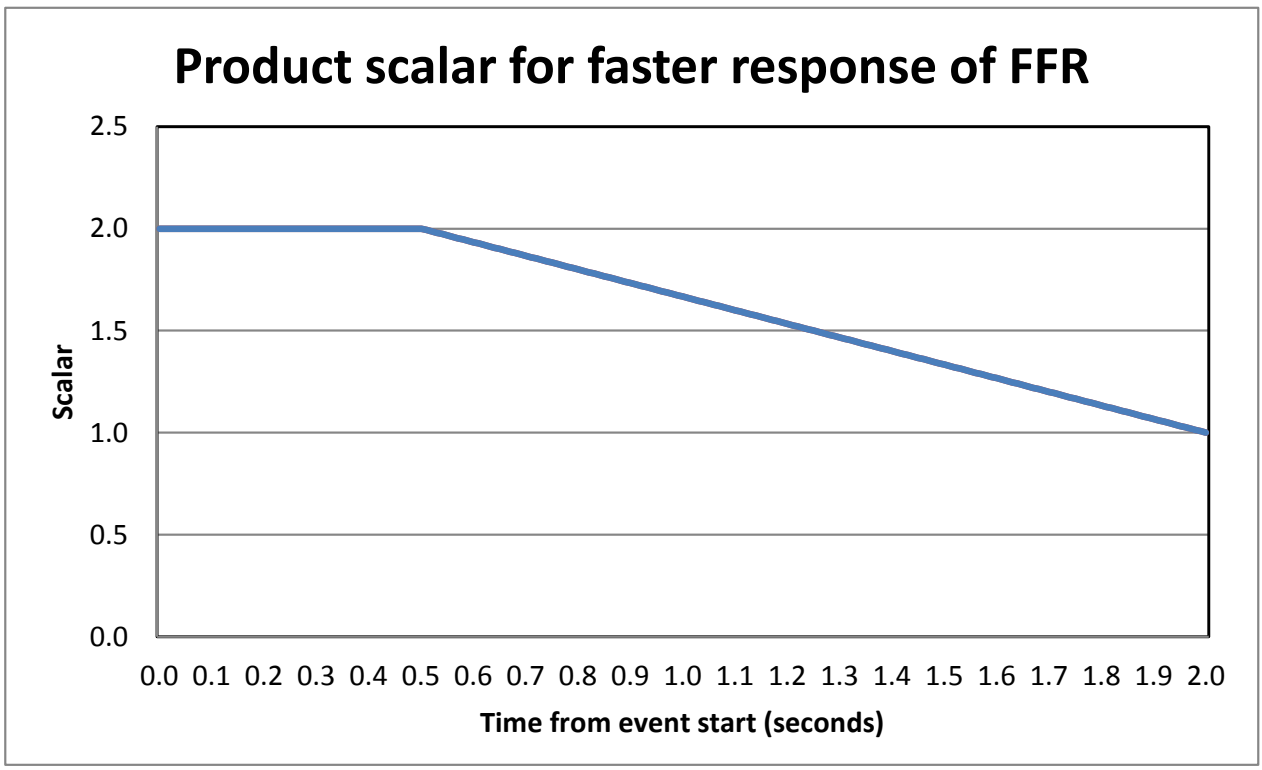

Figure 2: Product scalar for faster response of FFR scalar

Mathematically this scalar is represented as:

If T_R <= 0.5 s, **Scalar =** 2

If 0.5 s < T_R < 2 s, **Scalar =** $((2-T_R)/(1.5)) + 1$

Where: T_R = Response time from event start time

Some service providers may have a ramping characteristic such that their FFR MW capability in a sub-2 second timeframe may be lower than their FFR MW capability at the standard 2 seconds. Our view is that the service provider should have the opportunity at the contracting stage to decide whether to provide the lower MW response in the faster timeframe, or the higher MW response in the standard 2 second timeframe based on whichever is more economic for them. The agreed response would then be set for the contract period and all compliance validation and performance monitoring would be against that response option.

We propose that this scalar would only be applicable for the enduring arrangements. We do not believe it will be feasible to implement it in the timeframe of the interim arrangements.

Question 1: Do you agree with our proposal to implement a product scalar for faster response of the FFR product? If not, please specify why or identify what element of the scalar design you believe requires amendment?

2.2 Product Scalar for the Enhanced delivery of FFR, POR, SOR, and TOR1

The TNEI / Pöyry report also recommends the implementation of a product scalar for the enhanced delivery of the FFR, POR, SOR and TOR1 products i.e. for the provision of services provided with enhanced characteristics. These characteristics relate to parameters such as the frequency trigger capability[2], as well as the profile of the response curve.

We broadly agree with the recommendations made in the report regarding the implementation of the scalar. The scalar provides differentiation between the value to the system of different types of response.

We note that several technologies which service providers may use have the technical capability to deliver a response, which while provided in discrete steps can emulate a dynamic[3] response. While not fully dynamic, this manner of service provision is of greater value than that of a single step static response.

We are proposing to implement the scalar as follows:

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

[3] A dynamic response means that, once a response is triggered, the service provider will continuously react to changes in frequency in a controlled manner for increases and decreases in frequency.

Product Scalar = (Type Scalar + Trigger Scalar) / 2 *if Trigger Scalar is greater than 0; or*

Product Scalar = 0 *if Trigger Scalar is equal to 0.*

Where

- the Trigger Scalar is defined by Figure 3 and is a function of the highest frequency set-point (≤ 50 Hz) at which the unit is capable and willing to provide a response.
- the Type Scalar is 1 for dynamic response and between 0.5 and 0.75 for a response provided in discrete steps defined by Figure 4.

For example, if a unit can provide a response in 5 discrete steps with the highest allowable frequency set-point being 49.7 Hz the Product Scalar would be:

Product Scalar = (0.786 + 0.611) / 2 = 0.699

However, if a unit can and is willing to provide a dynamic response all the way from 50 Hz then the Product Scalar would be:

Product Scalar = 1 x 1 = 1

For a response provided in discrete steps we are proposing that we will specify in real-time whether the response should be enabled or disabled, the frequency trigger, which will be at or below the contracted capability of the provider, and the step sizes. For units that provide a dynamic response we are proposing that we will specify in real-time whether the response should be enabled or disabled, the frequency trigger, which will be at or below the contracted capability of the provider, and the droop setting. We propose that the units would have 60 seconds to implement changes in real-time.

Please note that the value that we set the frequency trigger at will not affect payment. Payment will be based on the frequency trigger at which the provider is capable and willing to provide the response.

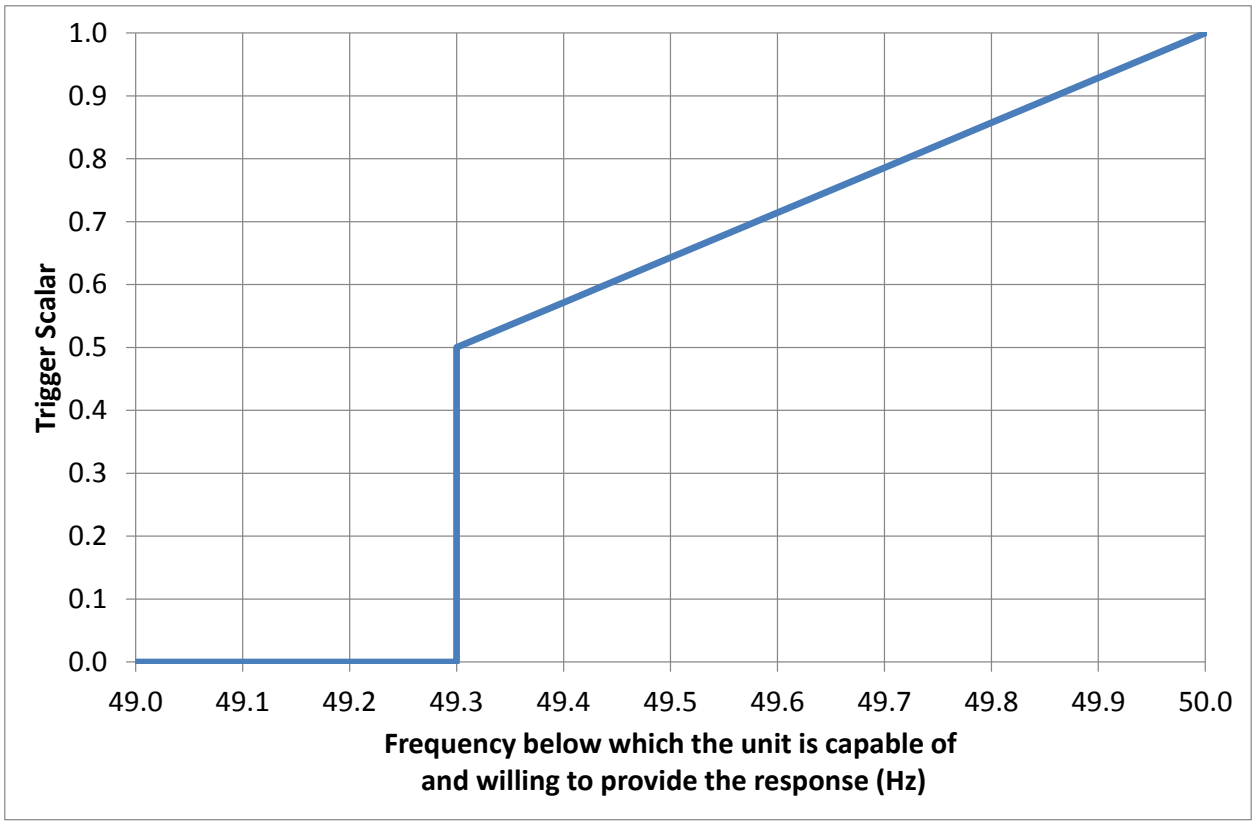

Figure 3: Definition of Trigger Scalar for use in product scalar for faster response of FFR

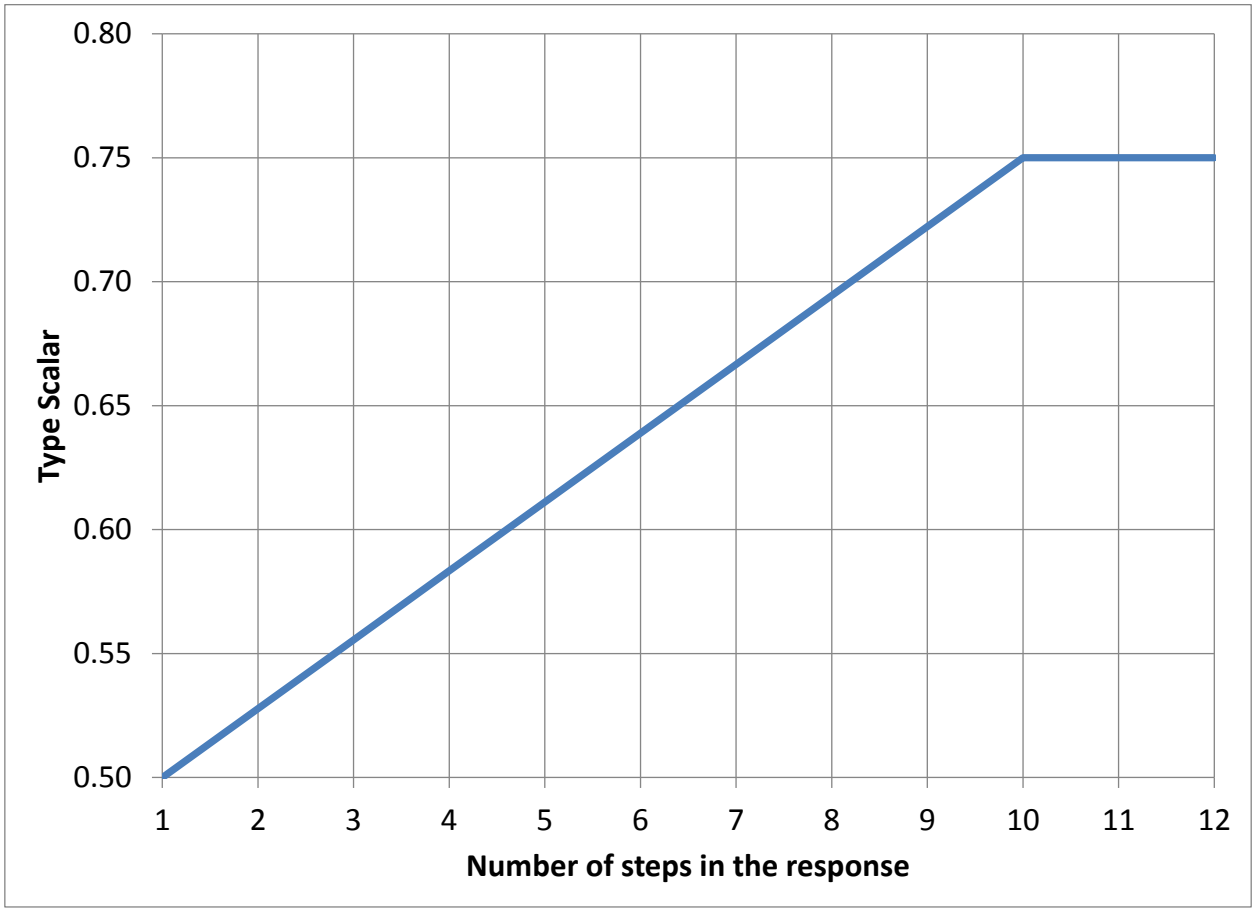

Figure 4: Definition of Type Scalar for use in product scalar for faster response of FFR

This scalar has been designed for implementation as part of the enduring arrangements. We believe that a simplified approach will likely need to be progressed for the interim arrangements. This would involve the use of a scaling factor linked to the frequency trigger capability. However, a simplified approach to differentiate between static and dynamic response will be proposed. This will be set out in the forthcoming Interim Arrangements Contract Design consultation.

Question 2: Do you agree with the implementation of a product scalar for the enhanced delivery of the FFR, POR, SOR and TOR1 products? If not, please specify why or identify what element of the scalar design you believe requires amendment?

2.3 Product Scalar for Enhanced Delivery of SSRP with an AVR

The report recommends that we should further consider whether or not to retain a product scalar for the provision of enhanced delivery of the SSRP product, where the provider has an Automatic Voltage Regulator (AVR) installed which is both functional and in operation. This scalar reflects the fact that those providing the SSRP product with automatic voltage regulation provide a more valuable service than those who do not have an AVR installed.

The existing HAS settlement system already includes this scalar by remunerating providers who have an AVR installed with a double payment at times during which the AVR is operational. In addition to this, the SEM Committee decision paper (SEM-13-098) stated that the variant of the SSRP product in the HAS arrangements, where providers provide the service under the control of an AVR, be retained.

For this reason we propose to implement the scalar on a binary basis as presented in the TNEI / Pöyry report. Therefore, a service provider would receive a scalar of 1 if it does not have an AVR installed, or when the service is available but the AVR is off or unavailable. A scalar equal to 2 would be applied when the service is technically realisable and the AVR is both on and operational.

Mathematically this scalar is represented as:

If AVR installed and operating correctly: Scalar = 2

Otherwise: Scalar = 1

We would propose to implement this scalar in both the interim and enduring arrangements.

Question 3: Do you agree with our proposal to implement a product scalar for enhanced delivery of the SSRP product with an AVR? If not, please specify why or identify what element of the scalar design you believe requires amendment?

2.4 Temporal Scarcity Scalar for DRR and FPFAPR

The TNEI / Pöyry report recommends the implementation of a temporal scarcity scalar for the DRR and FPFAPR products. A large proportion of all generators are required to provide these services in order to ride through faults and ensure safe secure operation of the power system.

Synchronous generation units tend to automatically provide both of these products due to the nature of their machines. However, many non-synchronous generation plant do not currently provide them.

As synchronous machines tend to automatically provide both the DRR and FPFAPR services, the shortage of both services becomes an issue only at times of low penetrations of synchronous generation. Therefore while both products are required by the system at all times, the scarcity of DRR and FPAPR generally only becomes an issue at high renewable penetration levels.

In a separate report by Pöyry called “Regulated Tariff Methodology For DS3 System Services”[4], which accompanied the Regulated Tariff Methodology consultation[5] that closed in December 2015, Pöyry suggested that payments should be targeted using a scarcity scalar to periods when the services are most needed, in essence when non-synchronous generation levels are high, to avoid overpayment of this service. Pöyry also outlined an alternative approach to

[4] Pöyry report on “Regulated Tariff Methodology For DS3 System Services”: http://www.eirgridgroup.com/site-files/library/EirGrid/Poyry-Report-Regulated-Tariff-Methodology-for-DS3-System-Services-v500.pdf

[5] DS3 System Services Regulated Tariff Methodology Consultation Paper: http://www.eirgridgroup.com/site-files/library/EirGrid/DS3_System_Services_Regulated_Tariff_Calculation_Methodology.pdf

targeting payments only to non-synchronous plant, but acknowledged that such an approach would not result in equitable treatment of all technologies.

We therefore support the recommendation made in the TNEI / Pöyry report to implement this scarcity scalar. We believe the introduction of this scalar is essential to ensure that the remuneration of both services is targeted towards units providing the service at times when both are most scarce in a manner that is technology neutral. In the longer term, there may be merits in exploring whether provision of these services should become Grid Code requirements.

We propose to apply it on a sliding scale based on a metric linked to either the volume of non-synchronous generation or percentage of non-synchronous generation with regard to demand in a given trading period. Initially this is likely to be System Non-Synchronous Penetration (SNSP) but it may evolve to be something else. While the specific details of this metric are still to be determined, we envisage that a scalar of zero would apply at all times up to a reasonably high non-synchronous generation level. The scalar would then have a non-zero value only at times when the determined metric is above a certain value and a scalar of 1 would only be applied at times when the percentage is at a high value as envisaged for 2020 and beyond. We believe this approach is both prudent to encourage investment and also essential to protect the consumer from over-expenditure relating to these payments. All service providers who are capable of providing the DRR and FPFAPR services would be eligible for remuneration.

By way of example, we could link the scalar value to the level of non-synchronous generation as a percentage of demand, whereby a zero scalar value could be applied at all times when this metric is below some lower threshold, for example 50%, and a scalar value of 1 applicable at 75%. An illustrative example is shown in Figure 5.

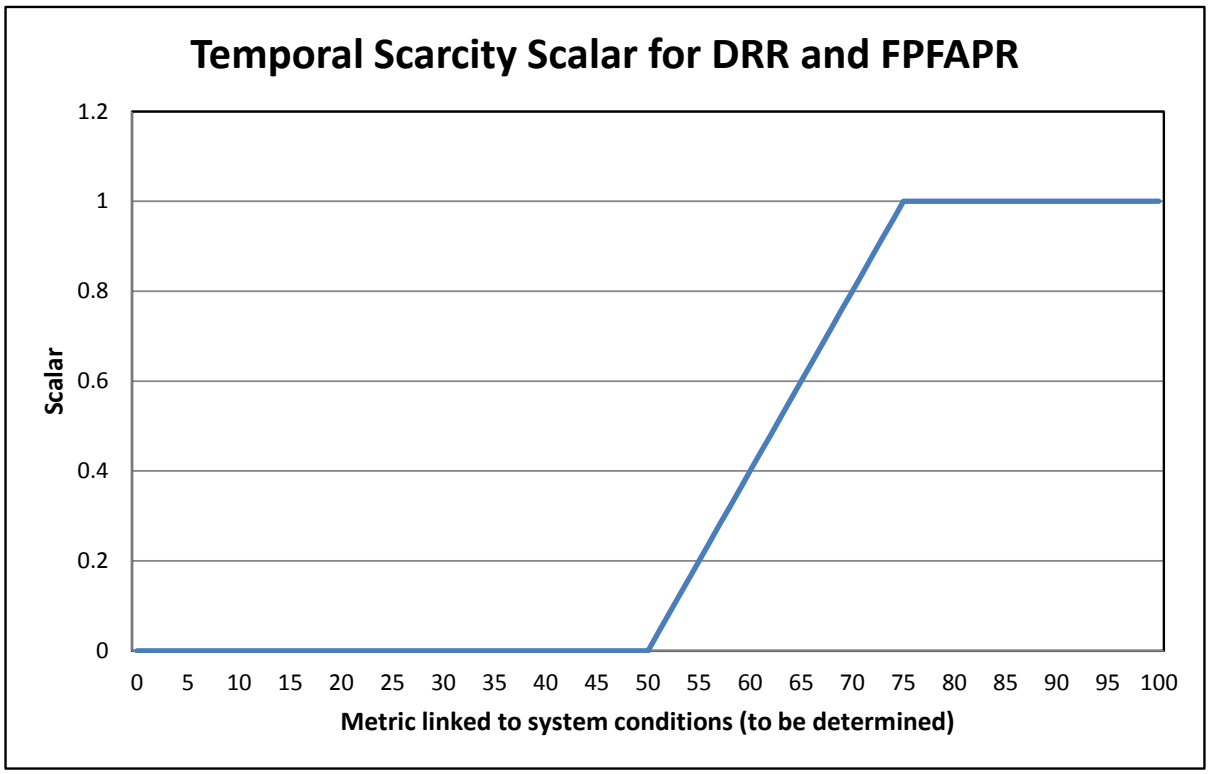

Figure 5: Temporal scarcity scalar for the DRR and FPFAPR products

While this paper looks primarily at scalars for the enduring System Services arrangements, we believe that a temporal scarcity scalar for DRR and FPFAPR is required as part of the interim arrangements also, to avoid exposing consumers to excessive payments. However we do not think it is possible to design and implement the necessary scalar calculations in the System Services settlement system within the timeframes required for the interim arrangements. Therefore an alternative approach will be necessary to manage expenditure for these products for the single year of the interim arrangements. One such approach may be to set the tariff rates for both products to a low value.

Question 4: What are your views on the temporal scarcity scalars presented for implementation of the DRR and FPFAPR products respectively? Do you agree with the principle behind the scalar and, if not, could you explain your rationale?

2.5 Volume Scalar

A volume scalar is proposed to be applied to regulated tariffs where necessary to manage overall expenditure on System Services. It is not expected that a volume scalar will apply to prices set by auction, under the current proposals for auction design. However, depending on the final auction design, a volume scalar may also be required for auctioned services.

The TNEI / Pöyry report puts forward options for a volume scalar to protect consumers from overpayment and allow the TSOs to manage the overall scale of payments. The two principal options for a volume scalar set out in the TNEI / Pöyry report are outlined in Table 4.

Volume Scalar Options	
Option 1	**Targeted, expenditure-based, annual, ex-ante (forecast)** $Volume\ Scalar = \frac{Annual\ DS3\ System\ Services\ Budget}{Forecast\ Annual\ Expenditure\ based\ on\ Base\ Tariff\ Rates}$
Option 2	**Targeted, requirement based, trading period, ex-post (actual)** $Volume\ Scalar = \frac{Requirement\ for\ the\ service\ in\ the\ Trading\ Period}{Volume\ of\ the\ service\ made\ available\ in\ the\ Trading\ Period}$

Table 4: Volume scalar options

For the purposes of simplicity we propose to implement Option 1 – the expenditure-based option. The volume scalars for all 14 System Services would be calculated annually on an ex-

ante basis. This is easier to implement and gives more certainty to service providers than an ex-post trading period calculation. The scalar could of course have a value of 1 if the forecast annual expenditure is lower than the annual budget. The maximum value of the scalar would be capped at 1.

In addition, in line with the TNEI / Pöyry proposal, we propose that the scalar design should retain some flexibility to target all services or a subset of services. For example, there may be some services which would benefit from being exempt from the volume scalar if there are particular investments required in order to provide the service. If some services are exempted from the scalar then this could mean a greater reduction in the payments for other services due to the volume scalar having a lower value.

This scalar design provides both a high degree of certainty to providers on how the scalar would work and thus affect their payment, while also limiting potential over-expenditure exposure.

This scalar will be applicable under the enduring arrangements only. We do not believe it will be necessary to use a volume scalar for the single year interim arrangements.

Question 5: Do you agree with the volume scalar proposal set out by the TSOs? If not, what part of the scalar design proposal do you believe requires amendment?

3 Other scalars not currently being proposed for implementation

3.1 Product Scalar for SSRP with Watt-less VArs

The TNEI / Pöyry report recommends that we should consider whether or not to introduce a product scalar for the provision of the SSRP product with Watt-less VArs i.e. with the capability of providing reactive power capability at zero MW output level. This scalar would recognise that operating in this manner provides a greater flexibility to the system by decoupling the provision of reactive power from the generation of active power.

While we acknowledge the benefits that this flexibility brings, we also note that operating in this mode is already incentivised to some degree through the redefinition of the SSRP product itself. The product will be remunerated using a scaling factor which takes account of the power output range over which the reactive power range can be delivered. Therefore providers that can provide SSRP at zero MW output (i.e. Watt-less VArs) will receive a payment greater than a similar unit not providing this flexibility.

Therefore we do not intend to introduce a scalar for the SSRP product with Watt-less VArs at this time. We will however design the System Services settlement systems in a way that would allow for the future implementation of this scalar, should a need for it arise in the future.

Question 6: Noting that our minded-to position is to not implement a product scalar for the SSRP product with Watt-less VArs, do you believe there is a material requirement to implement this scalar? If so, please provide justification as to why you believe this scalar is required.

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

The TNEI / Pöyry report recommends that we should consider whether or not to introduce a product scalar for enhanced delivery of the DRR product with more reactive current. The idea behind this scalar is that if a service provider had the capability to deliver a greater level of reactive current than required in the default product definition, the extra reactive current could compensate for other generators in the same electrical area that are not able to provide the DRR product.

We believe that the complexity of implementing this scalar outweighs the potential benefits. For this service to be of value to the power system in real time operation, a complex system would be required in which the set points for over-response would need to be changed dynamically to account for the characteristics of response of all other units. We view such a system as being difficult to design and implement. Furthermore, the adoption of such a system could cause transient events if providers were to over-respond or under-respond based on incorrect set points or communications issues.

For this reason, and the fact that such a system is not currently in place or scoped as part of the DS3 System Services implementation project, we do not propose to implement this scalar.

Question 7: Noting that our minded-to position is to not implement a product scalar for the enhanced delivery of the DRR product, do you believe there is a material requirement to implement this scalar? If so, please provide justification as to why you believe this scalar to be required.

3.3 Product Scalar for Enhanced Delivery of SSRP with a PSS

The TNEI / Pöyry report recommends that we should consider whether or not to introduce a 'decreasing' product scalar which would apply to the provision of the SSRP product where a Power System Stabiliser is installed but not operating correctly. The idea behind this scalar is that providers providing the SSRP product, which have a Power System Stabiliser (PSS) installed but where the PSS is not operating correctly, can cause system issues which would not arise had the PSS not been installed or had been turned off.

While we acknowledge the benefits of a service provider using a PSS we also note the effects a badly performing PSS can cause at a system level if the PSS is not responding to the settings provided, or is not tuned or calibrated correctly.

We support the principle of this scalar but we do not believe that it meets the objectives of a product scalar as set out in SEMC-14-108. We propose instead that the issue of poor PSS performance is addressed instead through performance monitoring of the SSRP product. This is in line with the conclusions drawn by TNEI / Pöyry.

To conclude, we do not propose to implement this scalar as a product scalar. However we do believe that it is important to introduce this assessment as part of the criteria for the performance scalar applicable to the SSRP product. We therefore welcome the views of stakeholders as to how this performance assessment may be conducted.

3.4 Product Scalar for SIR with Reserve

The report recommends that we should consider whether or not to introduce a product scalar for the provision of the SIR product for service providers that can provide reserve services at Minimum Generation (as defined in the Grid Codes). The idea behind this scalar, which was originally conceived by the TSOs and included in the 2013 TSO Recommendations Paper, is to incentivise service providers to maximise their flexibility and thus revenue streams by providing the SIR product at low MW output levels while also offering reserve services. This could be achieved through the lowering of Minimum Generation levels where possible while also providing reserve services to the system.

While acknowledging the potential benefits of this scalar, we believe that there is an inherent potential for this scalar to introduce an undesired outcome. Potential providers may decide not to offer their true lowest possible Minimum Generation level because the additional revenue received for the SIR product from lowering their Minimum Generation level may be less than that received from the scaled SIR payment at a higher Minimum Generation level coupled with payments for reserve being technically realisable. This is in line with the conclusions drawn by TNEI / Pöyry.

Furthermore, the type of flexibility which the scalar seeks to incentivise may not necessarily be required going forward as the mix of service providers could result in periods where inertia is scarce on the system, while reserve may be in plentiful supply.

For these reasons we do not propose to implement this scalar at this time. However, we believe the potential for this scalar could be revisited at a later time, when the effects of the auction or regulated price for the SIR and reserve products have stabilised and we are in a position to make an informed decision regarding the potential impacts the scalar could introduce.

Question 8: Noting that while our minded-to position is to not implement a product scalar for this service at this time, do you agree with our proposal to potentially reassess the impact of introducing this scalar at a later stage, or do you believe there is a material requirement to implement this scalar at an earlier opportunity? If so, please provide justification as to why you believe this scalar to be required.

3.5 Product Scalar for Faster Response of FPFAPR

The report recommends that we consider further whether or not to introduce a product scalar for the provision of faster response for the FPFAPR product. The idea behind this scalar is primarily to incentivise non-synchronous FPFAPR service providers to reduce the time taken to recover their active power post-fault.

We acknowledge the rationale for the consideration of this scalar and the technical benefits to system stability if non-synchronous providers were able to recover quickly following faults. However, if implemented this scalar would apply to all technologies that are able to meet the technical definition of this product, not just the non-synchronous providers. The introduction of this scalar would therefore dilute the revenue for the FPFAPR product away from the non-synchronous providers who may have to make material investment to provide the product. Synchronous service providers who inherently provide this service would likely receive the maximum scalar. This is in line with the conclusions in the TNEI / Pöyry report.

Therefore while we support the objective of this product scalar, we do not believe it should be implemented as it would make it very difficult to control the overall scale of payments.

Question 9: Do you agree with the rationale as to why we propose not to implement this scalar? Can you propose an alternative approach as to how this scalar could be introduced?

3.6 Temporal Scarcity Scalar for Reserve Products

The TNEI / Pöyry report recommends that further analysis be conducted on the potential benefits of implementing a temporal scarcity scalar for reserve products. This scalar is intended to ensure that the payment for each of the reserve products is targeted towards the timeframes when the products are most scarce.

The TNEI / Pöyry report outlines a design concept whereby payments would be increased during timeframes in which the reserve services are most scarce. This would provide an

incentive to marginal service providers to remain available at these times. It could also act as an incentive for some service providers who may be limited to the number of periods in which they could provide services but are largely indifferent to which periods they provide these services.

The design also includes a characteristic which would reduce the payment rate at times when the reserve service is being over supplied and is therefore of a lesser value to the system.

The TNEI / Pöyry report offers a number of ways in which this scalar could be implemented, each with their own benefits and levels of complexity. For example the TNEI / Pöyry report considers seasonal and daily reserve requirements, as well as more dynamic approaches which could examine overprovision in terms of the real time requirements for the product in question.

While we support the concept of this scalar we do not believe that implementing this scalar using a simplified seasonal or daily approach will necessarily result in the correct incentives to deliver the required flexibilities. The patterns of seasonal and daily cycles of reserve scarcity become less clear at higher levels of renewable penetration.

Therefore we view that the only way in which this scalar could definitively deliver the correct signal is to base it on the real time requirements for reserve. However, implementing the scalar in this manner would add significant complexity to the TSOs' settlement systems, as the over or under-provision would need to be calculated on a per-trading period basis before being settled ex-post.

In addition it is unclear what effect its implementation may have regarding service provider decision-making to provide services at certain times based on the temporal incentive.

Because of these reasons there is uncertainty regarding what metrics and tolerances would be appropriate if the scalar were to be implemented. We believe that this design feature is an important aspect of the scalar both to best incentivise reserve provision at scarce times without potentially over incentivising it and thus potentially incurring undue over expenditure for the end consumer.

For these reasons we do not intend to implement this scalar at this time. However we will design the System Service settlement systems to allow for the possible future implementation of this scalar, should future analysis indicate significant benefits from its introduction.

Question 10: Do you agree with the rationale as to why we are proposing not to implement this scarcity scalar at this time? If not, can you provide rationale to support your views?

3.7 Locational Scarcity Scalar for SSRP

The TNEI / Pöyry report recommends that we consider whether or not to introduce a locational scarcity scalar for the SSRP product. The concept behind this scalar is to incentivise the provision of the SSRP product in locations which have been identified as having a scarcity of reactive power provision and thus where reactive power control is more challenging.

We acknowledge the concept of this scalar and recognise that providers of the SSRP product in certain locations may provide a level of flexibility which is utilised for system benefit more than

SSRP providers in other locations. However, we also note that previous TSO analyses have indicated likely system-wide scarcity of the SSRP service by 2020.

In addition, we note the significant challenges that would arise from the implementation of such a scalar. The TSOs would need to develop a sophisticated and complex system to establish locational requirements for reactive power in real-time and potentially day-ahead to incentivise provision in the required areas. The system would have to make assumptions about what reactive power would be provided regardless of the scalar, so as to identify areas of under or over provision for calculation of the scalar. Such a system would provide little certainty to potential SSRP providers.

To conclude, we are minded to not implement a locational scalar for the SSRP product at this time.

Question 11: Noting the rationale provided as to why we are minded to not implement a locational scalar for SSRP at this time, do you agree with this proposal and the rationale behind it? If not, can you provide rationale to support your views?

3.8 Temporal Scarcity Scalar for SIR

The TNEI / Pöyry report recommends that we should consider further whether or not to introduce a temporal scarcity scalar for the SIR product. The concept behind this scalar is to vary the rate at which the SIR product is paid based on the level of inertia on the system. This would remunerate SIR providers at a greater value at times of low system inertia and could reduce the payment rate at times of high system inertia.

While we support the concept of this scalar we do not believe that the implementation of this scalar would result in any additional flexibility being offered or obtained, and thus the scalar's only outcome would be the redistribution of payments.

Therefore we do not believe that this scalar should be implemented.

Question 12: Do you agree with the rationale as to why we are proposing not to implement this scalar? If not, can you provide rationale to support your views?

3.9 Temporal Scarcity Scalar for FFR

The TNEI / Pöyry report recommends that we should consider further whether or not to introduce a temporal scarcity scalar for the FFR product. The concept behind this scalar is to vary the rate which the FFR product is paid based on the real time requirement for the FFR product.

We support the concept of this scalar. However, for arguments similar to those relating to the temporal scarcity scalar for reserve products discussed in Section 3.6, we do not believe that this scalar should be implemented at this time.

Question 13: Do you agree with the rationale as to why we are minded not to implement this scalar? If not, can you provide rationale to support your views?

4 Performance Scalar

4.1 Applicability and Materiality of Scalars

In the SEM Committee Decision paper[6] it was proposed to introduce a performance scalar which rewards and incentivises high levels of performance as well as ensuring lower payments for lower levels of performance.

Performance reliability is a key aspect of the proposed system services arrangements. A unit that performs consistently when called to provide a service gives a greater degree of certainty to the TSOs than a unit that performs sporadically.

We had previously outlined the high-level principles for a performance scalar aimed at incentivising a high-level of reliable service provision in our second consultation on DS3 System Services and in the TSO Recommendations Paper[7]. The design aimed to achieve this by decreasing payments in cases where the reliability of the service provider fell below a 90% threshold.

The design also included a lower limit of 50% reliability. At or below a reliability level of 50% we view the service provided by the provider as being unreliable and of no value to the TSO. Where reliability is determined to be below the 50% limit, the provider would receive a performance scalar of zero and thus receive no payment for the service. The design therefore incentivises service providers to take measures to maintain high levels of reliable performance.

The SEM Committee decision paper agreed with the principle and high-level design for the performance scalar. The decision paper directed that the scalar be set equal to one for a service reliability equal to or above 90%, reducing on a sliding scale to zero for reliability below 50%.

While designed for implementation as part of the enduring arrangements, the changes which are required in both the performance monitoring and settlement systems to monitor all of the services mean that a simplified approach for some of the products may need to be progressed for the interim arrangements.

4.2 Principles for high level design of Performance Scalars

Just as the system service products differ from each other technically, so too must the performance monitoring and settlement methodologies. While some principles can be applied across all services, for other services and indeed to take account of the operational characteristics of a wide range of technologies, some degree of differentiation must be applied.

Our primary objective is to simplify the performance scalar calculation where possible and design it in a transparent manner which is applicable to all products and service providers. Any assessment criteria for determining a service provider's performance should take account of

[6] SEM-14-108 - DS3 System Services Procurement Design and Emerging Thinking
[7] TSO Recommendations Paper: http://www.eirgridgroup.com/site-files/library/EirGrid/System-Services-TSO-Recommendations-May2013.pdf

factors such as the service requirement, the frequency of events (if event driven), and a provider's likely availability.

Where possible we could use existing HAS and performance monitoring data and data collated as part of the interim arrangements to determine an appropriate starting point for the performance scalar upon implementation of the enduring arrangements. Similarly, for the interim arrangements, we could use data collated under the HAS arrangements. Where no or insufficient data exists we would be left with the dilemma of paying a provider for a service that we could not necessarily rely on.

There are options for dealing with this lack of data. For example, we could initially set the Performance Scalar to a lower value of say 0.8 and over time, as data is gathered from the actual performance of the machines, the scalar can be adjusted up or down as appropriate. Alternatively we could set the Performance Scalar initially to 1.0. We would welcome your views on the better approach for dealing with this data gap.

For all performance scalars, we believe that they should be recalculated at the end of each calendar month or at the end of each Quarter. This will ensure that providers are sufficiently aware of the impact non-performance will have on their payments. The recalculation should take account of the provider's performance for each service over the preceding months. We believe that a 6 month rolling period for performance assessment may be sufficient in some instances. However, the performance determination criteria need to be different for different types of services.

System Service products will have different frequencies to which the performance assessment can be made; for example, there may be a relatively low number of system faults requiring FPFAPR and DRR services each year, but SSRP may be called upon quite regularly. Additionally various service providers may not have been providing services over a chosen assessment period due to factors such as availability or market position. For these reasons, for the assessment to be fairly conducted we believe that a rolling period of 24 months or more may be needed for services that are not called upon as often or for units who may not have been providing services through a sufficient number of events over a 6 month period.

The performance scalar is designed to encourage reliable provision of services. In the case where continued and consistent poor performance is recorded over time, we will require the right to renegotiate or indeed terminate a System Services contract. The triggers for such an exercise will be discussed in the contract design consultation.

4.3 Proposed Performance Scalar design for consultation

4.3.1 Performance Scalar Determination

One of the primary factors behind determining the performance scalar is the methodology to assess the performance reliability. Different assessment methods can result in large degrees of variation. At a high level, we considered two different approaches 1) a graded comparison of actual performance against expected values and 2) a simple binary assessment of whether or not the actual performance met the expected value.

While there are advantages and disadvantages associated with both approaches, it is our view that the simple Pass Rate approach is most appropriate as it is both simple to understand and provides a strong signal for providers to ensure that performance is maintained.

4.3.2 The Pass Rate Methodology

The Pass Rate methodology is based on a simple binary assessment of a unit's performance at each event. The unit's achieved response to an event/dispatch is calculated and compared to its expected value, the lower of its contracted and declared value. If the achieved response is greater or equal to the expected value then the product is deemed to have been delivered ("pass"), and not delivered if below ("fail").

The percentage of events that the unit passed within the assessment period is calculated to give the unit's percentage **Reliability**. This value determines the **Performance Scalar** using a straight line equation based on the SEM decision, where:

IF Reliability <= 50%, **Performance Scalar** = 0

IF Reliability >= 90%, **Performance Scalar** = 1

IF Reliability > 50%, <90% **Performance Scalar =** (Reliability - 50%)/(90%-50%)

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

Expected = Level of service response expected

Achieved = Level of service response deemed to be provided

The advantages of this method are that consistent delivery to expected levels is rewarded, and it includes an easily understood Pass / Fail criterion.

The primary disadvantage of this method is that a "bad" fail is treated the same as a "marginal" fail. However, we believe that this can actually be used as an advantage as repeated marginal failures should send a signal to service providers to re-declare their service provision capabilities or for re-contracting to take place.

4.3.3 Example of the Pass Rate Methodology

An example performance scalar calculation period is shown in Table 5, where a service provider is assessed over a rolling 10 events.

Event	Expected Response	Actual Response	Result
1	25	20	Fail
2	25	25	Pass
3	25	26	Pass
4	25	25	Pass
5	20	20	Pass
6	20	18	Fail
7	20	21	Pass
8	25	21	Fail
9	25	25	Pass
10	25	26	Pass

Table 5: Example of the Pass Rate methodology

Each event has a separate Pass / Fail result. These are translated into a performance scalar using the formulae used in the example below. Note that for this example, it is assumed that ten is the appropriate number of events to use for determining the scalar value. This could vary from service to service.

Reliability (%) = Count $_{10}$(IF[Achieved Response>Expected]) / 10

Reliability (%) = 7/10 = 70%

Performance Scalar = (Reliability – 50%) / (90% - 50%)

Performance Scalar = (70 – 50)/(90 - 50) = 0.5

4.3.4 TSO Proposal for Scalar Determination

The “pass rate” calculation is our preferred method for determining the Performance Scalar. It satisfies both the SEM Committee decision paper and the principle that consistent and not spurious under performance should be penalised.

We believe that the performance scalar should be implemented in this way for all products using the mathematical formulae set out in the following examples. However we wish to reserve the right to amend the assessment periods to ensure sufficient event assessment among the various products.

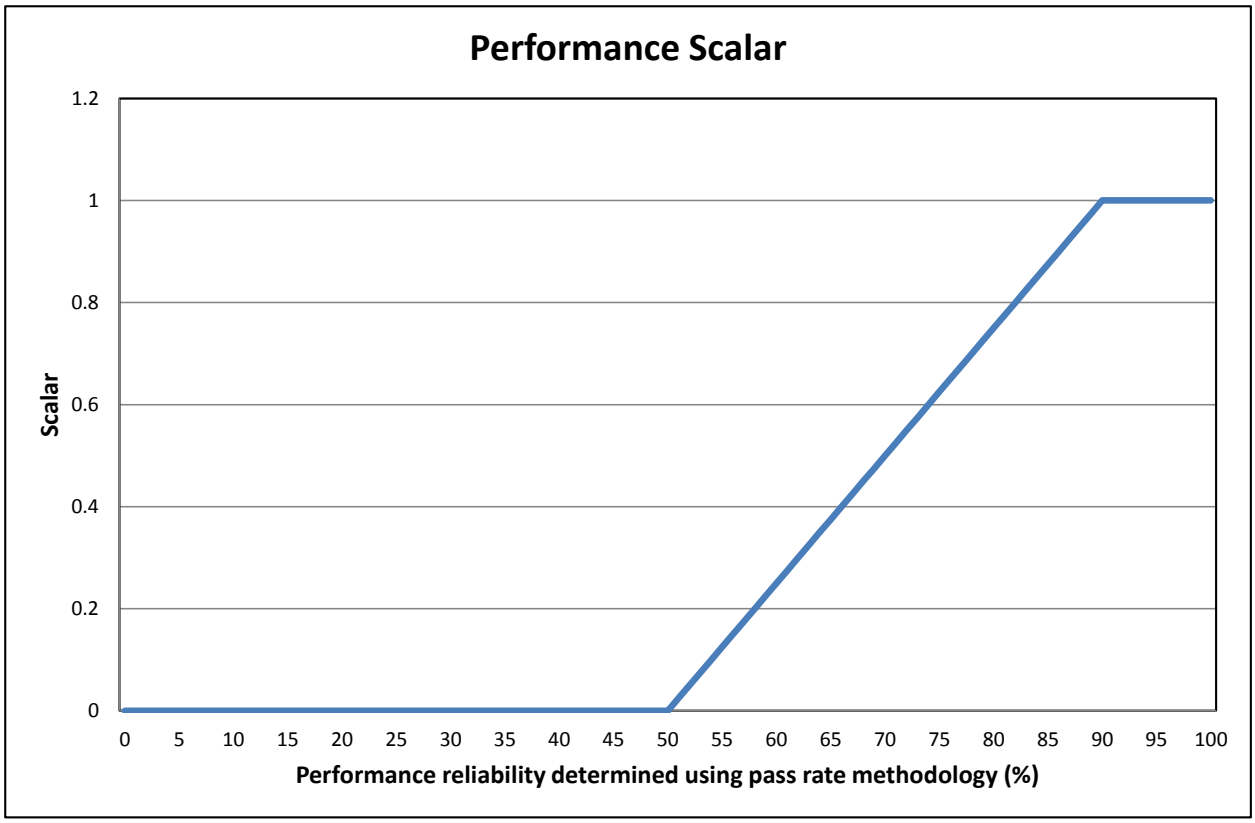

Figure 6: Performance scalar determination

Mathematically this scalar is represented as:

IF P_D <= M_{Min},	**Scalar =** 0	
IF P_D >= M_{Max},	**Scalar =** 1	
IF M_{Min}< P_D < M_{Max}	**Scalar =** $(P_D - M_{Min})/(M_{Max}-M_{Min})$	Scalar <1, >0

Where:	P_D	=	Performance determination	>= 0%, <= 100%
	M_{Max}	=	Metric Maximum	= 90 %
	M_{Min}	=	Metric Minimum	= 50 %
	S_{Max}	=	Scalar Max	= 1
	S_{Min}	=	Scalar Min	= 0

We also believe that we should have the flexibility to amend the M_{Max} and M_{MIn} values as set out below in the case of Ramping Margin 1, 3 and 8, TOR2, RRS and SSRP services where performance reliability against dispatch instructions of greater than 90% is essential to ensure system security can be maintained. For these products, an appropriate performance reliability will be required that exceeds 90%. We believe that M_{Max} and M_{Min} values of 99.5% and 97.5% respectively may be more appropriate for use with these particular products. The scalar

calculation for these services would then be determined using the curve shown in Figure 7 and as set out in the formulae below.

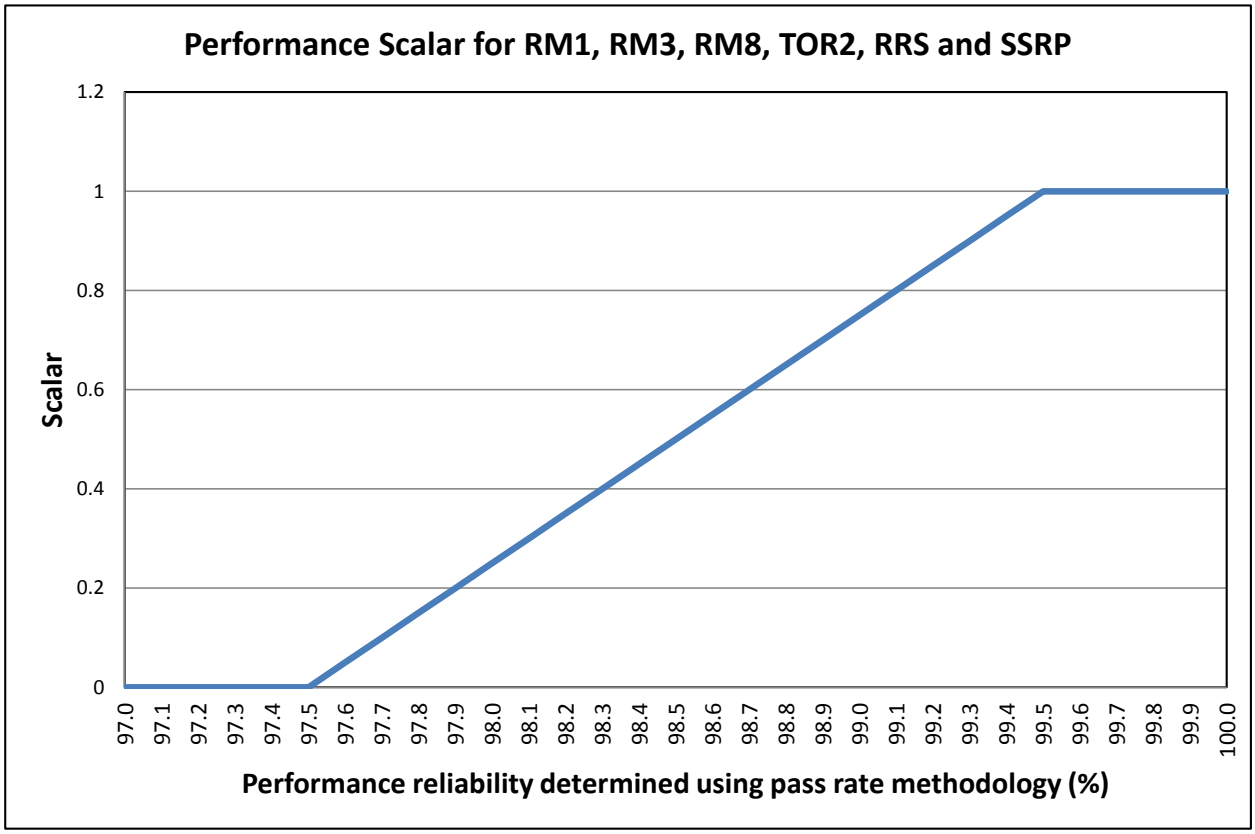

Figure 7: Proposed performance scalar determination for RM1, RM3, RM8, TOR2, RRS and SSRP

Mathematically this scalar is represented as:

IF $P_D <= M_{Min}$,	**Scalar =** 0	
IF $P_D >= M_{Max}$,	**Scalar =** 1	
IF $M_{Min} < P_D < M_{Max}$	**Scalar =** $(P_D - M_{Min})/(M_{Max}-M_{Min})$	Scalar <1, >0

Where:	P_D	=	Performance determination	>= 0%, <= 100%
	M_{Max}	=	Metric Maximum	= 99.5 %
	M_{Min}	=	Metric Minimum	= 97.5 %
	S_{Max}	=	Scalar Max	= 1
	S_{Min}	=	Scalar Min	= 0

Question 14: Do you agree with our proposals for the performance scalar design? If not, what part of the scalar design proposal do you believe requires amendment?

5 Consultation

We value the input of stakeholders on all aspects of DS3 and as part of the System Services detailed design and implementation project we will consult with industry across a variety of topics.

In this consultation process we are seeking industry views on the scalars that we propose to implement in the enduring System Service arrangements. As part of our stakeholder engagement activities we have previously hosted an industry forum in Dublin on February 1st during which the proposals for scalars were outlined.

5.1 Responding to the Consultation

Views and comments are invited on all aspects of this document. Responses to the consultation should be sent to:

DS3@eirgrid.com or DS3@soni.ltd.uk by 22 April 2016

Responses should be provided using the associated questionnaire template. It would be helpful if answers to the questions include justification and explanation. If there are issues pertinent to System Services 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. Please note that, in any event, all responses will be shared with the Regulatory Authorities.