Commission for Energy Regulation
An Coimisiún um Rialáil Fuinnimh

Utility Regulator
ELECTRICITY GAS WATER

Single Electricity Market

DS3 System Services Technical Definitions

Decision Paper

SEM-13-098

20th December, 2013

1 Introduction

On 15th May 2013 EirGrid and SONI (the "TSOs") formally submitted their Recommendation Paper regarding DS3 System Services to the SEM Committee. This paper was published for information on 24th May. This concluded an extensive period of consultation with industry by the TSOs on their proposals to redesign the Ancillary Services arrangements in order to meet the needs of the system in 2020. The SEM Committee would like to take this opportunity to acknowledge the significant work by the TSOs in preparing this suite of recommendations.

Following a review of the TSOs Recommendations the SEM Committee issued a consultation paper on 3rd September 2013 setting out its view that it was minded to approve the technical definitions of the proposed new system services and that it would be conducting further economic analysis on the commercial recommendations made by the TSOs. This paper sets out the SEM Committee's decision in relation to the technical definitions of the services.

2 Background

The TSOs formally commenced the DS3 Project in September 2011, following review by the Regulatory Authorities of the TSOs' Report on Ensuring a Secure, Reliable and Efficient Power System in July 2011. This followed a request by the SEM Committee for the TSOs to put in place a programme of work to solve the challenges which would occur with operating the electricity system in a secure manner as levels of wind penetration increase.

One of the key work streams in the DS3 programme is the Review of System Services (or Ancillary Services). The aim of the system services review is to put in place the correct structure, level and type of service in order to ensure that the system can operate securely with higher levels of wind penetration (up to 75% instantaneous penetration). The TSOs have statutory responsibilities in Ireland and Northern Ireland in relation to the economic purchase of services necessary to support the secure operation of the system. The SEM Committee at present approves the policy, rates and overall all-island monies for harmonised ancillary services as the cost is included in transmission charges and recovered from demand customers.

The TSOs have published three consultation papers and a Recommendations Paper on the System Services Review[1]. The TSOs also published a report carried out by KEMA into system services in international markets[2]. In addition to this the TSOs held a public workshop on their recommendations paper on 26th June 2013.

To date the TSOs have been responsible for the consultation process with industry. At the June meeting of the SEM Committee the TSOs presented their recommendations to the Committee. The Regulatory Authorities' advisors, Poyry, also presented their review of the Recommendations Paper. Following these discussions the Committee decided to publish the consultation paper SEM-13-060 which;

- set out the Committee's thinking on the TSOs' recommendations and how the Committee planned to proceed with the project; and

[1] TSO papers are available here
[2] KEMA Report available here

- invited comments on the Committee's initial conclusions on the technical aspects of the recommendations and, more specifically, on the services to be included in the project.

Following receipt of responses from industry on 11th October, 2013 the Regulatory Authorities held an industry workshop on 14th October, 2013 in Dundalk. At this workshop the Regulatory Authorities presented an overview of the comments received and opened the floor for a discussion with industry on each of the products. At this workshop the Regulatory Authorities also outlined their initial views on their approach to the economic analysis to be conducted. Comments were invited from industry on this approach. In order to assist with its supply side analysis the Regulatory Authorities also issued a call for evidence following the workshop inviting providers (existing and potential) to make submissions regarding the capability of units to provide the proposed system services, timeline for any necessary works and an indication (non-binding) of the associated investment and operational costs. The closing date for submissions was the 15th November, 2013.

3 Related Documents

- SEMC Consultation Paper (September 2013)
- TSO Recommendations paper (May 2013)
- Third TSO Consultation paper (December 2012)
- Second TSO Consultation paper (June 2012)
- First TSO Consultation paper (December 2011)
- Facilitation of Renewables Study (July 2011)

4 Update on the SEM Committee's Economic Analysis

The economic analysis consists of three main work streams:

- the demand side analysis to determine the value of the system services and the volumes likely to be required;
- the supply side analysis to determine the size and structure of revenues required to realise the necessary investment in system services; and
- the analysis on the options for procurement mechanisms.

The Regulatory Authorities have agreed modelling scenarios and assumptions with the TSO. This modelling is currently being carried out by the TSOs and is due to be submitted to the SEM Committee in March 2014. The Regulatory Authorities have commissioned consultants to develop a range of options for procurement mechanisms including both competitive and regulated approaches. Work will be commissioned in the near future to conduct the supply side analysis this will include a review of the responses to the call for evidence and the KEMA study previously commissioned by the TSOs.

Following the conclusion of these analyses in March 2014, the Regulatory Authorities will conduct its own analysis of the outputs before developing a proposal for submission to the SEM Committee which will be published by May 2014 for consultation. A decision on System Services is anticipated before the end of 2014.

5 SEM Committee Position

The Committee supports the need for a detailed review of system services and intends to make clear, evidence based and timely decisions on each aspect of this review. The DS3 programme, of which system services is one part, is an important part of the all island strategy to minimise curtailment levels.

The Committee acknowledges the considerable amount of effort on the part of the TSOs that has brought the system services work stream to this stage. The SEM Committee is of the view that the evidence provided from the results of the TSO's Facilitation of Renewables Studies (2010) and the Report on Ensuring a Secure, Reliable and Efficient Power System (2011) indicate that new and enhanced system services will be required to enable the TSOs to continue to operate the system in a secure and reliable manner as levels of wind generation on the system increase.

The Committee accepts that there is a need for new system services, in particular services that will reward flexibility and assist in the delivery of the 40% renewable targets in Ireland and Northern Ireland. The Committee is minded to agree with the technical aspects of the proposals in system services review.

The Committee has reservations on the proposed economic rationale and commercial arrangements. In reviewing the TSO's recommendations and in arriving at its decisions on the system services review, the Committee will apply the following principles:

- The Committee's decisions will be taken with reference to the Committee's principal objective is to protect the interests of consumers of electricity in Ireland and Northern Ireland by promoting effective competition wherever appropriate. When taking decisions on system services the Committee will have due regard to its other statutory obligations[3][4].
- The Committee will take into consideration the information provided by the TSOs, and will aim to make clear and timely decisions on each part of the system service review. If necessary, the Committee will consider phased implementation of services;
- TSO Proposals for new systems services will be required to have a well-defined product design (including technical parameters), as well as the costs and benefits of the services to be identified and analysis provided.
- The Committee will give consideration to other mechanisms, including market based instruments, to deliver the required services;
- The Committee is cognisant of other important work streams such as the Regional Integration Project. Whilst these work streams remain separate, the Committee will consider the interactions where decisions in either work stream could conflict.

The Committee acknowledges that interested parties have engaged extensively with the TSOs over the course of the three consultation processes on the System Services Review to date. The Committee is aware of the issues raised by the parties over the course of the review. In reviewing the TSOs' recommendations and in moving the System Services Review forward, the Committee understands of the importance of regulatory clarity for investors and

[3] See Section 9BC of the Electricity Regulation Act 1999, as amended.
[4] See Section 9 of The Electricity (Single Wholesale Market) (Northern Ireland) Order 2007

developers in order to enable the required level of service provision in the appropriate timeframe.

6 Responses to the Consultation Paper

In total 17 responses to SEM-13-060 were received, three of which were confidential. All responses are published alongside this paper, excluding confidential responses and annexes. The respondents were:

- AES
- Bord na Mona
- ESB GWM
- Grange
- RES
- Aughinish Alumina
- EAI
- Frank Burke
- IWEA
- SSE
- Bord Gáis Energy
- Energia
- General Electric
- NI Energy
- Three Confidential Responses

The detailed comments regarding each service definition are discussed below in the discussion on the individual services. However, many respondents made general comments in relation to the commercial aspects of system services, the interaction with the Rate of Change of Frequency (RoCoF) Grid Code modification and concern around the timelines for delivery of a SEM Committee decision on System Services.

The Committee, in taking a phased approach, had purposely restricted the consultation proposals to the technical definitions and avoided making any proposals on the commercial aspects of the TSO's recommendations. Therefore the Committee will not make any comment in relation to responses on the commercial arrangements. Once the economic analysis has concluded the Committee will form a view on these matters.

The Committee notes the considerable level of concern expressed by respondents at the length of time it is taking to reach a final decision on System Services. The Committee shares industry's desire to conclude this process and the implementation of System Services in a timely manner. However, the Committee considers it important that the new framework is robust, in terms of maintaining a secure system with a high penetration of wind and in value to the end customer. In this regard it is noted that several respondents welcomed that fact that the Regulatory Authorities were undertaking their own economic analysis.

7 Services

7.1 SEM Committee Decision

The SEM Committee has reviewed the TSOs' recommendations in relation to the proposed new services and has taken into account the assessment of the TSOs regarding the technical needs of the system in 2020. The Committee considers that there is clear evidence that enhanced system services are required in order to maintain a secure and reliable electricity system under conditions of high wind penetration.

Having reviewed each of the services proposed by the TSOs and the comments received, the Committee has decided to approve them in principle. For the avoidance of doubt this decision does not extend to the overall budget which may be allocated to System Services, any payments which may be made for the provision of these services, or the commercial terms that may apply to them.

The services are discussed in detail below, in summary the services are:

New Services		Existing Services	
SIR	Synchronous Inertial Response	**SRP**	Steady-state reactive power
FFR	Fast Frequency Response	**POR**	Primary Operating Reserve
DRR	Dynamic Reactive Response	**SOR**	Secondary Operating Reserve
RM1	Ramping Margin 1 Hour	**TOR1**	Tertiary Operating Reserve 1
RM3	Ramping Margin 3 Hour	**TOR2**	Tertiary Operating Reserve 2
RM8	Ramping Margin 8 Hour	**RRD**	Replacement Reserve (De-Synchronised)
FPFAPR	Fast Post-Fault Active Power Recovery	**RRS**	Replacement Reserve (Synchronised)

7.2 **Definition of Services:** Frequency Control

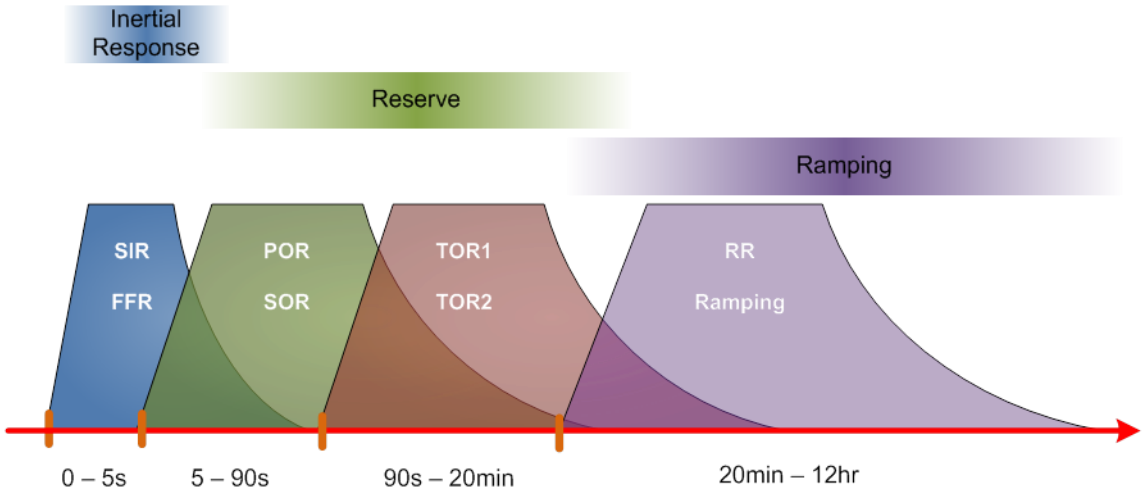


Figure 1: Frequency Control Services (Source: EirGrid)

The TSOs have proposed new services to complement the existing reserve services in order to control frequency. It is envisaged that these new services will provide a MW response in advance of the response time of Primary Operating Reserve and over a longer time horizon to account for the variability in generation due to intermittent generation sources.

7.2.1 Inertial Response

7.2.1.1 Synchronous Inertial Response

Synchronous Inertial Response (SIR) is a new service. SIR is the response in terms of active power output and synchronising torque that a unit can provide following disturbances. It is a response that is immediately available from synchronous generators, synchronous condensers and some synchronous demand loads (when synchronised) because of the nature of synchronous machines and is a key determinant of the strength and stability of the power system. It has significant implications for rate of change of frequency (RoCoF) during power imbalances and for transmission protection devices and philosophy. With increasing non-synchronous generation this response becomes scarce and therefore it is decided to explicitly request its provision as a system service. In particular, if synchronous inertial response can be provided at low MW outputs, the system can accommodate higher levels of non-synchronous generation.

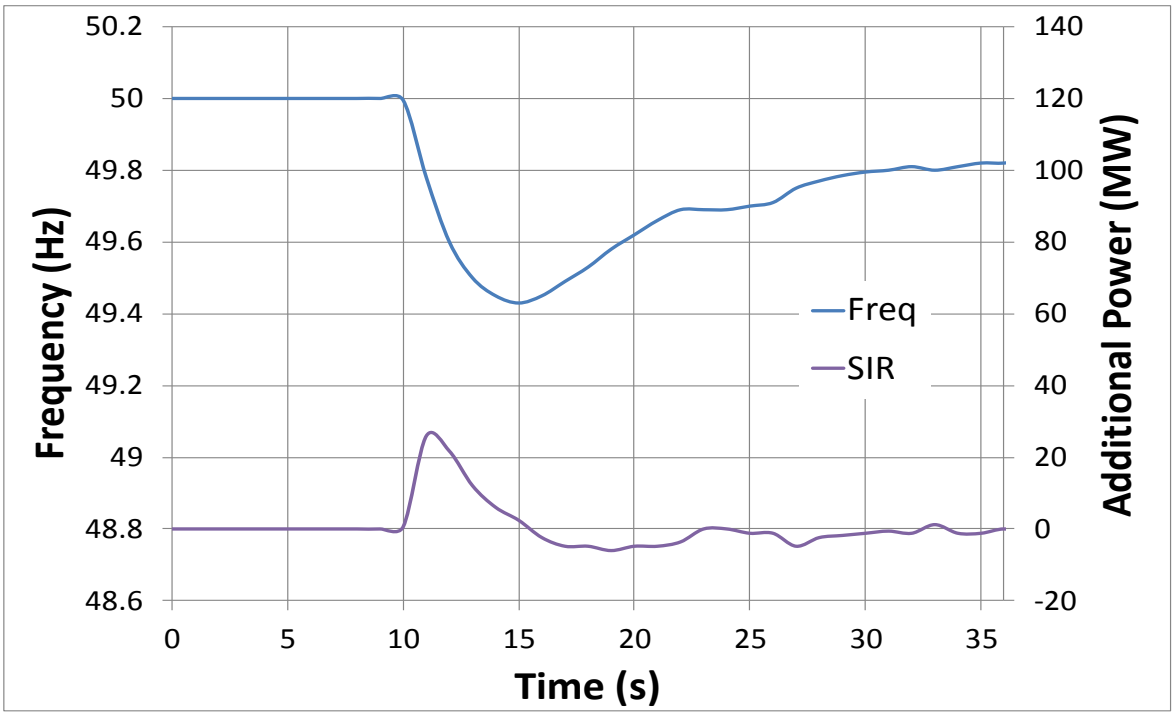


Figure 2: Illustration of inertial response

The SIR service is defined as the kinetic energy (at nominal frequency) of a dispatchable synchronous generator, dispatchable synchronous condenser or dispatchable synchronous demand load multiplied by the SIR Factor (SIRF). The SIRF of a synchronous generator is the ratio of the kinetic energy (at nominal frequency) to the lowest sustainable MW output at which the unit can operate at while providing reactive power control. It will be based on the commissioned design capability of the plant as determined through appropriate testing procedures. The SIRF has a minimum threshold of 15 seconds and a maximum threshold of 45 seconds. The SIRF for a synchronous condenser or a synchronous demand load that can provide reactive power control is set at 45 seconds. The SIR Volume is calculated by the following formula:

SIR Volume = Stored Kinetic Energy × (SIRF – 15) × Unit Status

Additionally a variant of SIR requiring operating reserve to be provided at the lowest sustainable MW output at which the unit can operate at while providing reactive power control will be introduced.

The Committee accepts that there is potential value to responses from providers of synthetic inertia and although this is distinct from the SIR service (in that such providers are not synchronised) the Committee will consider such a service of the appropriate quality. The Regulatory Authorities will engage with the TSOs on this matter.

7.2.1.1.1 Comments Received

Respondents raised three main issues with the SIR definition: the 15 second threshold, the 45 second threshold and the exclusion of non-synchronised units such as flywheels from the definition. Respondents argued that the thresholds are not appropriate on the basis that all inertia has a value to the system. The lower threshold will therefore exclude some inertia

being provided but not rewarded and the upper threshold puts a limit on the value to providers of providing inertia at very low MW output. Furthermore, the requirement to be synchronised excludes some very fast response (but not instantaneous) technologies.

7.2.1.1.2 SEM Committee View

While the Committee accepts that there is a value to all inertia and that the inclusion of the 15 second threshold means that not all inertia provided to the system will be remunerated the Committee has decided that the 15 second threshold should be put in place. This excludes those units that cannot provide inertia at low MW output. The rationale for this is that the purpose of the new system services framework is that enhanced capability should be incentivised. As a matter of normal system operation a certain amount of inertia will be provided by synchronous generators. The Committee considers it would not be in consumers interests to pay for such inertia for two reasons. Firstly, such inertia would not provide adequate additional value for the consumer relative to the status quo and secondly such payments would weaken the economic signals to generators to provide enhanced capability. The overall System Services framework, including the service definitions must drive enhanced capability from providers and additional value to the consumer.

The 45 second threshold creates an upper limit on the SIR volume for which a provider will be remunerated. The Committee supports the existence of such an upper limit in principle as there is a limit on the value to the system of a single unit providing additional inertia beyond a certain point. Not to include an upper limit would result in a weakening of the economic signals to other units whose incremental additional inertia would provide more value to the consumer in terms of system resilience. The TSOs, on the basis of their own technical analysis, have advised that the suitable level of this upper limit is 45 seconds. The Committee accepts this analysis.

The Committee notes the concerns of some respondents in relation to the exclusion of some emerging technology (flywheels in particular), which is not synchronised, from this definition. However, the Committee notes that emerging technology is eligible provided it is synchronised and accordingly not all such technology is necessarily excluded. A further consideration is that the value of the SIR product comes largely from the immediate response of the unit to an event and while de-synchronised units may be able to react quickly there will be a moment in time where an inertial response is required but not provided. It is for this reason that the Committee does not consider it appropriate to extend the definition of the SIR service as previously proposed to providers who are not synchronised. However, the Committee in recognising that there is a potential value to such synthetic inertia and while this is distinct from the SIR service in that it is not synchronous, the Committee considers there may be merit in exploring with the TSOs the potential of such a service.

7.2.1.2 Fast Frequency Response

Fast Frequency Response (FFR) is a new service. With appropriate control systems, both synchronous and non-synchronous generators can provide fast-acting response to changes in frequency that supplements any inherent inertial response. In particular, FFR provides a MW response faster than the existing Primary Operating Reserve times and may, in the event of a sudden power imbalance, increase the time to reach the frequency nadir and mitigate the RoCoF in the same period, thus lessening the extent of the frequency transient. This product

runs in conjunction with SIR so providers who can maintain or increase their outputs in these timeframes are eligible for both services. FFR 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 extra energy provided in the two to ten second timeframe by the increase in MW output must be greater than any loss of energy in the 10 to 20 second timeframe due to a reduction in MW output below the initial MW output (i.e. the hatched blue area must be greater than the hatched green area in Figure 3 below). The FFR volume be measured as the additional MW Output that can be provided when connected.

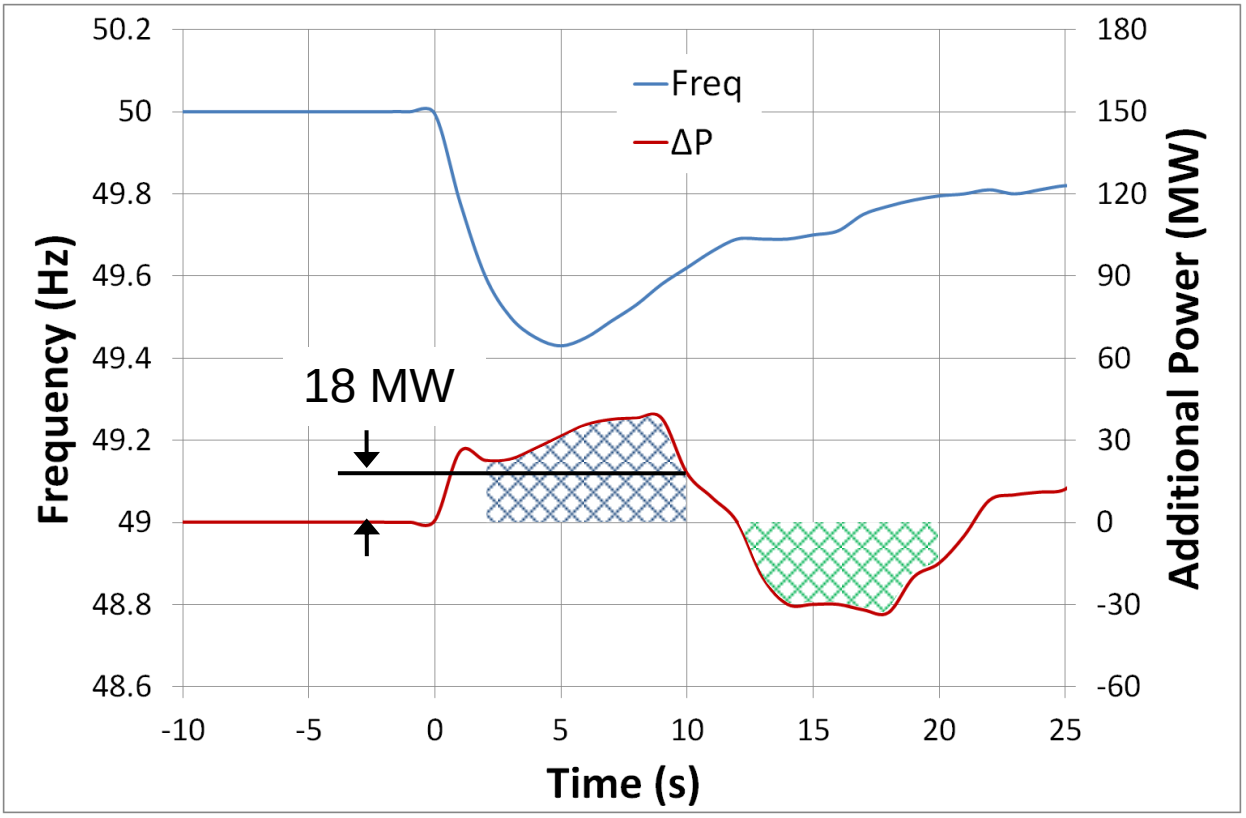


Figure 3: Fast Frequency Response

7.2.1.2.1 Respondents Comments

Several respondents had comments on FFR, mainly the comments supported some way of measuring the volume provided before two seconds. This issue is related to the issue discussed above in relation to SIR where non-synchronised providers are able to provide a response very quickly but not immediately. The view of respondents commenting on FFR was generally that there is a system value to providing as fast a response as possible and that incentivising providers to provide responses faster than two seconds would be beneficial to the system overall.

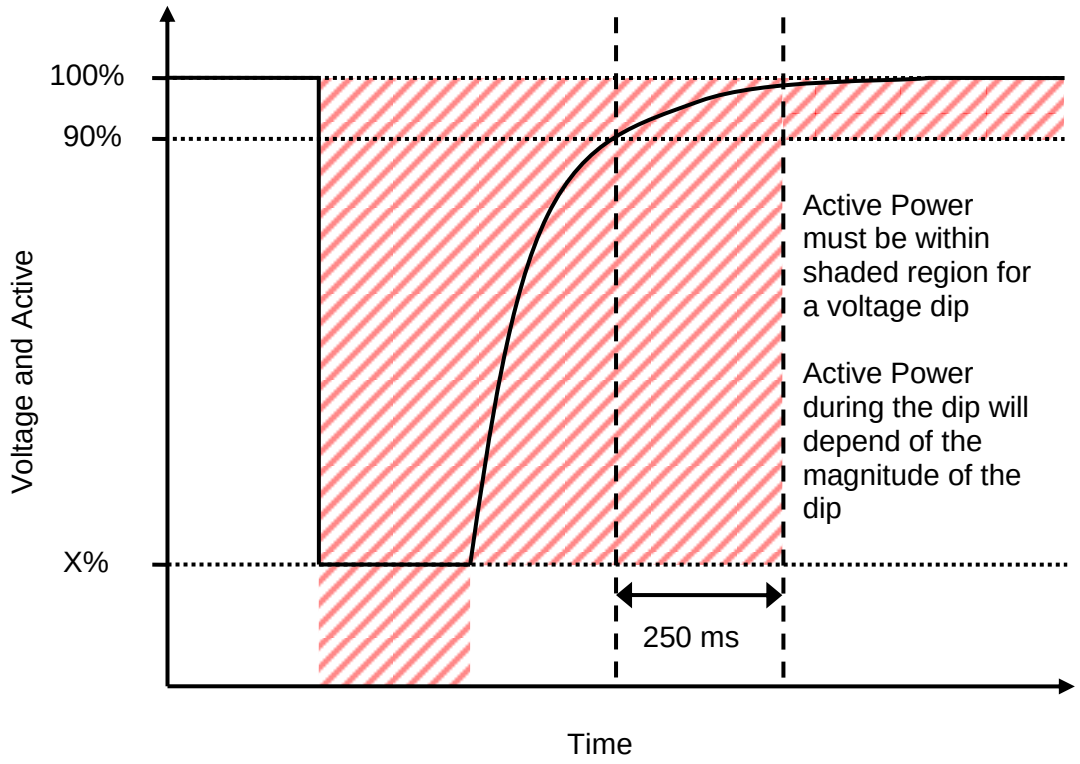
7.2.1.2.2 SEM Committee View

The Committee view is that while the purpose of System Services is to get more enhanced performance on the system it must be noted that this is not an end in itself. The purpose of enhanced performance is that it provides value to the end-consumer. Based on the TSOs'

technical analysis the system requires a FFR response within two seconds anything faster is over and above the required enhanced performance. Therefore, the Committee does not consider the FFR service should be defined to include responses faster than the TSO analysis suggests is required and the economic signals should accordingly focus on that standard as redistributing revenue from slower to faster FFR providers may result in less providers overall (as providers at or close to the two second threshold do not provide the service) and/or higher costs to the end-consumer than is justified by the value provided by the FRR service.

7.2.1.3 Fast Post-Fault Active Power Recovery

Fast Post-Fault Active Power Recovery (FPFAPR) is a new service. Units that can recover their MW output quickly following a voltage disturbance (including transmission faults) can mitigate the impact of such disturbances on the system frequency. If a large number of generators do not recover their MW output following a transmission fault, a significant power imbalance can occur, giving rise to a severe frequency transient. Therefore the Fast Post-Fault Active Power Recovery service provides a positive contribution to system security. Fast Post-Fault Active Power Recovery is defined as having been provided when, for any fault disturbance that is cleared within 900 ms, a plant that is exporting active power to the system recovers its active power to at least 90% of its pre-fault value within 250 ms of the voltage recovering to at least 90% of its pre-fault value. The generator must remain connected to the system for at least 15 minutes following the fault. It is proposed that the FPFAPR volume be based on MW output.



7.2.1.3.1 Respondents Comments

Respondents were mostly supportive of the proposed definition of FPFAPR. However, some respondents raised queries in relation to the volume of the service being based on the “MW

output", and whether this referred to output at the time of the event or the capability of the unit. Those that commented on the issue were of the opinion that it should be based on the unit's capability, not the output at the time of the event.

7.2.1.3.2 SEM Committee View

The intent of the service is that units can recover to their output in the event of a fault to the pre-event output. Accordingly the volume of the service is determined by the pre-event output (e.g. it is against this that performance would be measured). However, it should be noted that the precise relationship in terms of payments between a unit's capability and its MW output at a given time depends on the procurement method and whether payments are made on a dispatch or capability basis. This matter is not the subject of this Decision and will be addressed in the consultation on the financial arrangements.

7.2.2 Reserve

7.2.2.1 Primary Operating Reserve

Primary Operating Reserve (POR) is an existing service, no change to the current definition was proposed.

POR is the additional MW output (and/or reduction in demand) required at the frequency nadir (minimum), compared to the pre-incident output (or demand) where the nadir occurs between 5 and 15 seconds after an event. If the actual frequency nadir is before 5 seconds or after 15 seconds after the event, then for the purpose of POR monitoring the nadir is deemed to be the lowest Frequency which did occur between 5 and 15 seconds after the event.

7.2.2.1.1 Respondents Comments

Respondents supported the proposed definition. The SEM Committee considers that the definition should be implemented as proposed in SEM-13-060.

7.2.2.2 Secondary Operating Reserve

Secondary Operating Reserve (SOR) is an existing service, no change to the current definition was proposed.

SOR is the additional MW output (and/or reduction in demand) required compared to the pre-incident output (or demand), which is fully available and sustainable over the period from 15 to 90 seconds following an event.

7.2.2.2.1 Respondents Comments

Respondents supported the proposed definition. The SEM Committee considers that the definition should be implemented as proposed in SEM-13-060.

7.2.2.3 Tertiary Operating Reserve 1

Tertiary Operating Reserve 1 (TOR1) is an existing service, no change to the current definition was proposed.

TOR1 is the additional MW output (and/or reduction in demand) required compared to the pre-incident output (or demand) which is fully available and sustainable over the period from 90 seconds to 5 minutes following an event.

7.2.2.3.1 Respondents Comments

Respondents supported the proposed definition. The SEM Committee considers that the definition should be implemented as proposed in SEM-13-060.

7.2.2.4 Tertiary Operating Reserve 2

Tertiary Operating Reserve 2 (TOR2) is an existing service, no change to the current definition was proposed.

TOR2 is the additional MW output (and/or reduction in demand required compared to the pre-incident output (or demand) which is fully available and sustainable over the period from 5 minutes to 20 minutes following an event.

7.2.2.4.1 Respondents Comments

Respondents supported the proposed definition. The SEM Committee considers that the definition should be implemented as proposed in SEM-13-060.

7.2.3 Ramping

7.2.3.1 Replacement Reserve (De-Synchronised)

Replacement Reserve (De-Synchronised) (RRD) is an existing service however it was proposed to modify the service. It was proposed that, to avoid overlap with the 1 hour ramping service described below, the timings associated with the RRD service are redefined.

Therefore, RRD is the additional MW output (and/or reduction in demand) provided compared to the pre-incident output (or demand) which is fully available and sustainable over the period from 20 minutes to 1 hour following an event.

7.2.3.1.1 Respondents Comments

Respondents supported the proposed definition. However, some respondents requested that compatibility with the EU Balancing Network Code be taken into consideration. The Committee considers that the definition should be implemented as proposed in SEM-13-060. The issue of compatibility with the Balancing Network Code (currently in draft) will be monitored by the Committee and taken into consideration when deciding on the appropriate procurement mechanism.

7.2.3.2 Replacement Reserve (Synchronised)

Replacement Reserve (Synchronised) (RRS) is an existing service however it was proposed to modify the service. It was proposed that, to avoid overlap with the 1 hour ramping service described below, the timings associated with the RRS service are redefined.

Therefore, RRS is the additional MW output (and/or reduction in demand) provided compared to the pre-incident output (or demand) which is fully available and sustainable over the period from 20 minutes to 1 hour following an Event.

7.2.3.2.1 Respondents Comments

Respondents supported the proposed definition. However, a number of respondents requested that compatibility with the EU Balancing Network Code be taken into consideration. The Committee considers that the definition should be implemented as proposed in SEM-13-060. The issue of compatibility with the Balancing Network Code (currently in draft) will be monitored by the Committee and taken into consideration when deciding on the appropriate procurement mechanism.

7.2.3.3 Ramping Margin (1 Hour, 3 Hour, 8 Hour)

The Ramping Margin (RM) services are new services. The management of variability and uncertainty is critical to a power system with high levels of variable generation. Detailed analysis by the TSOs has shown that portfolios that are capacity adequate are unlikely to be adequate in terms of ramping over all the necessary timeframes to efficiently and effectively manage the variable renewable sources and changes in interconnector flows while maintaining system security. The TSO analysis has also indicated that a ramping-down product is not currently required and therefore the Committee does not propose to introduce a ramping down product at this time. The new ramping-up service covers three distinct product time horizons; one, three and eight hours.

Ramping Margin is defined as the guaranteed margin that a unit provides to the system operator at a point in time for a specific horizon and duration. There are horizons of one, three and eight hours with associated durations of two, five and eight hours respectively. The Ramping Margin is defined by *both* the minimum ramp-up and output durations. Thus the Ramping Margin represents the increased MW output that can be delivered by the service horizon time *and* sustained for the product duration window.

RM Service	Ramp-up Requirement	Output Duration
RM1	1 hour	2 hours
RM3	3 hours	5 hours
RM8	8 hours	8 hours

The following apply in relation to the RM services:

- The ramping-up capability of the plant will be based on Technical Offer Data submitted to the SEM and will include ramp rates, dwell times, break points, etc. as applicable.
- The measurement of this service will be based on half hour figures of MW output and availability.

- Performance metrics will be based on a consideration of performance against dispatch instructions, technical offer data and start reliability (e.g. failure to synchronise).
- The three proposed services are not mutually exclusive. Providers capable of providing all three products are eligible to receive payment for all three, similarly for two.
- Both synchronised and non-synchronised plant are eligible to provide the service.

7.2.3.3.1 Respondents Views

Respondents were generally supportive of the proposed definitions. There were some requests for clarity regarding the interaction of the different time horizons. Some respondents felt that there should be a "ramp-down" service in addition to the "ramp-up" services defined in the Ramping Margin services. Some respondents also raised concern that the full flexibility that a unit may be capable of would not be rewarded due to the current process around Technical Offer Data (TOD) submissions.

7.2.3.3.2 SEM Committee View

The Committee notes the request for further clarity an accordingly will provide some worked examples when there is clarity on the possible procurement mechanisms. In relation to "ramp-down" products, the TSO analysis did not find a requirement for enhanced performance over and above current Grid Code standards. Therefore the Committee, on the basis of the TSOs' assessment, does not consider it appropriate to incentivise enhanced "ramp-down" capability. The Committee notes respondents concerns in relation to TOD submissions. In principle the SEM Committee does not wish there to be any unnecessary impediment to units making the full range of their flexibility available to the TSO. However, this is a separate issue to the definition itself and therefore the Committee does not consider it necessary to revise the definition as proposed in SEM-13-060. Separately the Committee will review the current process for making TOD submissions.

7.3 **Definition of Services:** Voltage Control

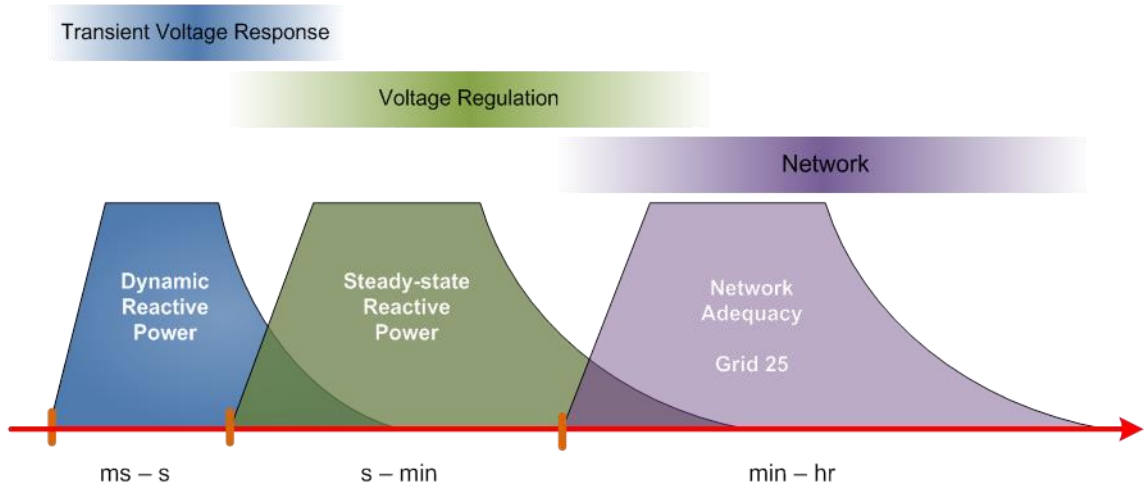


Figure 4: Voltage Control Services (Source: EirGrid)

7.3.1 Dynamic Reactive Response

Dynamic Reactive Response (DRR) is a new service. At high levels of instantaneous penetration of non-synchronous generation there are relatively few conventional (synchronous) units left on the system and the electrical distance between these units is increased. The synchronous torque holding these units together as a single system is therefore weakened. This can be mitigated by an increase in the dynamic reactive response of wind farms during disturbances. Therefore, this new service is particularly important at high levels of renewable non-synchronous generation. In line with the proposed changes to the Grid Codes previously approved by the Regulatory Authorities, a Dynamic Reactive Response service will be introduced.

The DRR service is defined as the ability of a unit when connected to deliver a reactive current response for voltage dips in excess of 30% that would achieve at least a reactive power in Mvar of 31% of the registered capacity at nominal voltage. The reactive current response shall be supplied with a Rise Time no greater than 40 ms and a Settling Time no greater than 300 ms.

It is proposed that the volume is based on the unit's registered capacity when connected and capable of providing the required response. The measurement of this product will require high quality phasor measurement units to be installed at the provider's site with appropriate communication and access arrangements agreed with the TSOs.

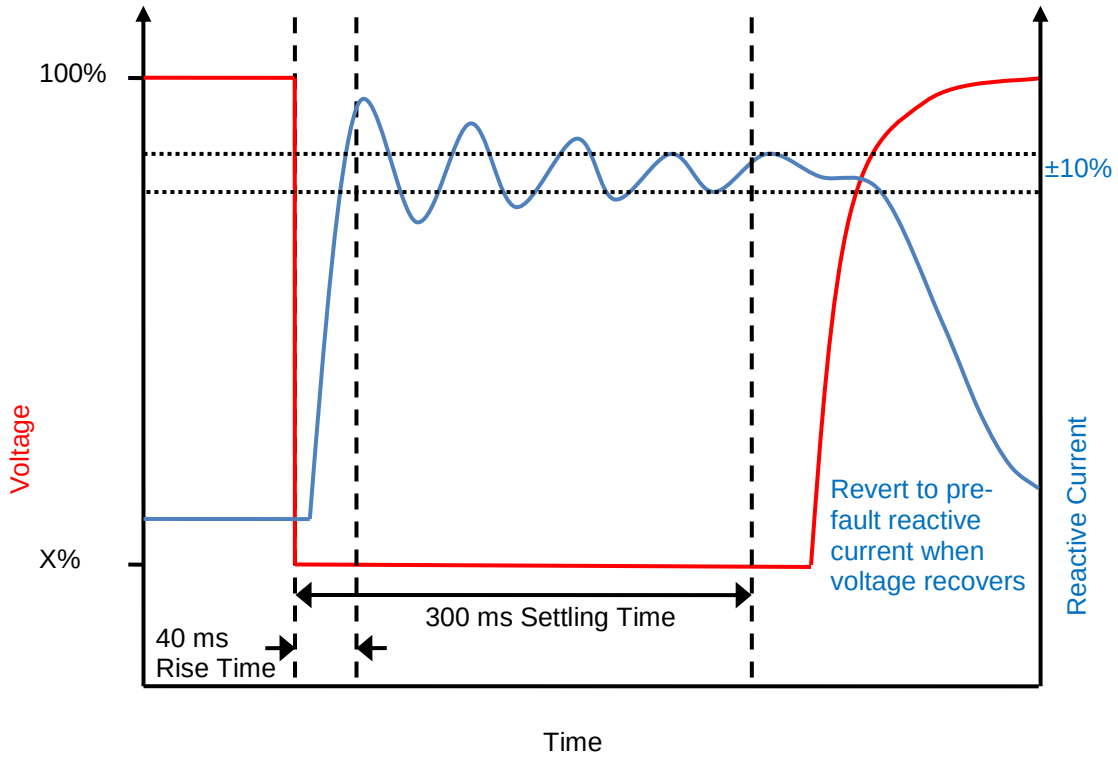


Figure 5: Dynamic Reactive Response Service

7.3.1.1 *Respondents Views*

Respondents supported the proposed definition. The SEM Committee considers that the definition should be implemented as proposed in SEM-13-060.

7.3.2 Steady-state Reactive Power (SRP)

Steady-state Reactive Power (SRP) is an existing service which the TSOs proposed to modify. The need for reliable steady-state reactive power control is important for the control of system voltages and for the efficient transmission of power around the system. Both synchronous and non-synchronous sources can contribute to this requirement.

The need for reactive power varies as demand varies and as the sources of generation vary. Since reactive power is difficult to transmit over long distances (unlike active power), reactive sources are required to be distributed across the system. Thus there is not necessarily a strong link between the need for active power and reactive power from the same sources. It is therefore proposed that the reactive power product is re-structured in a way that incentivises reactive capability across the widest possible active power range (P_{range}).

SRP is defined for conventional generators as the dispatchable reactive power range in Mvar (Q_{range}) that can be provided across the full range of active power output (i.e. from minimum generation to maximum generation). For wind farms SRP is defined as the dispatchable reactive power range in Mvar (Q_{range}) that can be provided across the active power range from registered capacity down to the higher of 12% of registered capacity or design minimum operating level as defined by the Grid Code.

$$RP\ Factor = \frac{Power\ Output\ range\ (P_{range})\ that\ Q_{range}\ can\ be\ provided}{Registered\ Capacity}$$

SRP Volume = Q_{range} x RP Factor, while able to provide reactive power.

RP Factor = 1 for dispatchable synchronous condensers and dispatchable loads.

The variant of this product, where the provider is required to operate under the control of an AVR[5], is additionally retained.

[5] Automatic Voltage Regulator

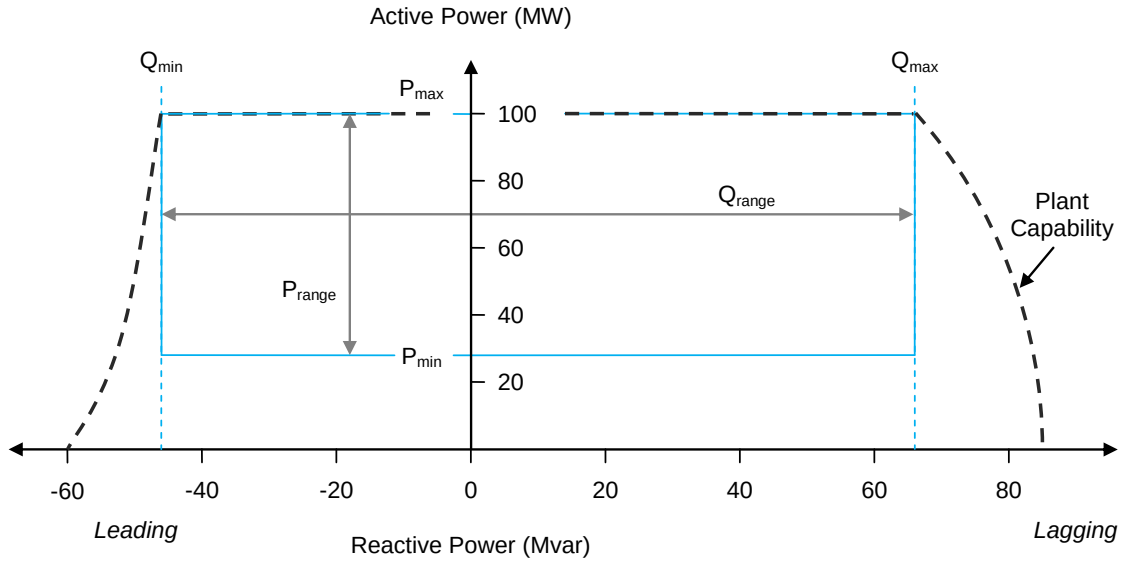


Figure 6: Illustration of the Q/P ranges for the SRP service

7.3.2.1 Respondents Comments

Several respondents raised issues with this definition. Some respondents were of the view that the requirement to require reactive power across the active power range was not appropriate on the basis that it excluded some providers who could provide reactive power at low active power output but could only provide less reactive power at higher active power output. They were of the view that remuneration of this service should reflect the full range of reactive power capability over its entire active power range. While some respondents raised this in relation to emerging technologies it is noted that this issue potentially applies to all types of unit. Another issue raised was in relation to the requirement for wind generators to maintain the reactive power range down to at least 12% of registered capacity. These respondents argue that all reactive power should be eligible for remuneration even if the unit is not able meet[6] the minimum requirements put in place in February 2013.

7.3.2.2 SEM Committee View

As noted above in relation to some of the other definitions the intent of System Services is to incentivise enhanced performance. This necessarily implies that the unit should at least meet the Grid Code standard and preferably exceed it. It is also noted that many of the wind farms applying for derogations have done so on the basis that meeting the new standards is excessively costly. It is open to such units to make the necessary investment in order to qualify to provide this service. However, having reviewed responses the Committee considers that Grid Code compliant providers should not be excluded from providing the SRP service and have accordingly modified the definition.

The Committee notes respondents concerns with limiting the reactive power remunerated to that which can be maintained across the full range of active power (i.e. the area shown in

[6] i.e. it has been derogated from that requirement

Figure 7) as opposed to the full range of reactive power over the entire active power range. The Committee does not consider it appropriate to remunerate reactive power which cannot be maintained across the active power range for two reasons. Firstly, such a provision would introduce a level of complexity in measuring a unit's volume that is potentially problematic in the context of implementing the overall system services framework. Secondly, and more importantly, because these providers could not be relied on to provide both reactive and active responses this would impose system operation costs (borne by consumers) but at lower investment costs for the provider, thus providing incentives that further increase system operation costs.

7.4 Blackstart

The TSOs have not recommended any change to the definition of the Blackstart service. The SEM Committee does not propose to make any change to the Blackstart service at this time.

7.5 Process for Revision of Definitions

The TSOs will periodically review the range of services, and their definitions, and will recommend any changes or new services to the SEM Committee. The frequency of these reviews and the process for implementing any new services or any changes to existing services will be decided in the context of the Committee's decision on the process for the procurement of system services as issues such as contract length among others may have an impact.

8 Next Steps

The TSOs will now commence the first phase of the implementation of the new system services. While much of implementation process cannot commence until a SEM Committee decision on the overall system services framework – the financial arrangements in particular – some elements can be progressed in advance of this decision. It is expected that testing and performance monitoring arrangements, for example, can be developed. The Regulatory Authorities will engage with the TSOs to develop a programme of work in this regard.

The Regulatory Authorities will continue to progress the economic analysis in Q1 2014. It is expected that the outputs from this analysis, including results from the TSOs' modelling, will be available in March 2014. Following this, the Regulatory Authorities will conduct its own analysis of the outputs before developing a proposal for submission to the SEM Committee which will be published by May 2014 for consultation. A decision on System Services is anticipated before the end of 2014.