DS3 System Services Consultation – Qualification Process

This questionnaire has been prepared to facilitate responses to the consultation. Respondents are not restricted to this template and can provide supplementary material if desired.

Please send responses in electronic format to DS3@eirgrid.com or DS3@soni.ltd.uk

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Note: It is our intention to publish all responses. If your response is confidential, please indicate this by marking the following box with an "x". Please note that, in any event, all responses will be shared with the Regulatory Authorities.

Response ☐ **confidential**

The closing date for responses is ~~Tuesday, 19 July 2016~~ Thursday, 21 July 2016.

Question	*Response*
Consultation on Qualification Process	
Question 1: Do you agree that the Qualification Process should focus on both "Provenability" and "Measurability"?	Yes, but our comment regarding question 10 adds some suggestions regarding the Qualification Process.
Question 2: Do you agree that the Provenability Trials should focus on proving only two System Services, as representative of all System Services in those categories of System Services?	We do not agree that the Provenability Trials should focus only on POR and RM3 as representative of all System Services. FFR is the system service that represents the greatest technical challenge and that does not currently exist in Ireland or elsewhere in the world (to our knowledge). Moreover, this System Service is vital to achieve the most important objective of the DS3 project which is to allow a high penetration of renewable energy. Considering this situation, we believe that FFR should be included with POR and RM3 in the provenability trials. Following comments regarding question 10 are good arguments towards this position as well.
Question 3: Do you agree that the Provenability Trials should focus on the Reserve and Ramping categories of System Services?	No, we believe you should also include the fast-acting category for the reasons described in question 2.
Questions 4 to 6 :	No comments.

Question 7: Do you agree with the minimum sizes of Providing Unit proposed for the Provenability trials?	We do not agree with the proposed minimum size of 1 MW for providing units regarding the demand response technologies class. This level may be appropriate for the wind category considering the size of each wind turbine but it is too restrictive for the Demand Side category and specifically with technology that continuously modulates load power consumption because smaller loads are involved (large 200HP motor for example). Moreover, we believe that the size of unit is not relevant for a provenability trial and that no minimum level provision should be fixed. The objective of provenability is to allow a technology to demonstrate its capability to provide a service. We do not agree with the 5 MW maximum limit for the Demand side category. This level associated with the total limit of 10 MW, could allow that only two providers be tested in the provenability trial. Considering the large spread of possible technologies, we believe that the 5 MW maximum level is too restrictive.
Question 8 and 9:	No comments
Question 10: Given the stated aims of the Qualification Process, are there different criteria that would better achieve those outcomes than what is proposed here? If so, what are they and how will they work?	The main goal of Qualification Trials is to construct a "portfolio of Service Providers in the provision of system Services while ensuring the integrity and security of the Irish Power System." In contrast, the Qualification Trials propose to focus only on provenability and measurability. We believe that a goal is missing from this Qualification Process regarding reserve services (including FFR). Currently, there is no criterion that allows evaluating the "operational complexity and practicability of implementation of the reserve services (mainly FFR, POR and SOR)". The reserve services (FFR, POR and SOR) as described in "DS3 System Services Consultation – Scalar Design" allow for a lot of operational freedom such as: faster response for FFR, dynamic or static response, static response with different numbers of steps (1 to 10), different frequency trigger capability and different profiles for the response curve. Considering this high degree of complexity and that large scale deployment of new unproven

	technologies could undermine the reliability of the power system, we believe that a way to assess the operational intricacies of FFR, POR and SOR must be added. The following sections are good examples illustrating this argument in greater details : *Section 1: The complexity of coordinating multiple set of static responses*. Several technologies could be used to deliver FFR, POR and SOR. The TSO's has authorised that response be provided by static or discrete step systems (based on ON-OFF response) which number of steps can vary between 1 to 10. In addition, it has been planned for TSO's to have such a degree of control that they could: enable/disable the response remotely and in real time and control the frequency triggers and step sizes. Designing a power system that uses multiple discrete steps and that, *from a power system point of view,* react to emulate a global dynamic response is not an easy task. This has been demonstrated by [1] in the bibliography bellow. Furthermore, many transmission system operators [3] [4] require that FFR and POR be exclusively provided by a dynamic response system to better ensure the grid's reliability. The task of reserve services and FFR is simple; they need to respond to a frequency event in a robust and reliable manner to bring the frequency back to its nominal value. The solution implemented to solve this problem must first and foremost also be simple. The universal solution to this problem is a continuous regulator (droop). It is a robust, resilient and reliable controller. It is also perfectly integrated in every power system. It's only disadvantage is its lack of speed when working with rotating mass (due to mechanical delays in turbine). The TSO's decision to allow static response to provide FFR, POR and SOR introduces a very high level of technical and operational complexity regarding the provision of reserve services. There is currently no technical evidence/study that demonstrates that a system based on multiple static response with multiple services providers to produce an aggregated response could reach an adequate level of response (in MW) and deal with all possible power system contingencies during any possible frequency excursion while remaining robust and reliable. More so on a power system's like the Irish one. As a result, we believe that an elaborate and

	comprehensive demonstration is essential for static response providing FFR, POR and SOR. We also believe such a demonstration should be part of the Qualification Trials process if TSO's are to allow these technologies on their network. Finally, regarding dynamic response systems based on droop control, we believe that the main challenge is to demonstrate that their response speed follows the requirements of FFR. Hence, we also believe that demonstrating the ability of dynamic response to provide FFR while respecting strict rapidity requirements should also be added in the Qualification Trials process. *Section 2: Impact of the FFR recovery phase on POR and SOR*. SEM defined the FFR 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" [5]. This definition allows for a drop of power (in the recovery phase) between 10 and 20 seconds. This part of the recovery phase (10-20s) is in the same time scale as POR and SOR and can thus have an impact on their required amount following a frequency excursion. This is demonstrated by figure 1 below :

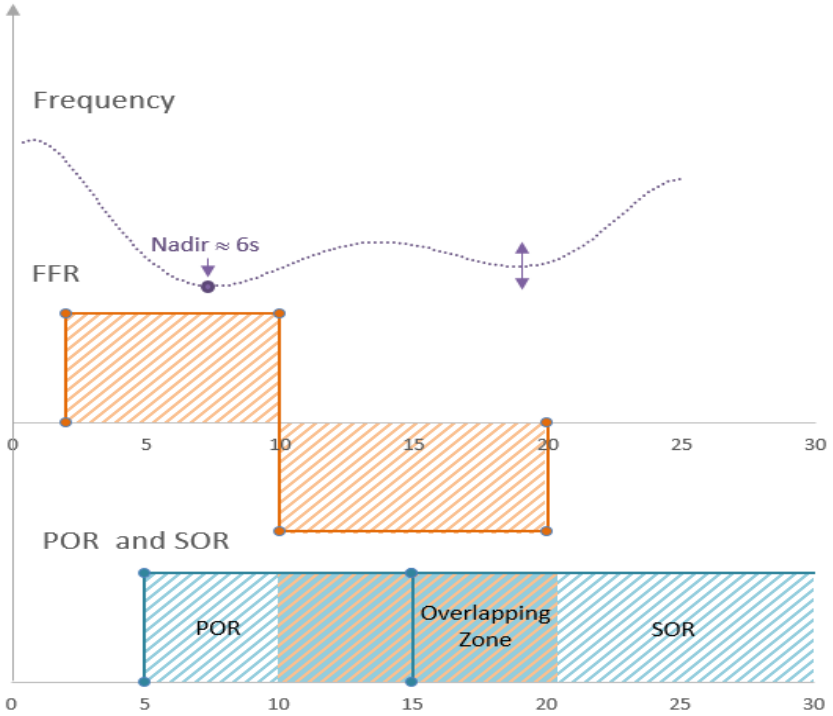


Figure 1 : Overlapping of POR, SOR and FFR causing a second nadir for a typical frequency excursion

This figure illustrates that the required amount for POR and SOR is dependant of the FFR power drop during the recovery phase. This phase, when related to wind providers, becomes dependant of the local wind conditions and power output of wind turbines which has a high level of imprevisibility [2].

A way to limit the impact (on POR and SOR) of the recovery phase regarding wind turbines is to regulate the amount of energy recovered. For example, Hydro-Québec [6] limits the energy drop to 20% of the total amount of energy delivered during the recovery phase.

We thus believe that a criterion (other than provenability or measurability) that allows TSO's to

	evaluate the impact and interaction on POR and SOR of technologies with a recovery phase is absolutely required. As shown with figure 1 above, such a criterion is essential if you want to avoid an over procurement of POR and SOR or, even worse, to avoid the creation of a second nadir because of the lack of POR and SOR. Consequently, even if this last matter is not directly related to the goal of this consultation (but rather to the consultation on the Design Scalar), we also believe that a scalar to take the recovery phase into consideration should be added. *Section 3: The proposed initial solution to provide FFR, POR and SOR is too complex*. The current offer of technical solutions for reserve services (including FFR) endorsed by the TSO's is, in our opinion, very complex on an operational and technical level. Respecting the general objectives of robustness, predictability and coordination between actions to guarantee the reliable operation of the power grid is a major challenge considering the variety of situations and events that can occur on a power grid. More so when you consider every technological variants allowed here. The motivation to facilitate the arrival of new technologies and a wide variety of means must not interfere with the duty to manage the system prudently. Thus, one should be careful to only contract for technologies that can be robustly implemented together. We also believe that such a range of technological solutions cannot be implemented in the initial step of reserve services procurement. A preliminary target for the implementation of reserve services (including FFR) should be simplicity and be established using autonomous, dynamic, proportional and fast technologies. These technologies should not require any outside coordination to ensure their efficiency. As a result, it is our belief that technologies that mimic the basic principles of existing governors while improving their speed to respect the requirements of FFR should be promoted and implemented first. Other technologies (e.g. discrete response with 1 to 10 steps) should be subject to further analysis and studies that demonstrate that the could be coordinate and that they could globally emulated dynamic response before one allows their full power system deployment.

Bibliography

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[3] RTE France, “Documentation Technique de Référence,” *Contribution des utilisateurs aux performances du RPT, Réglage Fréquence/Puissance,* vol. 5, January 2014.

[4] NERC : North American Electric Reliability Corporation, “Frequency Response Standard Background Document,” November 2012. [Online]. Available: http://www.nerc.com/pa/Stand/Project%20200712%20Frequency%20Response%20DL/Bal-003-1-Background_Document-Clean-2013_FILING.pdf.

[5] CER : Commission for Energy Regulation, “Single Electricity Market - DS3 System Services Technical Definitions - Decision Paper - SEM-13-098,” p. 10, 2013.

[6] Hydro-Québec, “Exigences techniques de raccordement de centrales au réseau de transport d'Hydro-Québec,” Régie de l'Énergie du Québec, *Demande R-3830-2012,* 19 12 2012.