

# DS3 RoCoF Alternative Solutions Phase 1 Concluding Note

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17/08/2015



## Introduction

In June 2015, EirGrid and SONI published the “[RoCoF Alternatives Technology Assessment](#)” report compiled by consultants DNV GL and the TSOs’ [summary document](#). The DNV GL report forms the basis for Phase 1 of the RoCoF Alternative Solutions project. The report provides an assessment of a range of technologies in terms of their capabilities to prevent high RoCoF events. The report highlights the fundamentally different characteristics of synchronous and non-synchronous devices in this context. It also raises a number of areas that must be resolved for non-synchronous devices in terms of capability for high RoCoF prevention.

The TSOs plan to investigate the deployment of synchronous and non-synchronous inertia for prevention of RoCoF events as part of Phase 2 of the RoCoF Alternatives project. This analysis will be performed through technical and techno-economic studies. The study will aim to determine volumes of synchronous and/or non-synchronous inertia to maintain RoCoF at 0.5 Hz/s whilst allowing for non-synchronous penetration to reach 75%.

EirGrid and SONI remain of the belief that generator compliance with the proposed new RoCoF standard is the most efficient and timely solution to the RoCoF issue. The priority is therefore to deliver the RoCoF Generator project and DSO project. Nonetheless, the TSOs are of the view that the analysis conducted as part of the RoCoF Alternative Solutions project would complement the implementation of the wider DS3 Programme.

## Summary of Phase 1 responses

EirGrid and SONI received fourteen responses from industry in relation to the DNV GL report. Each response has been reviewed by the TSOs and DNV GL. The report was well received by the majority of respondents. A revised final report has been compiled by DNV GL and has been published. The revised report was updated to correct a number of typos and inconsistencies in the original report. The overall analysis and conclusions from the report remain unchanged. This section outlines some of the main themes in the responses and the views of the TSOs on these themes.

### Weighted Scoring Matrix Approach

Many contributors offered views on the scoring matrix approach. Individual respondents provided comments on the scoring results for specific technologies based on their knowledge of the specific device types. The assessments in the DNV GL report were done at a high level and more detailed analysis would be required to fully assess the characteristics of individual technologies. DNV GL and the TSOs have assessed the industry feedback on the scoring matrix results, have made edits as appropriate but believe the results in the report are not materially affected. Responses also provided useful additional information

about the capabilities of certain technologies. The TSOs welcome this feedback and will consider all information when progressing with the RoCoF Alternatives project.

### **Weighted Scoring Matrix Criteria**

Several responses expressed views on the criteria used in the weighting scoring matrix approach. The omission of cost as one of the scoring matrix criteria was raised in submissions. The TSOs and DNV GL utilised all available information when conducting the technology assessment and an appraisal of technology costs was included in the ‘faceplate’ assessments. The review was limited by the available information on capital and operating expenditure for each technology. Given that the review was performed at a high level, the TSOs and DNV GL did not deem it appropriate to provide scoring for the various technologies without conducting more detailed studies specifically analysing technology costs. Similarly, the TSOs and DNV GL did not consider carbon emissions in the scoring matrix as this would have required specific detailed analysis that was beyond the scope of the technology assessment. It should also be noted that the DS3 Advisory Council was consulted on the scoring matrix criteria in advance of the study commencing.

### **Inertia provision from Doubly-fed Induction Generators**

Comments were also received relating to the description of doubly-fed induction generators (DFIGs) in the report. A DFIG is a popular electrical generation configuration used in modern wind turbine generators. The DFIG is a wound rotor induction generator that is configured to be supplied directly from the grid on its stator and through a power electronic convertor on its rotor. The connection of the stator directly to the grid provides an electro-magnetic coupling to the system. The power electronic converter on the rotor is usually controlled such that the speed of the machine will optimise the power take-off of the wind turbine. Studies have illustrated that this type of rotor configuration restricts the machine from giving an inertial response to the system<sup>1</sup>. DFIGs currently deployed on the system are operated in this manner but could be modified to provide inertial response.

A DFIG can provide a limited inertial response to the system when configured in a certain manner. For example, a DFIG that has its rotor winding short-circuited will act like a traditional induction machine. Similarly a DFIG with a DC current injected on its rotor windings will act similar to a synchronous machine. Both of these configurations would allow for an inertial contribution to the system. Therefore in these configurations a DFIG can provide an inertial response to the system.

### **Interaction with DS3 System Services**

Responders raised questions about the interaction between the RoCoF Alternative studies and DS3 System Services studies. The TSOs will be conducting separate analysis and consultation on the required volumes for system services. The RoCoF Alternatives phase 1 analysis is aimed at determining technologies with the capability required to prevent

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<sup>1</sup> “The utilization of synthetic inertia from wind farms and its impact on existing speed governors and system performance (Part 2 Report of Vindforsk Project V-369)”, Elforsk rapport 13:02 by Seyedi and Bollen, January 2013. Available: [http://www.elforsk.se/Rapporter/?download=report&rid=13\\_02](http://www.elforsk.se/Rapporter/?download=report&rid=13_02)

RoCoF events in excess of 0.5 Hz/s. The project is therefore focused on synchronous and non-synchronous devices that have the ability to resolve this issue. The outcomes from the RoCoF Alternatives assessments should not be interpreted as an assessment of the ability of a particular technology to provide system services.

The TSOs recognise that the System Services workstream may result in enhanced capability of existing and future plant which may complement the system requirements identified through the RoCoF Alternatives project. The TSOs will continue to monitor industry developments, and engage with industry representatives, to identify any such complementary overlaps in the two projects.

### **Commercial Arrangements for RoCoF Alternative/Complementary Solutions**

Several responses raised queries about commercial arrangements for the RoCoF Alternatives project. The TSOs wish to reiterate that the RoCoF Alternative Solutions Project is essentially a technology assessment from a RoCoF mitigation perspective only. The scope of the project does not include assessment or establishment of the commercial arrangements for the delivery of any potential alternative solutions, nor does it constitute a first step in a procurement process.

## **Conclusion**

In June 2015, EirGrid and SONI published the “RoCoF Alternatives Technology Assessment” report compiled by consultants DNV GL. Fourteen industry responses have been received on the report to date. The TSOs have reviewed all content in the responses and are considering these views as the project progresses. This document summarises some of the general themes submitted by industry and summarises the TSOs views on these themes.

The DNV GL report proposed that both synchronous and non-synchronous devices can provide responses to prevent high RoCoF events on the system. Phase two of the RoCoF Alternatives project aims to investigate this further by performing technical and techno-economic analysis to determine the volumes of synchronous and/or non-synchronous inertia required to resolve the RoCoF issue. The TSOs would also welcome further engagement with industry representatives to establish the capabilities of specific devices in resolving the RoCoF issue.