DS3 Rate of Change of Frequency Modification Recommendation to the CER

Dated: 20/12/2012

Introduction

The TSOs – EirGrid and SONI – are jointly recommending that the proposed RoCoF modification be approved simultaneously in Ireland and Northern Ireland by the respective regulators CER and NIAUR. While the modification itself is quite straightforward, the RoCoF issue is possibly the most contentious and complex to have come before the Regulatory Authorities in these jurisdictions. The ramifications of approving or not approving the modification are considerable, and will have an immediate impact on the viability of current and future wind projects in Ireland and Northern Ireland, and on the feasibility of the renewable energy targets. Moreover, a decision to approve will have an equally strong impact on the running regimes and operational costs of conventional plant.

This document is the formal recommendation from EirGrid TSO to the CER to change the Ireland Grid Code.

Background

Detailed technical studies have indicated that, during times of high wind generation following the loss of the single largest credible contingency, (RoCoF) values of greater than 0.5Hz/s but no greater than 1 Hz/s could be experienced on the island power system. In addition, studies have shown that instantaneous RoCoF values in excess of 2 Hz/s could be experienced in Northern Ireland if system separation were to occur on the island[1]. In addition there are issues associated with voltage dip induced power imbalances in a system with significant volumes of windfarms but these will be addressed elsewhere.

Current Standard

The current RoCoF capability required of all units in Ireland is 0.5 Hz/s and is set out in the Irish Grid Code clause CC7.3.1.1 (d). There is a RoCoF requirement in the minimum function specification of up to 1.5 Hz/s on all transmission connected plant in Northern Ireland from 2001, though this value has not been rigorously tested. With increasing penetrations of wind generation, it is essential to ensure that the power system can operate securely following the loss of the largest infeed or outfeed. In the future, when the Ireland and Northern Ireland systems are more strongly interconnected, all units must be capable of riding through RoCoF values up to and including 1Hz/s and if this is not possible to achieve there will need to be a mechanism introduced to ensure that there is sufficient synchronous inertia to prevent system RoCoF values occurring that are in excess of the Grid Code standard at the time.

Process

The TSOs have worked closely with industry over the past 12 months to resolve the RoCoF challenge. During that time a working group was set up under the Joint Grid Code Review Panel. The purpose of this working group was to provide a forum to discuss the RoCoF

[1] http://www.eirgrid.com/media/Northern%20Ireland%20System%20Seperation%20Studies%202012.pdf

issues and derive recommendations. This group met six times over a period from February to August 2012.[2] Following this, a Joint Grid Code Working Group Position paper[3] was published along with a TSOs' opinion paper[4] in September 2012. Agreement was not reached in this working group on the RoCoF modification proposal.

The TSO RoCoF recommendation and modification was discussed at the October Joint Grid Code Review Panel meeting and at the respective Ireland and Northern Ireland meetings. Following this, the Northern Ireland modification was published for consultation on the 17th of October until the 15th November[5]. On the 4th December, the RoCoF modification was formally proposed for approval at the Ireland Grid Code Review Panel meeting. It was noted that with regard to the process, no one at the Grid Code Review Panel had any issues with, or objections to, the processes that the TSOs have used to reach this point.

Actual vote at Ireland Grid Code Review Panel December 4th:

In Favour:

TSO Representatives: 3
Distribution System Operator: 1
Transmission System Owner Licensee: 1
Grid Connected Renewable Generators: 2
SEMO: 1
Demand Side Units: 1

Against:

ESB Power Generation: 1
Independent Grid Connected Generators (Non-Renewable): 1
Independent Grid Connected CCGT: 1
Independent Grid Connected Generators (Non-CCGT & Non-Renewable): 1

Abstentions:

Demand Customers: 1
Independent Electricity Supplier: 1

Absentees:

TSO (1); Interconnector Representative; ESB PES

[2] http://www.eirgrid.com/operations/ds3/communications/jointgridcodeworkinggroup/

[3] http://www.eirgrid.com/media/JGCWG%20RoCoF%20Position%20Paper.pdf

[4] http://www.eirgrid.com/media/JGCWG%20RoCoF%20Position%20Paper.pdf

[5] http://www.eirgrid.com/media/Northern%20Ireland%20-%20RoCoF%20Grid%20Code%20Modification%20Consultation%20Paper.pdf

Current Status and Submission

In Northern Ireland, SONI received several responses to the RoCoF consultation. A report summarising these responses and the SONI TSO recommendation will be submitted to NIAUR. In addition to the issues raised by generators in Ireland, the Northern Ireland generators do not think that the higher RoCoF value of 2Hz/s, required to allow high wind penetrations while maintaining a secure system in the event of a system separation event, is justified. Therefore, at this stage SONI shall seek a standard of 1Hz/s this being consistent with the EirGrid position and the future all-island position, however, SONI will review this standard in light of further analysis that the TSOs intend to undertake coupled, hopefully, with the studies that are to be completed by the generators.

The DSOs are in the process of publishing separate reports into the related loss-of-mains RoCoF issue. While the TSOs have not yet seen those reports, it is anticipated that the loss-of mains issue will be surmountable.

Since there was no unanimous agreement from the Ireland Grid Code Review Panel about the proposed modification, EirGrid TSO, under the Grid Code Constitution 18.5(c)(ii) and Grid Code GC7.2 are recommending the modification MPID229 to the CER, but are noting the material considerations of the Grid Code Review Panel. The material considerations are set out below. An implementation plan has also been developed that includes risks and issues, and is at the end of this document. The supplementary documents have been sent with this document and comprise the following:

1.	DS3 RoCoF Recommendation Letter to Regulators	(This document)
2.	TSO RoCoF Recommendations	TSO Summary of Overall Process, JGCWG outcomes and TSO Recommendations
3.	Joint Grid Code Working Group Position Paper	Position of the participants of the JGCWG
4.	Complete minutes of the JGCWG meetings	
5.	Historic Frequency Events	
6.	Northern Ireland System Separation Studies	
7.	Summary of Studies on Rate of Change of Frequency events on the All-Island System	EWIC Trip Studies
8.	Achieving the highest levels of wind penetration	Recent IEEE Paper by TSOs
9.	Comments from ESB PG on TSO Recommendations	
10.	MPID 229 – RoCoF GC Modification Proposal	EirGrid Proposal on RoCoF
11.	Response from SSER on RoCoF proposal	
12.	Email / Response from Bord Gais on RoCoF proposal	

Considerations to the Modification

A number of considerations to the proposed modification have been set forth by generators, through verbal comments at the GCRP, as well as through formal submissions to the TSO and at the JGCWG. Those objections are summarized below. The first seven objections have been addressed in the TSOs' Recommendations Paper on RoCoF and were previously discussed at length at the JGCWG:

Previously Documented Considerations address in the TSO Recommendation Paper

1. Generators do not know if their machines are capable of achieving the higher standard, and so the modification should not be brought forward until they are comfortable of meeting the standard, otherwise there may be many derogation applications.

2. The effects of operating at higher RoCoF could cause either catastrophic failure of the plant, or increase stresses on the plant, leading to a reduction in machine life. This would have serious consequences for machine insurance, outage planning and maintenance costs, and overall cost-effectiveness and profitability of each machine.

3. The cost of getting OEMs to study the RoCoF issue is very significant, with latest estimates of up to US$1.5m per CCGT, and studies taking up to one year. The generators are concerned that no cost recovery mechanism has been proposed, and they may be significantly out of pocket at the end of the process.

4. Even if the studies are completed, there is no guarantee that the machines will be able to meet the new standards and therefore it is unwise to either recommend or approve the modification until the outcomes of the studies are known.

5. The TSOs should seek alternative approaches to the problem, such as always maintaining enough plant to keep RoCoF within the current limit, and by incentivising generators to lower their minimum generation levels through 'parking services'.

6. The Regulator Authorities (CER/NIAUR) should jointly project manage the required RoCoF studies by the OEMs, and following that process they could decide on whether to proceed with approving the new standard.

7. The power system in Ireland and Northern Ireland is being driven by Government policies into areas of operation that no other power system has ever been operated in. OEMs have no experience of these areas, and so will find it difficult to provide the necessary expertise to engage with the studies.

New Considerations Raised in the Grid Code Review Panel of the 4th December

8. Concerns that none of the studies so far have looked at long term costs to plant, or costs of operating the system, or the impact on the end consumer, and what they pay for electricity. This means that supplier and demand side representatives are unclear on the full cost ramifications to their constituents.

TSO Response: The full costs of modifications to the generators are unknown at this stage and ultimately are a matter for the CER to decide. The only estimated costs are those by OEMs to complete a set of studies. These costs need to be considered with respect to the annual operating costs and initial capital investment for these plants. In addition, the TSOs have completed significant financial and technical analysis as part of the DS3 System Services review process that show there is a potential additional production cost benefit of €295 million per year if there is the appropriate level of system services to manage the power system with increased levels of wind. These benefits cannot be accessed unless there is a successful resolution of the RoCoF issue.

Next Steps

The TSOs have engaged the consultants DNV KEMA to carry out an independent analysis of the RoCoF capabilities of plant, and to get an international perspective on RoCoF requirements, particularly in other island systems. The TSOs will circulate the final report to the regulators when they receive it. In addition to this, the TSOs have developed a high level plan, outlining risks and issues, for moving the issue along in the next year. This is at the end of this document.

In Summary:

- The TSOs are proposing the Rate of Change of Frequency standards to be unambiguously clarified and augmented in the Ireland and Northern Ireland Grid Codes to provide the resilience that the power system requires to meet the renewable energy policy objectives in both jurisdictions.
- No information has been presented at this stage that indicates there will be a definitive issue for generators although the TSOs acknowledge that generators have expressed significant concerns about the potential catastrophic and long term implications for their plant.
- In order to address this a range of studies on the impacted conventional plant are required which will take potentially 12 months and are estimated to cost up to $1.5 million to complete for each plant. Generators do not support the modification until these studies are complete. They are seeking clarification of the cost recovery process for these studies before starting them
- Representatives of the renewable energy industry have indicated that their plants have no issues managing the higher RoCoF values and strongly support the amendment, as it has significant long term implications for their constituents.
- The DSOs in Ireland and Northern Ireland have indicated that appropriately altering the protection settings on their system is likely to be possible and support the modification subject to the formal completion of their studies
- EirGrid TSO is submitting the modification for approval by the CER but acknowledge that following approval, a detailed implementation plan will need to be developed with all the relevant stakeholders to ensure that the capabilities and protection settings have been addressed. The TSO will not operate the system at levels of wind penetration that might cause a material risk to the plant until this implementation is satisfactorily completed.

Implementation Plan:

The diagram outlines the TSOs' current expectation of how the RoCoF issue will be progressed. Please note the following:

Dependencies:

There are 2 critical dependencies to the plan:

- The DSOs complete their RoCoF studies in a timely manner and provide formal notification of this to the TSOs
- The Generators complete their RoCoF studies in a timely manner and provide formal notification to the TSOs

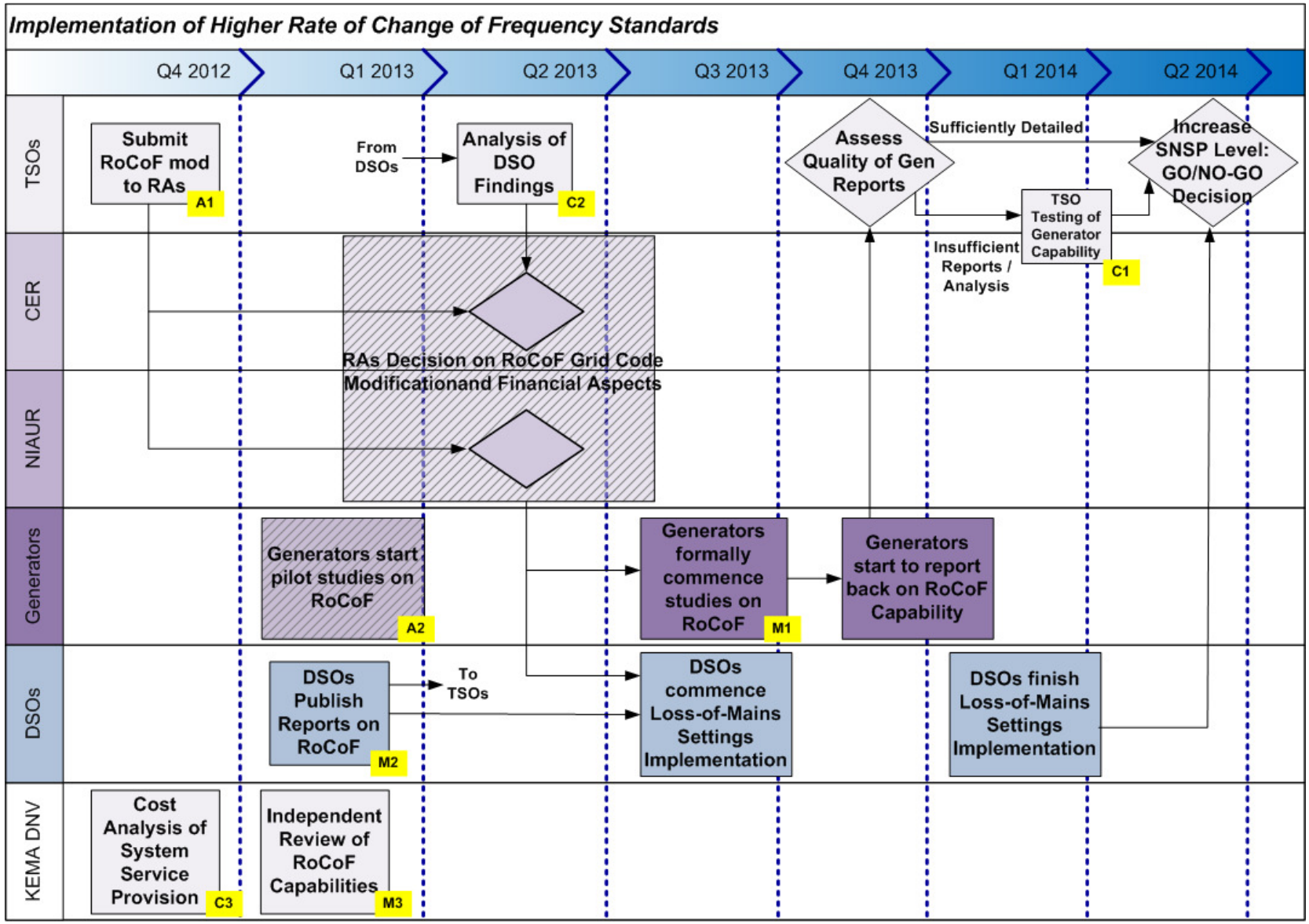
Risks

There are 3 significant risks to the achieving the stated outcomes in the stated timeline.

	Risks	**Mitigation (M)**	**Contingency (C)**
1	The Generators following their studies cannot robustly confirm they will be compliant with the standard	(M1) Get the studies completed as soon as possible with independent oversight	(C1) Following the reports proceed to complete a degree of testing on generators who cannot robustly confirm compliance
2	The DSOs cannot materially meet the requirements without compromising their loss of mains protection quality	(M2) Get the studies completed as soon as possible	(C2) Following the reports engage with the DSO to understand why there are issues and work with them to manage
3	That there is a material reason why the generators cannot comply.	(M3) Provide best in class information and independent assessment of ability	(C3) Explore avenues for innovation in System Services review.

Issues

	Issue	**Action (A)**
1	Generators are unwilling to begin any examination of the RoCoF capability of their units until there is clarity on the financial recovery mechanism to recover the cost of these studies.	TSOs to formally submit Grid Code changes to the Regulatory Authorities for consideration and decision
2	It is unclear how long the studies will take with estimates from a number of months to two years being proposed.	Generators to start pilot studies, with independent oversight, as soon as possible to explore true timeline


Implementation of Higher Rate of Change of Frequency Standards
Q4 2012
Q1 2013
Q2 2013
Q3 2013
Q4 2013
Q1 2014
Q2 2014
TSOs
CER
NIAUR
Generators
DSOs
KEMA DNV
Submit RoCoF mod to RAs
A1
From DSOs
Analysis of DSO Findings
C2
Assess Quality of Gen Reports
Sufficiently Detailed
Increase SNSP Level: GO/NO-GO Decision
TSO Testing of Generator Capability
C1
Insufficient Reports / Analysis
RAs Decision on RoCoF Grid Code Modificationand Financial Aspects
Generators start pilot studies on RoCoF
A2
Generators formally commence studies on RoCoF
M1
Generators start to report back on RoCoF Capability
DSOs Publish Reports on RoCoF
M2
To TSOs
DSOs commence Loss-of-Mains Settings Implementation
DSOs finish Loss-of-Mains Settings Implementation
Cost Analysis of System Service Provision
C3
Independent Review of RoCoF Capabilities
M3