

Rate of Change of Frequency Modification to the Grid Code

Utility Regulator Proposed Decision



About the Utility Regulator

The Utility Regulator is the independent non-ministerial government department responsible for regulating Northern Ireland's electricity, gas, water and sewerage industries, to promote the short and long-term interests of consumers.

We are not a policy-making department of government, but we make sure that the energy and water utility industries in Northern Ireland are regulated and developed within ministerial policy as set out in our statutory duties.

We are governed by a Board of Directors and are accountable to the Northern Ireland Assembly through financial and annual reporting obligations.

We are based at Queens House in the centre of Belfast. The Chief Executive leads a management team of directors representing each of the key functional areas in the organisation: Corporate Affairs; Electricity; Gas; Retail and Social; and Water. The staff team includes economists, engineers, accountants, utility specialists, legal advisors and administration professionals.

Our Mission

Value and sustainability in energy and water.

Our Vision

We will make a difference for consumers by listening, innovating and leading.

Our Values

Be a best practice regulator: transparent, consistent, proportional, accountable, and targeted.

Be a united team.

Be collaborative and co-operative.

Be professional.

Listen and explain.

Make a difference.

Act with integrity.

Abstract

The Northern Ireland transmission system operator (SONI) has proposed a modification to the Northern Ireland grid code that will introduce a minimum Rate of Change of Frequency (RoCoF) requirement. This will have the effect of helping to facilitate a greater penetration of renewable generation on the Northern Ireland grid.

This paper presents the Utility Regulator's proposed decision on the matter and invites comment from interested parties.

Audience

Regulators, transmission system operators, distribution system operators, generators, large energy users, manufacturing groups, consumers and interested parties

Consumer impact

Accepting this proposal will help SONI facilitate higher levels of renewable generation on the Northern Ireland power system. This will help facilitate achieving the 40% renewable target set out in the Strategic Energy Framework for Northern Ireland.

As part of the consultation, we are asking all stakeholders if they foresee any issues with the new standard that is being proposed.

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Introduction

1.1. Purpose of the paper

The following paper outlines the Utility Regulator's proposed decision with regard to the Rate of Change of Frequency (RoCoF) grid code modification submitted by the System Operator for Northern Ireland (SONI).

Whilst outlining the Utility Regulator's proposed decision on the matter, the purpose of this paper is also to ask interested parties if they envisage having any issues as a result of this modification. Responses should be sent to the postal address or email address indicated below no later than 5pm on Friday 27 September 2013. Our preference would be for responses to be submitted by email, although hard copy responses are also welcome.

Unless marked confidential, all responses will be published by placing them in the Utility Regulators' library and on our website. Respondents may request that their response is kept confidential. The Utility Regulator shall respect this request, subject to any obligations to disclose information, for example, under the Freedom of Information Act 2005. Respondents are asked to put any confidential material in the appendices to their responses.

1.2. How to respond

Any questions on this document and responses should be directed to:

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This paper is available in alternative formats such as audio, Braille etc. If an alternative format is required, please contact the office and we will be happy to assist.

Process Followed to Date

A RoCoF grid code Modification report was sent to the Utility Regulator by SONI on the 21 December 2012¹. SONI's report recommended that the Utility Regulator accepts a RoCoF requirement of 1 Hz/s in the Northern Ireland grid code (the "RoCoF modification"). A similar proposal is being consulted on by the Commission for Energy Regulation (CER), the regulator for the Republic of Ireland².

This report follows an extensive period of industry engagement through the working group of the Joint Grid Code Review Panel. Material relating to the group can be found in the SONI and Eirgrid (The TSOs) web pages³.

The Utility Regulator has reviewed the report along with all the original consultation paper and consultation responses. After receiving this report, the Utility Regulator offered to meet stakeholders on an individual basis to discuss the issues involved with the modification. This offer was taken up by a number of stakeholders. In addition to this, the Utility Regulator has analysed technical advice that was obtained by the CER in relation to this modification.

¹<http://www.soni.ltd.uk/media/documents/Operations/GridCode/RoCoFModificationsConsultationReporttoNIAUR.pdf>

²<http://www.cer.ie/en/electricity-transmission-network-current-consultations.aspx?article=4318d070-3e7c-4e2d-8c91-51b61f9f4902>

³<http://www.soni.ltd.uk/Operations/sg/DS3/>
<http://www.eirgrid.com/operations/ds3/communications/ds3gridcodemodifications/>

Background

Northern Ireland energy policy, as set out in the Strategic Energy Framework 2010, includes a target to achieve 40% renewable electricity in the supplied energy mix by 2020. This target is aimed at improving environmental sustainability and providing energy supply security and will help ensure Northern Ireland meets EU legislation and targets.

In order to help facilitate meeting this target the TSOs have progressed a project aimed at Delivering a Secure, Sustainable Electricity System (DS3). The objectives of the DS3 programme are to consider the operational implications for the power system of managing high levels of renewable generation. One of the key limiting factors is the risk of a high RoCoF on the power system.

A working group has been set up to progress some of the grid code changes that will be required under DS3, including RoCoF. This group comprises of industry representatives from across the island of Ireland, the TSOs, CER as the regulator for the Republic of Ireland and the Utility Regulator as the regulator for Northern Ireland.

1.3. DS3 and RoCoF

SONI have proposed the RoCoF modification which will help facilitate the 2020 renewables targets. Specifically the higher RoCoF standard should allow the TSOs to operate the All-island system at a higher Simultaneous Non Synchronous Penetration (SNSP) than the present operational limit of 50% Non-synchronous generation units include wind turbines, DC interconnectors and Photovoltaic. Due to system interdependencies, the RoCoF change alongside other DS3 initiatives will be required to reach a SNSP of 75%; the target at the completion of the DS3 programme. Without a higher RoCoF standard, it is likely that wind curtailment levels will increase considerably which could affect our ability to meet the 40% renewable target by 2020.

Both SONI and Eirgrid (the TSO in the Republic of Ireland) have both opined that there is no theoretical reason that generators cannot meet the higher standard and this view is outlined in the grid code modification report to the Utility Regulator. In addition the TSOs have commissioned DMV KEMA to carry out a desktop study on generator capability⁴. This study has been published and discussed at various industry forums including at the

⁴ <http://www.eirgrid.com/media/DNVKEMARoCoFReport.pdf>

working group. This report shows that generally generators should be able to withstand a 1Hz/s RoCoF. Conventional generator owners broadly agree with the DMV KEMA study but maintain the report's results supports their position, in that they do not know what the impact of a 1Hz/s RoCoF event will be, and must undertake extensive studies of each unit to assess the impact.

Conventional generator owners have argued that studies will be required to assess the ability of each plant to comply with the modification. They have also argued that it will be only upon completion of these studies that they will know the potential costs of compliance.

Indicative timelines of between 12 and 18 months to complete have been proposed by conventional generator owners to complete the necessary studies. Conventional generator owners argue that this is an excessive cost for them to incur particularly as the benefits of the RoCoF change will accrue to wind plant only. The vast majority of wind generators owners have indicated that there should be no difficulty with the technical standard. They have highlighted that delays in the implementation of this new RoCoF standard may impact on future development and investment in wind generation.

In addition to studies relating to conventional generator units, there are also issues associated with the distribution system which must be addressed during the implementation phase of any change to RoCoF requirements.

1.4. System Operation

As set out above changes to grid code RoCoF requirements are required in order to increase the SNSP to the eventual 75%. Without an increase in the RoCoF figure it is unclear what the final SNSP could be. Significantly credible or detailed alternatives to increasing SNSP through ROCOF changes have not been put forward to date by either the TSOs or members of the working group. However, it is apparent that there are mechanisms which could increase system inertia without impacting on curtailment levels that could play a role in increasing SNSP (e.g. lower minimum generation levels of generators). Nevertheless, it is not clear that such mechanisms are either more straightforward, less costly or would have as great an impact as a change to RoCoF.

For the new RoCoF standard to have any impact, the TSOs have stated that all (or almost all) generators must be able to comply with the new standard. If the system experiences a RoCoF of 1Hz/s and one generator tripped, the level of system RoCoF would increase resulting in another generator (who withstood the original RoCoF event) tripping, increasing the RoCoF yet further, and so on. This cascade effect would threaten system security.

Therefore it would be essential that all generators are compliant with the standard if the system is to operate at a higher SNSP (above the current 50% operational limit). At such an SNSP, any generators that were not compliant would not be committed to run on the system during high wind events to mitigate the risk of such a system failure and/or wind would have to be curtailed. The TSOs shall ensure that compliance with a higher RoCoF standard is achieved.

1.5. Conventional Generators

Excluding the ability to remain synchronized, there are two main concerns for conventional generators. These are that a high RoCoF event could cause a catastrophic failure of a generating unit – which is primarily a safety concern for station staff – and that repeated high RoCoF events may negatively impact the commercial life of the plant.

The risk of catastrophic failure has been identified by consultants employed by the CER to assist them in their assessment of a similar request to amend the RoCoF in the Republic of Ireland to 1 Hz/s. The expert consultants considered the risk to be “highly unlikely” on the basis that generating units can be expected to undergo more severe network fault events without such catastrophic failure.

The impact on the commercial life of the plant is highly dependent on the number of high RoCoF events. If the events are infrequent then it can be expected there will be minimal impact on the life of the unit. There is no way of estimating the frequency of such events with a high degree of accuracy. However we cannot rule out increased wear and tear on conventional plant in the coming years as levels of wind on the system increase, even in the absence of RoCoF events. This is likely to increase as a result of increased cycling of plant to accommodate wind.

1.6. Wind Generators

Wind farms, with some exceptions, do not have any issue with the proposed standard and the manufacturers have confirmed they could comply with the proposed RoCoF standard.

The main issue for wind is that the longer the delay in resolving this issue the higher wind’s curtailment levels are likely to be. Therefore there is considerable concern in the industry that a delay to the implementation of the proposed RoCoF standard may have a significant impact on the commercial viability of wind projects.

1.7. Distribution System

Northern Ireland Electricity (NIE/DSO) currently uses safety measures (including RoCoF and “vector shift protection”) to detect when embedded generators are attempting to supply an isolated portion of the distribution system. The distribution system is the final stage in the delivery of electricity to end users. A distribution system's network carries electricity from the transmission system and delivers it to consumers and users. A RoCoF of 1Hz/s is not compatible with current practice. If no changes were made on the distribution system a high RoCoF event could result in large parts of the distribution system tripping unnecessarily creating a cascade effect across the entire transmission network. The DSO supported the TSO's modification and based on their analysis consider that the current protection settings can be modified to allow for the 1Hz/s. There is a considerable amount of further work to be undertaken in terms of implementation and engagement between TSO and DSO to work out remaining technical details. While the amount of outstanding work should not be underestimated there does not appear to be any issues which would prevent the implementation of the TSOs' proposed RoCoF standard.

Utility Regulator Proposed Decision

Over the past six months the Utility Regulator has reviewed the SONI recommendations, submissions from industry, independent studies carried out by DNV KEMA and the independent report from PPA, consultants procured by the CER.

The Utility Regulator is of the opinion that all the evidence provided indicates that an increased RoCoF standard is required in order to facilitate the 40% renewables target contained within the Strategic Energy Framework. The Utility Regulator is minded to accept the SONI proposal to introduce a 1 Hz/s RoCoF standard into the Northern Ireland grid code.

The Utility Regulator's proposed decision is that this standard would not be applied for 18 months from the date of a final decision being published. This will allow conventional generators owners sufficient time to address issues relating to generator compliance and carry out the necessary studies to assess the impact of a 1Hz/s standard on conventional generator units. In addition to this, the Utility Regulator would also suggest that any studies that are carried out should assess the impact of a RoCoF of up to 2Hz/s. This is the value that SONI had originally consulted upon, as this would potentially be required in the event of system separation between the Northern Ireland and Republic of Ireland networks.

This 18 month period should give generators sufficient time to conduct any relevant studies.

The Utility Regulator is also minded to implement similar proposals to those being considered by CER for non-compliance with the RoCoF standard. In section 3.6 of the RoCoF CER consultation paper⁵ a Generator Performance Incentive (GPI) for non-compliance has been proposed. This would only apply after the proposed 18 month time period given to generators to carry out studies and modification of the plant to ensure compliance.

Before accepting this standard, the Utility Regulator wishes to hear from stakeholders that may be affected by this change to ascertain if they foresee there being any issues with complying with this standard.

⁵ <http://www.cer.ie/en/consultations.aspx?type=electricity&article=4318d070-3e7c-4e2d-8c91-51b61f9f4902>