



**RATE OF CHANGE OF FREQUENCY (ROCOF)
MODIFICATION TO THE GRID CODE**

**SSE RESPONSE TO UTILITY REGULATOR PROPOSED
DECISION**

SEPTEMBER 2013

INTRODUCTION

Issue in Question

In opening our response to the Utility Regulator's Consultation on RoCoF Modification to the Grid Code, we would like to draw attention back to what the underlying issue is: moving SNSP from 50% to 60% in order to facilitate the achievement of RES-E targets in both Ireland and Northern Ireland. The proposed RoCoF standard of 1Hz/sec for generator units is simply an identified means to this end. However, this proposal is only one means of addressing the fundamental challenge – providing for the TSO to operate the system with increased non-synchronous generation. Other solutions and approaches to meeting this challenge exist; those solutions and approaches also need to be comprehensively evaluated.

Doing so will ensure any final decision taken on this issue is properly informed and based on solid evidence. At present this is not the case; the lack of a comprehensive review places the proposed decision to accept SONI's proposal to introduce a 1 Hz/s RoCoF standard into the Northern Ireland grid code on weak and unsubstantiated foundations.

The Utility Regulator's proposed decision paper appears to give the issue at hand cursory examination. There is no detailed examination of:

- whether the proposed grid code modification will be cost effective;
- whether all generation units should be required to undergo expensive and complex testing for compliance;
- how costs will be allocated; and
- whether an 18 month period will be sufficient time for the detailed technical testing, evaluation and potentially modification required

The proposed decision paper appears to be wholly inadequate in addressing an issue that could have significant cost implications for both customers and generators.

Review of CER consultant's advice

The paper notes that:

"The Utility Regulator has analysed technical advice that was obtained by the CER in relation to this modification."

We assume that this statement refers to the advice provided by independent consultants PPA Energy. We have also looked at the

technical advice provided, and summarise some of the recommendations below:

- I. Requiring conventional generators to obtain detailed quotations and timescales for studies required to demonstrate ability to comply with the proposed 1 Hz/s over 500ms;
- II. Requiring the TSO to explore the level of RoCoF that arises over a 100ms period in a range of scenarios that show an average RoCoF of 1 Hz/s over 500ms, to enable further consideration of the short term impact of potentially higher rates of RoCoF;
- III. Requiring the TSO to provide further information about the alternatives to changing the RoCoF standard that exist, describing the potential impact of these on system operation and the electricity market, and detailing the likely limitations of any alternatives on the level of SNSP that can be achieved in 2020; and
- IV. Requiring the TSO to explain the process by which derogations from the new RoCoF standard would be applied.

The consultants unequivocally advise CER (and therefore NIAUR) **not** to approve changes to the Grid Code until these recommended processes are completed and the results are evaluated. The consultants state that:

“There is relatively limited information available from actual system events from which to draw firm conclusions.

The report recognises that a simplified mathematical model of synchronous machine performance is used in the analysis. There is a limit therefore to the range of mechanical and electrical phenomena which are addressed in the study, and the study cannot be considered comparable with the detailed analysis that is proposed by turbine manufacturers to consider the full range of mechanical and control system issues that arise in exposing generators to high rates of change of frequency.

For the generators, it appears to be mainly the effects of high ROCOF events on flame management, torsional effects on the turbine/generator shaft and the generator control systems that are of primary importance. These effects are not readily studied through the type of analysis undertaken in the KEMA study.”

Based on the conclusion reached in the proposed decision paper, we assume that the Utility Regulator has analysed and rejected the

recommendations included within the technical advice paper, and disagrees with the analysis above.

However, we do not see any robustly presented counter-arguments within the paper, or any attempt to address or even summarise the points raised in the technical advice that the Utility Regulator has analysed.

Risk-Reward Distribution is Distorted

The proposed decision of introducing a RoCoF standard of 1Hz/sec into the Grid Code, with the associated features of non-cost recovery and imposition of GPs for non-compliance creates a situation where one class of system users (conventional generators) are impelled to provide a system solution for which they enjoy no benefits, entirely at their own expense. In contrast, some other system users are provided with double benefits, first by avoiding any explicit payments and second by receiving lower SMP in the case of consumers and lower curtailment in the case of wind generating units. This represents undue discrimination between licence holders.

While there are concerns surrounding how the capability to achieve the proposed RoCoF standard of 1Hz/s by conventional generators can be demonstrated, nonetheless it provides a perverse incentive to require conventional generators to engage in that process under the threat of penalties and with all associated costs absorbed by them.

For a very significant retrospective requirement, this is the wrong signal to send to investors, particularly considering that Northern Ireland is facing a potential Security of Electricity Supply risk from 2016 onwards¹. Sizeable benefits are anticipated from the success of the DS3 process; for incentives to be properly aligned and in order to guide prudent, sustainable behaviour, it is essential that these improvements are funded centrally, potentially through the SEM Imperfections mechanism or TUoS charges.

SSE recommends

We would urge NIAUR to properly consider their decision to approve the RoCoF Modification to the Grid Code at this time. There needs to be a broader recognition of the problem to be addressed, which is ultimately enabling the SNSP limit to increase from 50% to 60%.

This will require identification of the various means that exist to solve the problem, as well as detailed comparative analysis of those means, before moving to the step of deciding on a solution. This would be in

¹ As detailed in SONI's Generation Capacity Statement for 2013-2022, and the joint DETI/NIAUR paper on Security of Electricity Supply.

line with the recommendations included in the technical advice commissioned.

However, time is of the essence in this process. The implications of not raising SNSP as per the current DS3 schedule are significant. Raising SNSP is a complex issue and although there are potentially numerous routes to be taken to achieving our goal, that goal must be achieved in a timely and efficient manner. It is imperative that we maintain momentum in this process and define key deliverables.

SSE makes the following 3 key recommendations, which are developed further in the main body of this response:

1 Time limited suspension of the Grid Code Modification approval, expand process to conduct studies

Suspend the current proposal to approve an increased RoCoF standard outright, together with the associated GPIs, but progress a comprehensive but time-limited programme of investigations and studies to determine a relevant subgroup of generator capabilities that would need to achieve the 1Hz/s RoCoF standard;

2 Redefine the issue, identify alternative methods

Redefine the issue in question from one of requiring a RoCoF standard on conventional generators to one of identifying methods of managing RoCoF as a means of enabling higher SNSP. This will necessarily include the proposed RoCoF standard, but in addition will include other technically feasible means of addressing the issue as well;

3 Conduct Cost-Benefit Analysis, proceed to decision

Conduct thorough commercial, economic and technical analysis of all identified options as a means for determining which method, or combination of methods, best meets the primary objective of enabling increased SNSP. This must be done in parallel with the generator RoCoF studies and must be time-limited.

In addition to the recommendations above we also suggest the following:

- **Provide worst-case RoCoF trace**

Require that the TSO provide a worst-case RoCoF trace that generators can use to determine the limits of their capabilities;

- **Address consultant's points**

As pointed out earlier in this document, it is essential that the Utility Regulator addresses, or at least acknowledges the points raised in the technical advice, specifically in relation to the processes recommended;

- **Establish Working-Group**

Given the significance of this issue, as well as the time constraints if 2020 targets are not to be impacted, it is essential to convene an all-island industry working group to provide some impetus to investigating options for addressing the higher SNSP challenge. We propose that a group should convene from 1/10/2013 and meet every 2 months thereafter. It should include representation from generators, the TSO and the RAs.

KEY POINTS OF RESPONSE

About SSE

SSE operates a number of renewable generation units in Northern Ireland. While we do not own any conventional generation units located in Northern Ireland, we do own and operate conventional plant in Ireland and Great Britain and we are currently constructing a 460MW CCGT at Great Island, Co. Wexford. With our ownership and operation of a broad mix of generation technologies SSE is well placed to provide a balanced view on the issue under consultation.

We have committed to reducing the carbon intensity of our overall generation fleet by 50% by 2020. We have made significant investments in renewable energy across the island and we are actively progressing a significant pipeline of future renewable projects.

SSE's position on the proposed RoCoF Modification

With this level of existing and future investment in renewable energy in Ireland, it is firmly in SSE's interest that the Northern Irish electricity system can be operated at higher SNSP levels to accommodate more wind-generated electricity and to reduce the overall level of curtailment that wind generators are subject to. SSE supports the objective of successively raising the SNSP levels on the system in a timely manner, variously through the new system services proposed in the DS3 programme and through a means of managing RoCoF.

Recommendations

- 1 **Time limited suspension of the Grid Code Modification approval, expand process to conduct studies**

The proposal to simply introduce the increased RoCoF standard is a narrow approach that doesn't consider alternative means of addressing the issue. This, in our view, leads us to the conclusion that the proposed decision to approve the modification is premature. This view is supported by the technical advice provided by PPA Energy, the consultants engaged by the CER to review the TSO's proposal.

Rather than simply approving an increased RoCoF standard, SSE recommends that a comprehensive but time-limited programme of investigations and studies to determine the capabilities of a relevant subgroup of generators to achieve 1Hz/s RoCoF standard.

Derogation for Certain Plant

In line with the recommendation on derogations from the technical consultant, clear criteria need to be established to determine a sub-set of generators required to carry out the studies. In our view, it would make little sense to require all plant on the system to meet the RoCoF standard.

2 Redefine Issue, identify alternative methods

As TSO for Northern Ireland, one of SONI's primary contributions toward meeting the Department for Enterprise, Trade and Investment's 40% RES-E target is by ensuring the safe and secure operation of the system at higher SNSP levels. SSE is strongly supportive of that role. However, SSE objects to SONI identifying, studying, promoting and intending to impose (with regulatory consent) only one method of managing RoCoF, one of the factors impinging on the TSO's ability to run the system at higher SNSP levels.

It is of particular concern that the Utility Regulator proposes to accept this, despite an independent technical recommendation that *"... the TSOs provide further information about the alternatives to changing the RoCoF standard that exist."* The consultants specifically mention the *"maintaining of additional conventional generation on the system at lower levels of generation in order to maximise system inertia."*

The Utility Regulator proposes to approve an increased RoCoF standard even though other methods of achieving the objective of running the system at higher SNSP exist. Some of these alternative methods which could be adopted, singly or in combination include:

- I. **Network-based methods** such as installing synchronous condensers to increase system wide inertia, hence reducing the level of RoCoF post fault;
- II. **Operational methods** such as improving control centre tools to identify the risk of potential high RoCoF event situations and taking precautionary measures such as temporarily lowering SNSP level in real-time, or bring on a subset of generators to provide more inertia;
- III. **Market-design methods** such as providing for co-optimised energy and reserves/services market design for the SEM Integration Project;
- IV. **Generator-incentive methods** for certain capabilities such as lower minimum generation running and low load operation modes (i.e. where a plant can go below its MINGEN level for a restricted period);
- V. **Generator-subset methods** such as designated (perhaps by tender) certain generators to run during forecast infrequent high RoCoF events;
- VI. **Interconnector-flow methods** like restricting flows during potential high risk periods, thereby reducing the largest infeed and the risk of high RoCoF events.

We would ask that the Utility Regulator request that the TSO identifies all technically feasible methods, or combination of methods, whether listed above or not, and to proceed to study them as viable means of managing the system with higher SNSP.

3 Conduct Cost-Benefit Analysis, proceed to decision

The purpose of outlining alternatives in the previous section is not to explicitly recommend any of them; it is to demonstrate some of the alternatives that exist. With the identification of all technically feasible options, the logical next step would be to carry out a comprehensive cost-benefit analysis on those that could achieve the overarching objective.

Until such an assessment is carried out and comprehensive comparisons, including commercial comparisons made between them, the proposal to approve a change to the RoCoF standard in the Grid Code would be premature.

It is likely the case that rather than the singular approach outlined in the proposed decision paper, a combination of measures similar to those outlined above could be employed to achieve the same objective.

KEY POINTS OF RESPONSE

Testing and Certification

There is general agreement that the capability of a generator to withstand a high RoCoF event cannot be fully tested in the real-world environment. What is suggested is that generators essentially self-certify within the 18 month period proposed.

We would consider that self-certification of generator sets is ill-advised for the following reasons:

- I. The lack of a unifying engineering standard or standard test will lead to generators reviewing high RoCoF event performance to different criteria.
- II. Reliance on desktop studies without real-world live engineering tests limits the value of self-certification and the reliance that can be placed upon it.

Generators would effectively only be in a position where they could certify the actual studies and tests carried out, rather than being able to certify that they would be able to ride-through a future high RoCoF event.

SSE believes that a precise range of tests or sets of studies will need to be specified in detail by a competent party; either the TSO or an independent technical consultant. At the end of this process, generators will then be in a position to certify the completion of these unified tests and studies.

We would also raise a concern that this proposal, if applied retrospectively would require generators to operate outside original design limitations. It is not clear whether current insurance policies would even allow for this testing. This could result in generators being in breach of their respective Connection Agreements.

Cost recovery

If tests and/or studies are to be carried out by generators, with the potential for subsequent retrofits to upgrade capability, then adequate provision for cost recovery ought to be made.

The paper does not address the issue of cost recovery, but we believe that as the benefits of running the system at an increased SNSP level accrue to consumers through lower market prices and non-

synchronous generators via lower levels of curtailment, a full cost recovery option should be implemented, potentially using the SEM Imperfections or through a TUoS option.

Generator Performance Incentive

The paper states that:

“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 paper 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.”

Incentives presuppose that a benefit exists in the first instance. This is not the case here; a penalty is being proposed with no corresponding benefits to the generators concerned.

Usually, a penalty amount will be reflective of the costs imposed on the system as a direct result of the non-provision of services, but the GPI penalties set out by the CER (and therefore the Utility Regulator) appear to have been determined as ‘penal’ rather than calculated as cost-reflective.

We would also note that the definition of System Support Services in the SONI TSO licence effectively describes the RoCoF requirement, since compliance with the standard will be necessary for system support, rather than part of the central function of electricity generation.