



**NIAUR Rate of Change of Frequency (ROCOF)  
Modification to the  
Grid Code  
Utility Regulator Proposed Decision Paper  
RESPONSE on behalf of  
AES Kilroot Power Ltd and AES Ballylumford Ltd**

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## Introduction

This consultation response paper is prepared on behalf of AES Ballylumford Limited and AES Kilroot Power Limited (collectively “AES”) and documents AES’s response to the Utility Regulators proposed Rate of Change of Frequency (RoCoF) Grid code modification consultation. AES welcomes the opportunity to submit comments in response to the above consultation document and would note that AES participated in the Eirgrid/SONI DS3 workgroup providing input into Joint Grid Code Working Group Position Paper on RoCoF issued in September 2012 and attended a bilateral meeting with NIAUR on 17<sup>th</sup> July 2013 to discuss the implications of the grid code modification proposed.

AES, through its involvement in various industry bodies and working groups, is fully aware of the objectives to increase the levels of system non synchronous penetration to allow the Governments’ policy for renewable generation to be achieved and that this is somewhat dependent on conventional generator flexibility. Due to the consequent change in the behaviour of the power system more operational flexibility will be required from all generating technologies and AES understands the requirement for an enhanced or in the case of Northern Ireland (NI) the introduction of a RoCoF standard in the respective grid codes.

AES would note that it already has plant that is extremely flexible and provides significant ancillary service functions at present and is keen to see that flexibility is valued and rewarded appropriately.

## High level messages

AES supports the renewable energy objectives set out by the NI and ROI governments and recognises that the time frame is challenging. AES has been and continues to be fully engaged with the TSOs on the DS3 program of work

AES acknowledges that without increased flexibility from conventional and non-synchronous generators the current SNSP level of 50% cannot be increased and curtailment will increase with a risk of further projects not being progressed.

AES believes that with the completion of OEM Studies and any associated modification to the AES Plant and Apparatus, coupled with the provision of new ancillary services and new energy storage technology it can provide a significant contribution to the achieving the stated objectives.

## **Do Interested Parties envisage having any issues as a result of this modification?**

### **1. RoCoF – A New Requirement**

Although the ROI grid code has historically contained a RoCoF requirement of 0.5 Hz/sec, a move to 1 Hz/sec represents a significant change in the flexibility required from a conventional generator. In Northern Ireland, the grid code has no stated requirement for a RoCoF compliance limit. In discussions with the TSO (SONI) on the RoCoF requirement SONI pointed to the Grid Code Connection Conditions Sections CC 5.2 and CC 5.3.2 which state:

*CC 5.2. Each User shall ensure that it's Plant and Apparatus at Connection Points is capable of operating under any variation in the System Frequency and voltage as set out in CC 5.3 to CC 5.5*

*CC 5.3.2. In exceptional circumstances the system frequency could rise to 52 Hz or fall to 47 Hz but sustained operation outside the range specified in the Electricity Supply Regulations (NI) 1991 is not envisaged. Users should take these factors into account in the design of Plant and Apparatus.*

SONI stated that although not specifically identified in section CC5.3.2, nor mentioned previously by SONI, this clause does include the requirement to comply with any RoCoF value identified by SONI as being required for system operation. AES does not agree with this assertion and would content that the grid code had been silent on RoCoF due to no previous requirement to identify a limit or oversight.

A RoCoF requirement is mentioned in the SONI minimum functional specifications however these were developed in 2008 for OCGTs and 2010 for CCGTs and after the design of the current generators operating in NI. These documents both state

*In view of the possibility of the NI system operating in island mode, all plant must be able to remain synchronised if the frequency changes at a rate that could reach 1.5 Hz/sec.*

As a result AES views the introduction of a RoCoF requirement into the NI Grid Code as a new requirement and not as was implied by the system operator a modification of an existing clause.

As there has always been an emphasis on the requirement for flexibility from generators in NI. AES does not foresee a high risk of catastrophic failure from an incident with a RoCoF of 1 Hz/sec. However, as highlighted by some other generators and as identified in the Consultants (KEMA) study commissioned by the TSO, should the RoCoF event occur when operating in leading power factor mode, AES is

concerned that an increased number of high RoCoF incidents could have a significant cumulative effect on machine and plant life. Having stated that, AES does not have any objection to the inclusion of a the RoCoF limit of 1 Hz/sec averaged over 500 milliseconds in the grid code provided the limit is not implemented until the required OEM plant assessments and any subsequent modifications to the plant has been completed.

## **2. SONI Requirement for Assessment of Compliance with RoCoF of 2Hz/sec.**

During Joint Grid Code Panel - RoCoF Working Group discussions SONI initially required that NI generators demonstrate compliance with a RoCoF value of 2 Hz/sec measured over 500 milliseconds, a value twice that required in the ROI due to the possibility of system separation. When queried about the possibility of a system separation event SONI stated that, since the North/South (Tandragee – Louth) tie line had been permanently re-established (late 1990s) there had never been a system separation event and the risk of one occurring would be considered to be quite low. In effect SONI are asking NI (only) generators to potentially carry out further studies which may result in additional modifications to plant, over and above that which would be required for the rest of Ireland to pay for what is essentially a transmission system risk. AES views this as unacceptable.

## **3. Timing of the Implementation of the Modification to the Grid Code?**

AES welcomes NIAUR's view that the modification would not be implemented until after 18 months from the date of the final decision being published. This agrees with the CER's proposed position that implementation of the modification will occur only following the completion of technical studies and any necessary implementation works that have been identified as being required by the OEMs to ensure that the machines, in so far as is reasonably practicable can sustainably comply with the new RoCoF limit. AES believes that the timescale is optimistic as most generators will have a difficulty engaging the OEMs to ensure the completion of the required studies and works in the proposed time frame. The reason being that this is the first time our OEMs have been asked this question and much of the analysis will need to be carried out for the first time. AES would like to understand further how compliance with the standard would be determined by the TSO in light of the comments in the PPA report as to the feasibility of conducting suitable compliance testing.

## **4. Determination of Compliance/Derogation Process**

AES understands its Grid Code requirement to act as a prudent operator and that the proposal to engage the OEM to carry out studies on the impact of high RoCoF events on the machine life, which is essential to the on-going prudent operation of the plant, has been acknowledged in the conclusions of the CER consultant's (PPA) report. AES agrees that these studies should also include a detailed investigation of

the RoCoF levels expected in the 100ms time period of an event. AES can understand the view that Eirgrid/SONI, in its role as TSO, would be in the best position to determine when sufficient number of conventional and other generators plant is deemed to be compliant with the new required RoCoF limit to enable the SNSP level to be increased.

AES agrees with the point highlighted in the PPA report i.e. that each generator, for insurance and other reasons, will want to engage its own OEM to complete plant specific studies rather than rely on a more generic TSO run study. As such our OEMs will determine how long they will need to complete the study and provide conclusions. AES is concerned with the long term impacts on machine life and will engage its OEMs to provide specific analysis and conclusions. Although the PPA report has suggested that in future years, with higher levels of SNSP, there is no evidence to suggest the number of high RoCoF incidents will be any greater than it is now, it is also fair to say that every event could have a higher RoCoF value than currently experienced. The ability to withstand one historic high RoCoF event, as has been suggested, cannot be taken as evidence of long term compliance capability as this approach will not address the requirement for repeated survival and the impact on longer term operation and maintenance regimes. For this assessment we required the expert opinion of the specific OEM.

AES would agree to cooperate, (within reason) with the TSO to provide information on the progress of the OEM investigation, the conclusions and recommendations determined. As regards the facilitation of RoCoF assurance testing to determine compliance AES would like to understand further how this aspect would be addressed by the TSOs.

AES recognizes that there is a requirement for a sufficient level of plant to be deemed to be compliant before any change to the SNSP level can be progressed. Undoubtedly the TSOs are in the best position to co-ordinate the responses from generators and determine when that level of plant has been attained. It is important that the TSOs understand that the generators time scales will be driven by the availability of the OEM experts to complete the studies and that if there is disagreement between generator and TSO on any aspect of the process, that there is recourse to the appropriate regulator/authority for resolution.

## **5. The proposed introduction of a GPI for ROCOF**

As mentioned earlier in this response the requirement for an increased or new RoCoF limit in the Grid Code(s) is driven by government policy developed after the design and commissioning of most of the conventional generating plant on the system. Given that the generators have not yet engaged the OEMs to conduct the studies required to determine what plant modifications may be required to enable compliance and therefore do not yet know the level of potential costs due to plant

modification and associated outages to implement the modifications, generators (depending on the cost recovery option) could already be exposed to considerable costs for no benefit. In addition, the proposal to introduce a significant financial penalty for non-compliance with the new RoCoF limit as an attempt to ensure compliance, is unhelpful.

Both options for the structure of the GPI in the CER RoCoF Grid Code Modification Consultation paper are extremely punitive given they are based on the requirement to demonstrate compliance with a RoCoF limit on which there is little information on how compliance can be tested. More information is required on how the GPI would be implemented. For example, if it is based on assessment after an event has taken place, i.e. a generator has failed to stay connected following a 1 Hz/sec event, there is already a GPI for a generator trip and short notice redeclaration in place to penalise this. Given it is unclear how generators will be expected to demonstrate compliance in advance of moving the SNSP limit and the size of the level of penalty (€1.8m for a 400mw unit) this arrangement is disproportionate and unfair given the uncertainties which still exist and the existing penalties.

AES objects to the inclusion of the RoCoF GPI and as an alternative would propose that those generators which cannot provide the evidence required to prove compliance are factored into the scheduling and dispatch processes at times of high SNSP and that the flexibility of plant is used and rewarded more transparently in the unit commitment process.

AES would also like to express its concern at the uncertainty created for investors by the retrospectively imposed change of operational limits and compliance standards required by the Regulators and the considerable impact that the costs of compliance and the proposed non-compliance penalties would have on current and future projects.

## **6. Cost Recovery**

Unlike the CER RoCoF Modification to the Grid Code consultation paper the NIAUR paper is silent on the issue of cost recovery. AES understands the requirement for its plant to be grid code compliant and the stated industry practice that it is the responsibility of the generator to achieve or maintain compliance. However as rightly stated in the CER consultation document the introduction of a new (NI) requirement for RoCoF will primarily benefit wind generators only and therefore conventional generators are being asked to incur the costs for completion of studies and potential associated plant modification works (which would likely require outages to complete) to ensure they are grid code compliant, without the associated benefit and to implement government policy.

That coupled with the uncertain method for determining compliance could mean excessive costs for conventional generators with any benefit going to wind generators. The Regulators require generators to undertake this work and if required, modify their plant, in order to achieve the required RoCoF levels. The only consequential benefit for the generator expense is the possibility of an optional ancillary services contract with the TSO. Due to the structure of the proposed new ancillary services it is not clear if the value available will provide a suitable incentive to make any investment feasible. The only other option suggested by CER would appear to be to exit the market. AES views this as discriminatory against conventional generators as these additional costs are incurred as a result of the requirement to connect more renewable generation and should be treated as a cost of connection for the renewable plant. Furthermore, we would contend that plant exit is not an option for Northern Ireland given the identified generation adequacy risk post 2015.

AES would like to understand what options NIAUR are proposing for the recovery of costs incurred by generators in preparing for and implementing the proposed new RoCoF Grid Code modification.

The CER paper proposed cost recovery, AES has reviewed the 3 options identified in the paper and would make the following comments.

- (i) **No cost recovery:** This would have a significant impact on generators. The current budget proposal from our OEM is @ €1m to complete the studies they require. In addition there could be investment costs to comply and/or mitigate the impact of RoCof. AES believes it is unfair and discriminatory to expect the generators to bear the costs of the studies which will result in benefits to customers and also wind generators which are already heavily subsidized. AES does not support this option.
- (ii) **Cost recovery from consumers:** The increase in SNSP afforded by the greater flexibility of conventional generators will allow for higher levels of renewable generation resulting in lower SMP benefiting all consumers and ultimately help achieve government policy. Consequently AES believes that the costs for getting to this position should be borne by all consumers. AES would suggest that information on costs for studies could be provided and managed to ensure that these costs are kept as low as practicable. Although these costs are associated with Grid Code compliance they are also, as stated above, associated with providing the circumstances for increasing the levels of SNSP which will in turn reduce SMP levels to the benefit of all consumers. AES supports this option.
- (iii) **Postalised recovery from all generators:** AES has engaged with and obtained a plan for the completion of studies envisaged by its OEM. This plan has been assessed and budget costs developed for the completion of

the work. AES is not aware if other generators have developed proposals to the same extent with detailed costs structures. If each generator is to carry out independent analysis as was indicated in the PPA report then it is possible that AES could incur higher costs than that required to complete the studies on its own plant under the postalisation option. AES does not support this option.

AES suggested a further option:

- (iv) Individual Generator Reimbursement of Costs: as this is a government policy with challenging targets for SNSP increase and the objective of the renewables policy is to deliver social benefit to all customers by higher use of renewable generation, then the cost for achieving the higher SNSP levels should be reimbursed from the expected saving in production costs by the TSO. A suggested method to control the costs is to provide open book cost reimbursement for each generator up to a pre investigation agreed quoted contribution amount (any surplus to be paid by the generator) to be reimbursed on completion of the studies from the savings in production cost realised by the TSO on implementation of a higher SNSP level.

## **7 Alternative Solutions**

The previous consultation papers on the DS3 RoCoF problem have indicated that even if all the required plant is compliant with the new RoCoF standard, additional flexibility will be required of plant to facilitate an increase in the SNSP level to that envisaged by the TSO. It is the intention to incentivise additional plant flexibility through the provision of new ancillary service products but it is unclear how many of the existing conventional generators can offer improved services under the new ancillary opportunities and therefore other technologies to provide flexibility should be explored.

As an example of one such option, is the installation of Energy Storage technology at Kilroot Power Station proposed by AES and currently undergoing a feasibility study prior to a formal approach to SONI for connection. The AES energy storage technology has been deployed in several markets in the world including the PJM market in the United States and the proposal could provide all of the proposed new and existing ancillary service products in addition to providing frequency regulation and overnight load to reduce wind curtailment. The TSO has expressed interest in the technology and AES believes energy storage could provide an important component in a secure and sustainable system with increased SNSP. AES would encourage the TSO and Regulators to further explore the opportunities afforded by energy storage.



## **8. Additional Issues**

### ***Project Time Scale***

The TSO's recommendation paper sets out a time line for the completion of the project to complete the relevant studies and the subsequent implementation of the grid code modification. The plan estimates that the conventional generators will have engaged their OEMs, commenced their studies by Q3 2013 and will have completed them by end of Q1 2014. Based on the evidence provided from contact with our OEMs AES believes this time scale to be extremely optimistic as one of our OEMs has indicated that it will take approximately 12 months to complete the required studies. The prospect of operating machines in a power system with the levels of SNSP being proposed is new territory for our OEMs and they will want to consider in detail the implications for their equipment as they have no previous similar operating history or experience.

### ***Long term O & M costs***

It is conceivable that as a result of the OEM studies conducted physical changes or changes to the operational and maintenance regimes may have to be made. This could have a considerable effect on the costs of operating and maintaining the plant. At this point the impact is not known but thought should be given to possibility that significant investment may be required to ensure compliance but also the higher O&M costs could impact negatively on the profitability of the plant.

### ***Determination of Compliance with the new RoCoF Standard***

As mentioned in the previous sections it is not clear from the documents provided how compliance with the new RoCoF standard would be assessed and determined by the TSO. It would be helpful if the TSO could provide more information on the assessment and compliance determination processes and the options and consequences of non-compliance with the RoCoF standard.