



9th August 2013

Mr Robert O'Rourke
Commission of Energy Regulation
The Exchange
Tallaght
Dublin 24

Re: Aughinish Alumina Ltd. response to CER Consultation Paper (CER/13/143)

Dear Robert

This is the response of Aughinish Alumina Limited to the CER consultation paper (CER/13/143) on Rate of Change of Frequency (ROCOF) Modifications to the Grid Code. This response is not confidential.

Background to AAL

Aughinish Alumina Limited ("Aughinish") is a large alumina manufacturing refinery based in the mid-west region since 1983, employing almost 600 people. In 2006 (7 years ago), Aughinish commissioned and constructed a 160MW combined heat and power plant ("CHP") to meet the power and heat needs of the alumina refinery.

The owners of Aughinish in good faith invested over US\$120m funding in the CHP plant in 2005/2006 as part of a Government/CER-sponsored Capacity 2005 competition. The technical specification of the plant was based on the detailed requirements of the Grid Code.

As is typical in such large projects, during the evaluation and construction phase many detailed discussions and technical reviews took place between owner's engineer, EPC contractor, OEM and ESB National Grid so as to ensure clarity on grid code requirements. At the time of commissioning the compliance of the units was assessed, witnessed and approved by ESB National Grid, OEM and ESBI engineers. The CHP Plant at Aughinish was funded by our owners and constructed as a strategic long term enabler to the alumina manufacturing plant in terms of combined heat and power generation. The CHP embedded at Aughinish is a high efficiency CHP plant that meets the requirement of EU and Irish Government targets for increased energy efficiency.

For the avoidance of any doubt, it was never envisaged at any time during the construction and commissioning that a step change in ROCOF was likely or imminent in the early stages of plant lifetime. The high efficiency CHP at Aughinish is a base load plant technology planned to run continuously so as to meet the continuous heat demands of the host alumina refinery.

Therefore, before we can seek agreement with the CER's proposal to approve MPID 229 in principle our Owners, Insurers and Shareholders of this valuable asset demand that a full and thorough technical study be carried out. The owners of Aughinish operate to a 5-year budget planning with advance pre approval for large expenditures or investments. We therefore do not have prior approval to fund significant costs associated with this technical upgrade at this time.

Problem Statement

The generation mix in the Island of Ireland will significantly change between now and 2020 as a result of Irish Government renewable targets associated with intermittent wind generation. However the proposed target does not come free as there is a cost for back-up power usually gas-fired or coal-fired generation. The associated significant increase in intermittent wind generation will introduce more frequent and severe dynamic instability issues onto the grid which are in excess of the capability of existing generators.

The analysis of the problem and suggested solutions by Eirgrid and CER are geared towards directing that existing conventional generators should be modified to ensure they remain operational throughout these more frequent periods of increased instability.

The TSO has therefore proposed the introduction of a step change in rate of change of frequency within the Grid code for existing (and new) generators. The existing ROCOF target of 0.5 Hz/sec will be doubled to 1 Hz/sec. The actual proposed ROCOF experienced by generators and consumers is unclear, the TSO state a 1 HZ/sec based on a rolling average over 500ms. This issue requires clarification to eliminate uncertainty.

In making the proposed change, the TSO is therefore accepting the increased dynamic instability on the Irish grid. The resultant change in grid code to accommodate the new ROCOF requires modifications to ensure existing generators can continue to operate reliably under the new conditions. This change which sounds easy will have little adverse impact on renewable generators and will enable increased penetration to meet national targets.

In a nutshell:

- Can existing generators comply with the proposed change?
- What technical changes are required to be implemented, and at what cost?
- Is the change in system dynamics feasible and tolerable by manufacturing industry?
- Can the technology changes be implemented by existing generators?
- Who benefits and who pays?

ROCOF Proposed Target level – clarity required

The most confusing aspect of this issue is the lack of an absolute ROCOF value for the plant studies.

The TSO's proposed definition of ROCOF as being a rolling average measured over 500ms needs to be distilled down to an absolute value to be used for the studies. Taking worst case, this absolute value could in theory be 3 Hz/sec, which even the KEMA report does not extend to. At some point in time Aughinish will have to decide what value to use in the engineering analysis. If this value is say 1.5Hz/sec and the Grid Code could still in theory allow 3 Hz/sec, then there is a disconnect that may be of concern to Aughinish and the validity of any analysis based on this rate.

The KEMA study does refer to higher absolute ROCOF than 1 Hz/sec; in Appendix 1 summary results are provided for various cases including ROCOF up to 2 Hz/sec. In some of the analyses for ROCOF of 2 Hz/sec on a CCGT, a pole slip is observed for power factors of 0.93 leading, unity and 0.85 lagging. As KEMA themselves say "During the study it became clear that this becomes different for a longer time window looking at a 1 Hz frequency drop and the higher RoCoF values of 1.5 Hz/s and 2 Hz/s where unstable operation was detected"

Both KEMA and PPA Energy stated that individual plant assessments would be needed to verify the capability and life-cycle/maintenance effect on the plants of the proposed increased ROCOF. Until this is done it will not be possible to have a clear view as to whether or not existing gas turbine plant can realistically manage the proposed new requirement. Therefore in the first instance we request increased clarity from TSO on the basis of the 1 Hz/sec target.

Generic Study versus Site Specific Study

The units at Aughinish comprise generators, load gearboxes and gas Turbines. In order to carry out a feasibility study on the full equipment train, this will require the involvement of a number of independent OEM parties. As the operator of an alumina manufacturing refinery, we do not possess the design knowledge or engineering capability that OEM's have in relation to the required technical assessment. Detailed input will be required from OEM's including, GE (gas turbine), Renk (load gearbox) and (ELIN for Generator) working together to assess the requirements and provide a technical solution with proposal.

The technical feasibility study is an additional significant cost that has not been budgeted for and that cannot be recovered from the market. The solution proposal is also not an area of investment in our 5-year planning cycle.

We understand that Eirgrid engaged KEMA to complete a high level feasibility study in order to make the case for higher ROCOF. Due to the complex nature of the alumina manufacturing plant, Aughinish cannot rely on the limited study carried out by KEMA using mathematical models rather it must base any decision on OEM technical/engineering study with reference to the actual

machines characteristics and specifications in use at Aughinish. We do not believe that a generic study would be appropriate, as it is unlikely we would base our decision on another generator results. For the Irish system, our units are unique in terms of the size, are CHP and incorporate load gearboxes.

Risk to Large Customers

Aughinish is one of largest site loads on the Irish electrical system averaging over 44MW. The alumina refinery with embedded CHP has:

1. 1,500no. motors ranging in size from 2.2MW to 1 kW, including large (2.2MW) synchronous motors most of which are very sensitive to grid frequency and voltage changes.
2. Possibly the largest electrical network of any single site in Ireland
3. 150no. electronic variable speed drives, both Medium voltage (3.3kV) and low voltage (400V)

The alumina refinery is very sensitive to voltage dips and power quality issues and we are very conscious to the impact of disturbances emanating from the grid. As a large demand user with a significant manufacturing facility, we are concerned that Grid power quality should not deteriorate. Importantly, to guarantee jobs and attract inward investment in manufacturing Ireland needs to ensure it possesses world class grid quality. With the drive to increase SNSP, it is important that Eirgrid and CER do not allow a deterioration in this standard.

Aughinish Alumina is extremely concerned that Eirgrid as TSO and CER appear to support much higher levels of disturbance and frequency changes. Disturbingly, the consultant report concludes that there is likely to be an increase in network events with higher SNSP and that 1 HZ/500MS is likely to be more onerous than over 100ms.

Aughinish calls on the TSO to carry out dynamic system studies to confirm to the market and demand users that power quality will not deteriorate as a result of the proposed change to ROCOF target.

As a manufacturing industry, Aughinish Alumina will be required to carry out a dynamic grid stability modelling exercise on its internal network, based on the proposed changes to the external grid dynamics. This study would require key data from Eirgrid, plus the hiring of consultants to model and simulate plant electrical system reliability. Once complete, a detailed scope on the necessary changes and cost implications required to ensure plant reliability would be required.

Cost of Study and Implementation

The TSO and CER propose that existing conventional generators investigate and implement necessary changes to ensure they will not trip due to the increased system disturbances associated with the government's decision to increased Renewables.

The CER proposes that the cost associated with this be fully borne by existing back-up conventional generators. The impact of the targets will ultimately mean that conventional generators will operate at lower levels of dispatch in the market therefore there is little benefit accruing.

Eirgrid's submission includes an estimate of approximately €300m benefit to Ireland from 2020 due to the increase in renewables. If the proposed changes are essential to achieving the SNSP of 75% then we believe the party which benefits most from the change should pay for them.

Existing grid compliance

The GPI charge for ROCOF - we do not understand basis for the charge. Where generators were signed off as fully grid compliant and have not made any modifications, we do not accept they are potentially liable for GPI. However should any non-compliance issues come to light then generators should be incentivised to close out and quickly resolve on an urgent basis. We suggest that Generators and TSO work together in a co-operative manner to quickly resolve any non-compliance issues.

In our view, if generators are found to be non-compliant and refuse to implement changes to resolve, then a GPI charge may be appropriate, but not in the case of generators who are using all reasonable endeavours to resolve issues.

Summary and responses to specific CER questions

1. CER have selected and engaged an industry consultant (with required technical capability and experience) to evaluate the proposals, review responses from individual Generators and to interview generators. The Consultant report highlights a number of problem areas with the new ROCOF proposal based on review with individual Generators and understanding of technical issues.

Notwithstanding this, the CER appears to ignore the consultant report in a number of key areas, namely:

- The consultants recommend that CER should not approve MPID 229 until a number of key issues are resolved.
- TSO should give further consideration to the potential impact of higher ROCOF on system demand customers.
- TSO should report on the alternatives to ROCOF changes
- 100ms ROCOF scenarios should be explored

On this basis we agree with the consultant and propose that the CER should not approve MPID 229 at this time.

2. The CER claim “that delivery of policy should only take place without impacting on the quality, reliability or safety of electrical supplies”. It is clear from the CER proposal paper and their consultant’s report that quality, reliability and safety are likely to be adversely impacted were the proposals to be implemented. Therefore, the CER would fail on their objectives by approval of MPID 229. We cannot therefore logically agree that CER should approve proposal in principle ahead of any detailed technical analysis, when this is in effect a technical problem. We do not agree with the conditions for giving MPID effect in the Grid code.
3. The necessity to implement changes, whether the proposed ROCOF or alternatives, resulted from Ireland agreement to the new Renewables target for 2020. However in hind-sight, it may have been more prudent to fully investigate extent and impact of technical barriers before agreeing actual target and deadlines.
4. Where the generators using OEM’s must carry out feasibility studies – then it is essential that TSO provide clarity on the actual target ROCOF value and over what timeframe.
5. The beneficiary of the changes should pay. As stated in the proposal, the estimated benefits of €300M per annum will materialize in 2020. We believe therefore that the beneficiary should pay for the changes. Yes, the costs should be recoverable.
6. We suggest that Generators and TSO work together in a co-operative manner to quickly resolve any non-compliance issues. GPI should not apply for ROCOF.
7. Eirgrid should explore and implement alternative solutions to this ROCOF proposal.

Other Issues

8.
 - a. Aughinish has a specific concern in relation to deterioration in power quality for manufacturing industry arising from this proposed change. We believe it would be prudent that Eirgrid and TSO should investigate alternative solutions that enable SNSP targets to be met while maintaining or indeed improving power quality.
 - b. Aughinish agrees with the consultant report recommendation that TSO should prepare a report exploring level of ROCOF that arises over 100ms in a range of scenarios that show an average ROCOF. More clarity on actual ROCOF values is required to enable OEM technical studies.
 - c. As a demand user we require transient stability information to enable internal network studies to be carried out.

- d. To guarantee jobs and attract inward investment in manufacturing Ireland needs to ensure it possesses world class grid quality. With the drive to increase SNSP, it is important that Eirgrid and CER do not allow a deterioration in this standard.
- e. Eirgrid and the TSO should extend the consultation to ensure all large demand users are aware of this CER proposal and have ample opportunity to respond.
- f. We believe the approach being proposed by the CER lacks commercial awareness in that all generators will be individually approaching a limited number of OEMs within a tight time-frame. This will exert upward pressure on cost of studies and solutions. This may also mean that some generators will not be able to make a declaration of compliance to EirGrid within the proposed 18 months from a final decision on this modification.

Yours sincerely

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Gas Boiler Project Manager