



Mr John Pierce
Australian Energy Market Commission
Level 6, 201 Elizabeth Street
Sydney NSW 2000
Lodged via www.aemc.gov.au

Friday, 21 October 2016

Dear Mr Pierce,

RE: System Security Market Frameworks Review (ref EPR0053)

ENGIE appreciates the opportunity to comment on the Australian Energy Market Commission (AEMC) System Security Market Frameworks Review Consultation Paper (consultation paper). ENGIE is a global energy operator in the businesses of electricity, natural gas and energy services. ENGIE is the number one independent power producer in the world with 115.3 GW of installed power-production capacity, 19 GW of which is renewable. ENGIE employs 1,800 people in Australia and supplies 12 per cent of Australia's National Electricity Market, and has an installed generating capacity of more than 3,550 MW. ENGIE also owns Simply Energy which provides electricity and gas to more than 550,000 retail customer accounts across Victoria, South Australia, New South Wales and Queensland.

This review is to consider regulatory frameworks that affect system security in the NEM, as well as three recent rule change requests that relate to system security - inertia, rate of change of frequency (ROCOF) and system strength.

The items relating to inertia and ROCOF are closely related and so their discussion in this submission overlaps somewhat. The rule change request relating to system strength relates to different issues and is therefore discussed separately.

Managing power system strength

The consultation paper outlines three specific problem areas that could arise due to reducing power system strength (fault level), namely:

1. reducing the effectiveness of protection systems,
2. increasingly difficult for network businesses to maintain stable voltages, and
3. reducing the ability of inverter based generators to operate continuously following a fault





The South Australian Government has also lodged a rule change proposal relating to power system fault levels, and notes that as fault levels decrease due to retirement of synchronous generators, remaining generators may find that the consequential increase in the magnitude of voltage disturbances during system faults is beyond their capability to withstand. The problem in this scenario is one that the remaining generator, through no fault of its own, is suddenly potentially non-compliant with its generator performance standard obligations.

As noted in the consultation paper, it is conceivable that obligations can be imposed on new connecting generators in relation to fault contribution, but it is not clear what party should carry the obligation where fault level issues arise due to generator retirements. One option would be that the network businesses could be required to identify the minimum fault level required across their network, and where generator retirements would cause the actual fault level to fall below the required minimum, there could be a competitive tender process for options that could improve the fault level to the required minimum. The network business could benchmark all tenders against the cost of a network solution, such as a synchronous compensator.

Inertia rule change request

The inertia rule change request suggests that since power system inertia is decreasing in the NEM as a result of synchronous plant retirements, new mechanisms should be introduced that appropriately value this service.

AGL proposes that the inertia ancillary services procurement mechanism would only apply when the supply of inertia drops below a set threshold to be determined by AEMO, based on consideration of certain contingency events occurring. Specifically, the AGL rule change proposes that inertia would be procured based on both Heywood interconnector lines unexpectedly coming out of service.

The consultation paper notes that inertia has decreased in South Australia from just over 10000 MW sec in 2012 to approximately 7000 MW sec in 2016. AEMO have advised that this decline does not affect stable operation in South Australia provided the Heywood interconnector is in service, although there may be insufficient inertia in South Australia to maintain secure operation if South Australia becomes separated (islanded) from the rest of the power system.

Managing ROCOF

Another rule change proposal under consideration in the consultation is the South Australian Government's proposal in response to increasing rates of change of frequency. This rule change is in some ways responding to the same issue as the AGL proposal to introduce inertia procurement into the NEM. In their rule change proposal, the South Australia Government suggest that in response to increasing ROCOF, AEMO should procure the necessary service via an ancillary service. The rule proposal also suggests that "any ongoing purchase costs are likely to be minimal as the service will only be required on an occasional basis".

ROCOF standard

The consultation paper suggests that a system standard for ROCOF may be required in order for AEMO to determine how much inertia is needed in response to credible contingency events and for a certain sub category of non-credible events (protected events).



Alternative approach

ENGIE is supportive of reform which provides mechanisms which ensure power system security can continue to be effectively and efficiently managed as we continue to transition to increasing levels of intermittent generation.

ENGIE is also generally supportive of introducing processes into the NEM which place a value on the delivery of power system inertia, particularly given the observed decline in the amount of this important element in the suite of services that are needed to maintain a secure alternating current power system.

Although supportive of the aims of the proposed changes to inertia and ROCOF arrangements, ENGIE is concerned that the specific proposals will run into some practical and commercial difficulties. These concerns are set out in some detail later in this submission.

As an alternative, ENGIE has set out an approach which would build on AEMO's current responsibility to maintain power system frequency, and does not require the introduction of a new ROCOF standard.

Rather than attempt to define a ROCOF standard, the security objective can be expressed as a requirement to maintain the post contingent power system frequency to within the frequency operating standards, taking into account the assessed level of frequency response to disturbances inclusive of inertia and frequency control services. This approach provides AEMO with greater degrees of freedom in achieving the objective since it can be achieved through a combination of inertia and frequency control services.

As inertia levels fall and ROCOF levels increase in the power system, it is likely that AEMO will find that it needs to procure inertia and perhaps faster frequency control services in order to stay within the frequency control limits.

For example, suppose that the Heywood interconnector has been declared as a protected event, and that the frequency control standards include new provisions to cater for protected contingency events. Suppose that these new frequency control standards require AEMO to ensure that the post protected contingent event frequency deviation in South Australia for loss of Heywood does not fall below, say 48 Hz. Suppose that AEMO real time calculations based on current South Australia operating conditions reveal that loss of Heywood would cause frequency to fall more quickly than the currently available frequency control services can manage, and the frequency deviation is therefore likely to fall below 48 Hz, AEMO would then seek to procure additional inertia service to reduce the level of ROCOF.

So in other words, the trigger for AEMO to procure inertia is not that ROCOF has breached a particular number, but that the increase in ROCOF is contributing to AEMO being unable to manage the contingency event within the defined frequency standard.

This approach has the benefit that as well as supporting the procurement of the proposed inertia service, it also opens up the possibility of a new fast frequency control services that could act as a compliment to the existing frequency control services. ENGIE is aware that fast frequency services are being adopted in other countries – for



example, in the UK a new one second “enhanced frequency response¹” service has recently been introduced, and is procured through a competitive tender process.

ENGIE believes that the advantage of this approach is that it avoids the need to set a single number as the ROCOF standard, and it also enables AEMO greater degrees of freedom in that it can call on inertia and frequency control services in combination to maintain the frequency standard.

As well as establishing the security objective through the frequency standard rather than a new ROCOF standard, ENGIE believes that there would be merit in the proposed inertia service being expanded to incorporate a suite of ‘flexibility’ services, that would deliver a wider range of system benefits and therefore provide a better balance of costs and benefits.

Such a package of services would be useful in complementing intermittent, non-synchronous generation sources and would likely include inertia, frequency response, fault level (system strength) and flexibility capacity. Whereas the inertia service might only be specifically required in the rare instance of an islanding event, the other services are more likely to be of value under system normal conditions. For example, suppose that the interconnector is operating at full import into South Australia when there is a large amount of intermittent generation. Having the ability to ensure the appropriate amount of flexible generation is online within South Australia capable of increasing quickly should the intermittent generation suddenly reduce, allows AEMO to control the interconnector flow more accurately, thus reducing the need to run to conservative import limits. The flexible generator would also be able to assist with frequency control if needed along with a range of additional services.

Such a package of services which have utility both before and after an islanding event is likely to be of greater value than the provision of inertia alone. Although the payment for these services would still need to be sufficiently high to justify the flexible generator remaining online, the value being received in return is far greater than just inertia, and therefore more likely to satisfy a cost benefit evaluation.

Consideration would need to be given to how the package of services should best be procured and dispatched in a commercial sense. For example, a contracted flexible generator could receive a single contracted payment for the entire package of services, or it may be expected to participate in the existing frequency control services market for the frequency control element. These matters would need to be considered in more detail if such a proposal were to be pursued.

¹ See National Grid website at <http://www2.nationalgrid.com/Enhanced-Frequency-Response.aspx> for more information.



Issues with current proposals

The rule change proposals for inertia, managing ROCOF and a new ROCOF standard all overlap to a considerable extent and as such ENGIE has provided in the section below a consolidated set of comments which consider all three proposals.

Since the start of the NEM the South Australian region has been islanded rarely and in most cases, has been restored quite quickly. Since a lack of inertia is only expected to impose an operational issue in the event that South Australia becomes islanded, careful consideration needs to be given to the extent to which new arrangements are imposed onto the NEM to deal with a rare and localised circumstance.

Unless the low inertia problem is expected to become more widespread in the short term, introducing specific mitigating measures into the South Australian region only to deal with islanded operation raises a number of questions. For example, suppose that AEMO were required to enter into a contract with a synchronous generator to provide inertia in the event that the South Australian region became islanded. Unless the contracted generator is able to start up and synchronise almost immediately following an islanding event occurring, then the generator would need to be online in advance of the contingency event to be of any value. Since it is not possible to know in advance when the contingency event will occur, the contracted generator would therefore need to be running virtually continuously to be confident of being able to provide inertia in the event of an island forming, despite the very low probability of the islanding event.

Unlike the provision of frequency control ancillary service by generators, which is related to the level of energy output and can therefore be co-optimised within the NEM dispatch engine, inertia is a binary; it is available in full whenever the generator is synchronised, and is unavailable when the generator is offline. If we are to consider commercial arrangements for the provision of inertia, then it needs to be an arrangement that will influence the decision by a relevant generator to commit the generating unit, and leave it online for a significant period of time. So in other words, the incentive on offer from whatever the commercial arrangement is for inertia will need to be sufficiently large to influence generator commitment decisions.

The consultation paper discussion on the proposed ROCOF standard suggests that a different standard might be introduced for credible contingencies, and another for a subset of non-credible contingencies.

In consideration of credible contingency events, AEMO advice indicates that it is highly unlikely that a credible contingency event is likely to cause a frequency deviation with an abnormally high ROCOF. As such, there should be no need for AEMO to take any pre-contingent action for managing ROCOF in the event of a credible contingency.

The consultation paper introduces the idea of a new category of non-credible contingency event. The paper does not use the term, but it is understood that these might be referred to as 'protected events'. It is understood that protected events would be a special category of non-credible contingency for which AEMO would be required to ensure that the post contingent system conditions would be within a defined range. This defined range would be less stringent than for credible contingencies, but would provide an additional level of protection over and above the current non-credible contingencies.



Given that a ROCOF standard has no utility regarding credible contingencies, and that the rules do not require AEMO to cater for non-credible contingencies, it would seem that the only utility of a ROCOF standard would be in relation to protected events.

So for example, if the loss of the Heywood double circuit interconnector was to be declared as a protected event, and a new standard was introduced which required that ROCOF not increase above say 3 Hz per second following the occurrence of the protected event (Heywood interconnector trip), then AEMO would be required to ensure sufficient synchronous generators were online to support the flow on the Heywood interconnector. This is effectively what has been occurring at the instruction of the South Australia government since soon after the 28 September blackout event.

At present, there are no specific mechanisms in the NEM to encourage the provision of inertia services, so the only way in which AEMO can ensure that the post contingency ROCOF in South Australia will be within the declared standard is to constrain the interconnector flow. This in turn, might act as an incentive for additional synchronous generators in South Australia to come online, but it remains to be seen how effective this market signal is.

Whilst this approach provides the outcome of ensuring that the ROCOF remains within the standard, it will result in the Heywood interconnector being more heavily constrained than would otherwise be the case, which potentially undermines the value of the recently upgraded Heywood interconnector.

If a new mechanism was introduced for power system inertia (as proposed in the AGL rule change request), then this would provide an additional service that AEMO could utilise to assist with managing the post contingency ROCOF following the loss of the protected Heywood interconnector. Without knowing the form of this mechanism, it would need to provide a sufficiently strong signal for a synchronous generator that otherwise would not have been run, to decide to come online. Synchronous generators are unlikely to be influenced in their commitment decisions by relatively small changes in their potential revenue, and so if the inertia signal is to be effective, it will need to represent a substantial value to the generator.

So to summarise, it would seem that a ROCOF standard would have limited application since it would only apply to protected events, and would lead to reduced utilisation of the protected interconnector. Introducing a mechanism for competitive procurement of inertia service is unlikely to be sufficient to change generator commitment decisions, which would render the mechanism as ineffective. In addition, ENGIE suggests that it would be somewhat problematic to determine the appropriate level for the standard, given the range of generator performance obligations and implications for under frequency load shedding schemes.

For these reasons, ENGIE is concerned that the proposed arrangements for inertia and ROCOF may not achieve the objective of ensuring power system security – an objective which ENGIE strongly supports. ENGIE does believe that these issues can be overcome however, and has endeavoured to contribute constructively by suggesting alternative arrangements earlier in this submission.



Future of the NEM arrangements

In past years debates about the viability of the energy only market have been more theoretical than practical. While many of these debates have subsided, it may be the case that at some point the future viability of the NEM needs to be explored.

In short, there is a view the current market may become more difficult to maintain as supply and demand sides become more complicated, as gas plays a greater role in balancing supply and demand and managing system stability, and the transition to low short-run marginal cost renewables continues.

It may be possible to maintain energy only market arrangements if there are appropriate incentives for flexibility services. Alternatively, the current architecture may only be appropriate for dispatch purposes whereas new mechanisms may be required to support new investment and fixed cost recovery.

While the consultation does not explicitly pose such questions, there may come a point where these questions become more pressing and need to be explored by the AEMC and policy makers. Although ENGIE does not have a reform goal it wishes to propose at this time, there is a growing awareness that such reform may be required in the coming period.

ENGIE trusts that the comments provided in this response are of assistance to the AEMC in its deliberations. Should you wish to discuss any aspects of this submission, please do not hesitate to contact me on, telephone, 03 9617 8331.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Chris Deague". The signature is fluid and cursive, written in a professional style.

Chris Deague
Wholesale Regulations Manager