

8 November 2017

Australian Energy Market Commission (AEMC)
PO Box A2449
Sydney South NSW 1235

Dear Mr Pierce

RE: ERC0222 Generator Technical Performance Standards

Tasmanian Networks Pty Ltd (TasNetworks) is pleased to provide our response to the *Consultation Paper – National Electricity Amendment (Generator Technical Performance Standards) Rule 2017* which was published by the AEMC on 19 September 2017.

As the Transmission Network Service Provider (TNSP) and Distribution Network Service Provider (DNSP) in Tasmania, TasNetworks is focused on delivering safe and reliable electricity network services while achieving the lowest sustainable electricity prices for Tasmanian customers. We are committed to ensuring the secure operation of the Tasmanian power system.

TasNetworks is supportive of the assessment framework, especially the promotion of efficient investment that strikes a balance between system security and the price ultimately paid by consumers. Minimising energy costs for Tasmanian consumers is a significant consideration for TasNetworks, however this issue is always considered in parallel with the need to ensure a safe and secure electricity supply.

TasNetworks believes the role of TNSPs is to facilitate the connection of all generation and network users while ensuring a safe, reliable and secure network.

TasNetworks is thus broadly supportive of the changes proposed to the various generator technical performance standards that have been outlined by the Australian Energy Market Operator (AEMO) in its Rule change submission. The changes reflect an increasing need for all generating systems to contribute towards the operability and ongoing security of the power system, irrespective of the technology used. The ongoing transition away from traditional base load power stations populated with synchronous generating units, towards both large scale and embedded intermittent asynchronous generating systems, is creating new challenges that cannot be solved by network operators alone. TasNetworks has offered commentary on each of the proposed changes, including potential refinements to the initial Rule drafting offered by AEMO, as part answering the questions put forward by the AEMC.

In regard to the proposed changes to the Rules negotiation framework, TasNetworks is fully supportive of the move to formalise the commencement of Generator Performance Standard (GPS) negotiations at the automatic access standard. As described later in this submission, TasNetworks has identified that in Tasmania the minimum access standard is not appropriate for some technical requirements and negotiated performance standards are required. The proposed Rule changes will make the process of reaching agreement on the required performance standards more efficient and transparent.

TasNetworks agrees with AEMO that the Rule changes should be enacted as quickly as possible to minimise potential legacy issues. TasNetworks is currently managing an unprecedented level of connection activity, with seven connection applications currently in progress totalling more than 400 MW of installed capacity, and numerous connection enquiries on our books. All are based on asynchronous generation technologies. TasNetworks believes it is critical that the changes proposed to the Rules are applied to as many of these connections as possible.

TasNetworks would like to acknowledge the efforts expended by the AEMC during this consultation period to solicit feedback from the electricity industry. As detailed in our responses to the specific questions raised in the consultation paper, changes to the generator performance standards are an important part of the industry's future toolbox needed to successfully transition the NEM away from traditional base load synchronous plant. It is therefore important that all stakeholders are provided with the opportunity to help contribute to shaping direction.

We look forward to further discussions with the AEMC as the Rule change process is progressed. Should you have any technical queries in relation to our submission, these should be directed to Andrew Halley, Principal Operations Engineer (andrew.halley@tasnetworks.com.au).

Yours sincerely

A handwritten signature in black ink, appearing to read 'T. Astley', with a stylized flourish at the end.

Tim Astley

NEM Strategy and Compliance Team Leader

1. Introduction

TasNetworks supports the implementation of generator technical performance standards that align with the automatic access standards.

In this submission we recommend a number of changes that help clarify particular elements of the proposed changes. We recommend further clarification in the following areas:

- generating system response to disturbances following contingency events;
- frequency control;
- voltage and reactive power control; and
- active power control.

Generation technologies that were once niche suppliers are now mainstream energy sources. It is therefore reasonable to expect that such generators should contribute to the security and operability of the power system consistent with their increased role in meeting demand. In the case of the existing National Electricity Rules (Rules), this should translate into increased performance expectations where such expectations have been appropriately tailored to take account of practical limitations that may be uneconomic (or not physically possible) to overcome. Also, given the application of the Rules to both transmission and distribution networks, it is important that sufficient flexibility is available to manage sometimes very different circumstances in distribution networks.

TasNetworks is fully supportive of the intent contained in the Rule change proposal initiated by AEMO. We are also fully supportive of many specific recommendations that make up the proposal. For certain issues, we have offered commentary and potential refinements for consideration. Such contributions will hopefully clarify and build on the intent of the various changes proposed.

2. Response to specific AEMC questions

Question 1 Assessment framework

TasNetworks is supportive of the assessment framework, especially the promotion of efficient investment that strikes a balance between system security and the price ultimately paid by consumers. Minimising energy costs for Tasmanian consumers is a significant consideration for TasNetworks, however this issue is always considered in parallel with the need to ensure a safe and secure electricity supply.

To this end, we would like to offer the following comments for consideration:

- a) While marginal increases in energy costs may well result from some changes proposed to the generator performance standards, if such increases mitigate new power system security risks brought about by the significant change in how electricity is being produced, then they are justified and should be accepted as part of the energy transition occurring across the NEM. In TasNetworks' view, the AEMC should not necessarily seek to find a 'cost neutral position' but rather attempt to determine what additional costs are justified and provide long term benefits to consumers in the context of significant change across the industry.
- b) Modifications to generator performance standards potentially mitigate future costs (to which consumers are exposed) that exist in various other forms, such as:
 - Increased operational complexity (to maintain power system security) if the capability of connected generating equipment is limited. The Supervisory Control and Data Acquisition (SCADA) and control systems and resources to manage increasing complexity need to be developed and maintained at a cost by the NSP.
 - There are costs associated with market impacts resulting from constraints or directions necessary to manage operation within the *technical envelope*. This is especially true when unexpected stability phenomena are identified in real time.

- The need for new ancillary service markets or the development of new network assets to maintain an operable power system will impose new costs on consumers.
 - Any increased potential for major power supply interruptions represents a significant 'risk cost' for consumers that should also be appropriately considered.
- c) Some risks and associated costs will be more easily quantifiable than others. The AEMC is likely to be faced with situations where qualitative benefits will need to be appropriately weighted given that some uncertainties will be unresolvable. In considering the benefit of making changes, the AEMC should consider a long term view recognising that the generator performance standards 'set the scene' for at least the next 25 years given the typical life expectancy of assets. In this context, the performance standards are an integral part of planning the future power system and should reflect the industry's 'best guess' as to what is required to meet future customer needs and expectations.
- d) Cost impacts on generators should be evidence based and take into account the technical expectations now being enforced overseas. The same issue is relevant when considering if changes to existing performance standards represent a practical 'barrier to entry' or not.
- e) TasNetworks agrees with the premise that imposing strict performance standards needs to be appropriately tempered with flexibility, especially in relation to existing generation equipment (already in service) that is subject to modification and upgrade works. Mechanisms to negotiate access standards reflective of inherent limitations in existing plant (that may be impractical to overcome) should be appropriately considered as part of the Rule change process. For Example the Tasmanian generator mentioned in our response to Question 5.

Question 2 Role of access standards

There are a number of generator access standards that require changes. In TasNetworks' view, changes are justifiable on the following basis:

- a) Address what are considered to be inconsistencies in the existing Rules, for example the relationship between the *minimum access standard* for S5.2.5.1 (Reactive power) and the *minimum access standard* for S5.2.5.13 (Voltage control).
- b) There are justifiable increases/changes to certain access standards necessary to address emerging power system security issues and the future operability of the network for AEMO and NSPs. Changes to fault ride through (FRT) and active power control requirements are relevant examples of each.
- c) The inclusion of a new technical requirement to specifically address system strength is necessary given the dominance of power electronically controlled generating technologies that are being connected to the NEM en masse.
- d) There is merit in bringing the Australian Rules into line with other major Grid Codes applied in first world countries which have comparable expectations with respect to power system security and reliability. Countries/regions facing a similar influx of asynchronous generating technologies provide a valuable source of reference, for example the European Union and specifically, the Republic of Ireland.

TasNetworks would strongly encourage the AEMC to consider the incremental cost of changes that may be necessary to a new generating unit/system design to provide a certain level of service/capability, as compared to the costs of an NSP having to provide the same services via the development of new assets. The provision of reactive power is a relevant example.

Furthermore, consideration needs to be given to the cost impacts on consumers. Continuing with reactive power as an example, the development of network based assets to provide sufficient capability to manage system voltages is guaranteed to result in additional costs for consumers via

higher network usage charges (which generators are not exposed to). While it could be argued that increased capital costs for new generators would ultimately be passed onto consumers through higher energy prices, TasNetworks would argue that the market will determine this outcome and that natural competition in the generation pool is likely to result in the cost increase actually flowing to customers being negligible if at all.

In this sense, when determining the lowest cost approach (for consumers) to maintain system security, the role of the market should be considered. A simple comparison of development costs between two different parties is overly simplistic when regulated assets are the alternative source of capability.

Conceptually at least, increasing the capability of generators creates multiple sources of competitive supply to address the existing (and future) needs of the power system. Consideration needs to be given to what is optionally supplied (unless remuneration is offered) versus what should be mandated at all times. Recent issues with NEM frequency control are an example of what can happen when capability is allowed to be withdrawn in market based arrangements.

In summary, TasNetworks believes that changing access standards for generators will frequently be the most cost effective way of meeting the needs of the power system.

Question 3 **Proposed changes to generator access standards**

For those proposed changes that are not discussed in detail as part of subsequent questions, TasNetworks would like to offer the following commentary.

S5.1a.4 **Power frequency voltage**

TasNetworks recommends that the proposed changes to the over voltage withstand capability curve be implemented as a generator connection requirement rather than as changes to the *System Standards*. Notwithstanding that TasNetworks would like to see future modifications to the figure¹, the proposed changes could not be applied as operational limits without a detailed audit of existing network and generator protection settings as well as a review of existing plant capabilities. There will be a time and cost associated with this activity, both of which are difficult to estimate and will extend to third party assets.

The objective to increase the capability of new equipment (arguably both generator and network assets) is sound, recognising that future power system operating conditions, especially following non-credible contingency events, are becoming less predictable. The presence of significant micro embedded generation (mainly rooftop PV) in all NEM regions is one contributing factor. The ability of larger scale generation to remain in service following credible and non-credible contingencies would greatly assist in stabilising the network and would provide a stronger platform for supply restoration.

TasNetworks suggests that the existing temporary over voltage curve be retained for operational purposes (and remain relevant only for credible contingency events), with higher expectations built into new performance standards to create a 'working margin' to cater for the impacts of non-credible contingency events.

S5.2.5.1 **Reactive power capability**

TasNetworks supports the intent to increase the reactive capability required to satisfy the minimum access standard. The move is consistent with our own initiative to impose higher requirements in

¹ Specifically, to remove the vertical transition which presently occurs at 900 milliseconds and have it replaced with a smooth characteristic in the form of a ramp or exponential curve, as well as removing all horizontal lines which create unnecessary confusion as to what time duration applies for a given voltage level.

the Tasmanian region when negotiating new generator performance standards. Further discussion is provided as part of the response to Question 11.

While the intent is fully supported, the minimum access standard being proposed requires additional consideration. In TasNetworks view, linking the minimum required reactive power capability with fault level is a questionable added complication. The fact that the minimum access standard may climb to be equal to the automatic access standard at the strongest locations in the network (where the required additional reactive power may be minimal) suggests an almost perverse outcome.

TasNetworks is in favour of a simple metric that is less onerous than the automatic access standard, but guarantees the provision of some reactive capability at the connection point to assist with network voltage control. Such an approach would also be consistent with a number of overseas Grid Codes.

As a suggestion, TasNetworks would recommend consideration of a figure similar to that applied by EirGrid² for controllable wind farms as shown below:

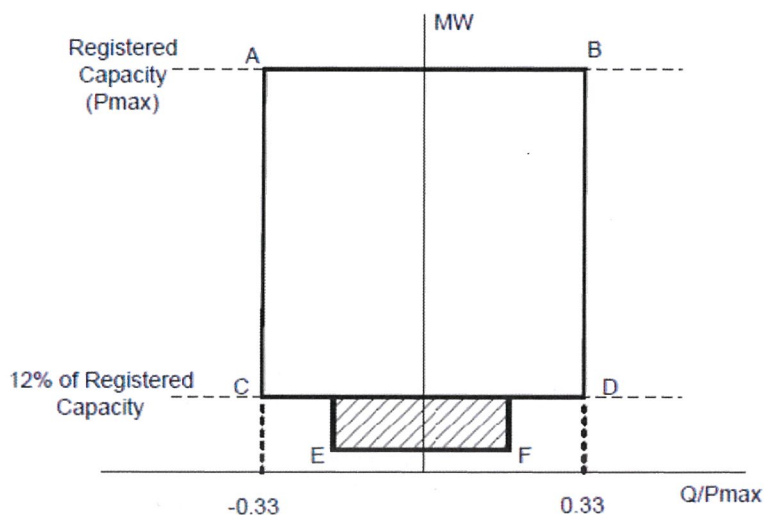


Figure WFPS1.4 – Minimum Reactive Power Capability of Controllable WFPS

² Extracted from EirGrid Grid Code, Version 6.0, Section: Controllable wind farm grid code provisions

S5.2.5.3 Generating system response to frequency disturbances

TasNetworks is supportive of the changes proposed to S5.2.5.3. To avoid any potential confusion and aid application of the Rules, it is recommended that a paragraph be added to the minimum access standard making it clear that asynchronous generating units must meet the equivalent of the automatic access standard for this technical requirement.

S5.2.5.4 Generating system response to voltage disturbances

Noting the discussions related to the definition of *continuous uninterrupted operation* provided within Question 7, TasNetworks is supportive of the move to update the *minimum access standard* to largely reflect the requirements of the *automatic standard*.

As with the S5.2.5.5 discussions below, TasNetworks is not clear at this point how the 100 MW threshold provided as part of the *negotiated access standard* would be applied in practice (at least with any confidence). In TasNetworks' view, this is the one aspect of the proposed changes that needs to be further discussed, and potentially better described in the Rules drafting. The ability to cater for *embedded generating systems* having lesser impact on the security of the broader power system is believed to be the intent. TasNetworks would like the opportunity to further discuss this issue with the AEMC.

S5.2.5.5 Generating system response to disturbances following contingency events

In relation to the changes proposed to the *automatic access standard*, TasNetworks is supportive of the changes subject to consideration of the following:

- a) The manner in which the multiple fault ride through requirement is described. As noted by AEMO in its published supplementary material, the objective of this proposal is to limit implementation of controls (e.g. simple fault counters) and to establish capabilities to ride through successive faults. While TasNetworks is fully supportive of this objective and considers it critical to the ongoing security of the power system, the manner in which the requirement is described may not be optimal.
 - TasNetworks shares a broader view that the wording may lead to an assessment methodology whereby faults are 'applied end on end' with virtually no time gap in between. This is not considered credible or consistent with the intent.
 - The relevance of '15' as an ongoing Rules requirement is questionable albeit that it may have origins from historical system operating events (was a statistically valid sample set available or was the data set limited?).
 - The specification of '15' disturbances somewhat counteracts the objective as stated above to limit the implementation of 'simple fault counters'.

To help progress this issue, TasNetworks would like to offer the following alternate drafting for consideration.

Automatic Access Standard (S5.2.5.5)

- b) The *automatic access standard* is:
 - (1) A *generating system* and each of its *generating units* must remain in *continuous uninterrupted operation* for disturbances that are caused by any combination of the following fault events which may occur in a 5 minute period:
 - (i) Any number of *credible contingency events* in a *transmission network* and *distribution network*, the latter of which must also include consideration of three phase faults;

- (ii) A single three phase fault in a *transmission system* cleared by all relevant *primary protection systems*;
- (iii) A single *contingency event* involving a two phase to ground, phase to phase or phase to ground fault in a *transmission system* cleared in:
 - A. No changes to existing wording.
 - B. No changes to existing wording.
- (iv) A single *contingency event* involving a three phase, two phase to ground, phase to phase or phase to ground faults in a *distribution network* cleared in
 - A. No change to existing wording.
 - B. No change to existing wording.

Provided that:

- (v) None of the events would disconnect the *generating unit* from the *power system* by removing *network elements* from service;
- (vi) The time between the application of successive faults is not shorter than the time for *automatic reclose equipment* to operate for the voltage level being considered (being equal to the automatic reclose dead time).
- (vii) That the total time that the voltage at the *connection point* is less than 90% is not more than 1800 milliseconds in any 5 minute period.

(2) No change to existing wording

The principles which underpin this potential alternative Rules drafting are:

- Any number of credible contingency events could occur in a 5-minute period. Being too specific may be counterproductive.
- For the purposes of compliance assessments, it is reasonable to assume that only one three phase fault event will occur in the transmission system in any 5-minute period.
- For the purposes of compliance assessments, it is reasonable to assume that only one event in any given 5-minute period will require the operation of backup protection systems.
- It is reasonable to assume that the time between the application of successive faults would not be less than the auto reclose dead time. In Tasmania, this would correspond to 700 milliseconds for the 220 kV network and 5 seconds for the 110 kV network. This is considered to be a practical application of AEMO's intent and will make a substantial difference to the risk of transient instability when applied to the assessment of synchronous generating units.
- This approach removes the concept of needing to remain connected for a specific number of events (e.g. the reference to '15') and rather focuses on the thermal capacity of equipment as defined by the 1800 milliseconds requirement. This is consistent with the stated objective.

In relation to the changes proposed to the *minimum access standard*, TasNetworks would suggest incorporating the concepts outlined above for the *automatic access standard*, with appropriate changes to the expectations for successful fault ride through.

The ability to negotiate a lesser outcome if "AEMO and the NSP agree that the total reduction of generation in the power system due to that fault would not exceed 100 MW", is, in TasNetworks' opinion, impractical. While the intent of allowing up to 100 MW (or some other agreed number as recently suggested by AEMO) theoretically lessens the burden on smaller *embedded generating*

units, how in practice are NSPs going to develop confidence that accepting a lesser standard won't cause more than 100 MW to be disconnected? This is especially the case when considering *embedded generating systems* that may be in close proximity to any number of similar installations, some of which may not be modelled explicitly in simulation software due to their size?

TasNetworks recognises the need to incorporate some flexibility for smaller generating systems and would like the opportunity to discuss possible solutions with the AEMC.

TasNetworks also has the view that there is conflict with the wording of paragraph (f) in the draft Rule (impact on other *generating plant* or *loads* to remain in service) and the 100 MW provision as currently proposed.

S5.2.5.7 Partial load rejection

Please refer to comments under Question 5

S5.2.5.11 Frequency control

Please refer to comments under Question 5

S5.2.5.13 Voltage and reactive power control

Please refer to comments under Question 6

S5.2.5.14 Active power control

Please refer to comments under Question 5 & 6

S5.2.5.15 System Strength

Please refer to comments under Question 4

S5.2.6.1 Remote control and monitoring

Please refer to comments under Question 6

Definition: Continuous uninterrupted operation

Please refer to comments under Question 7

Question 4 System strength access standard

TasNetworks is fully supportive of AEMO's proposed introduction of a new technical requirement which deals specifically with system strength.

TasNetworks already specifies its own connection requirement for the Tasmanian region which requires satisfactory operation of asynchronous generating systems down to a short circuit ratio (SCR) of 2.0. We have been applying this performance requirement on the basis that the connection of equipment which requires a higher SCR has the effect of 'consuming' more of the available system strength which:

- a) Reduces the hosting capacity of the existing network to accommodate additional asynchronous generators or high voltage direct current (HVDC) connections.

- b) Increases the probability of negative interactions with power electronics already connected to the power system including relevant generators, HVDC interconnectors and potentially certain types of customer equipment.

The mitigation for both is to make available plant and equipment capable of increasing system strength, which in practical terms (at present) means maintaining synchronous generators in service or dispatching available synchronous condensers. Going forward, such mitigations will be classified as system strength services in accordance with the recently published “Managing power system fault levels” Rule change.

It is important to fully consider the implication of (a) above in the context of the new technical requirements proposed by AEMO. While the “*Managing power system fault levels*” Rule change has included the concept of “do no harm”, there is nothing yet which prevents the consumption of existing network hosting capability up to the point to which ‘harm’ commences. Just because a new generator requires a certain amount of network support to operate satisfactorily, it will not be classified as ‘doing harm’ until one or more technical criteria are actually breached, e.g. inability of an existing *generating system* to meet an agreed Generator Performance Standards (GPS) with respect to FRT.

In TasNetworks’ view, the proposed new technical requirement addresses this concern. It is reasonable that new equipment should be capable of operating down to an SCR of 3.0, thereby more equitably sharing the available network hosting capacity, and in doing so, better managing the future need for *system strength services*.

In recent times, TasNetworks has been negotiating generator access standards with a number of proponents involving two different wind turbine manufacturers. The requirement to operate at an SCR of 2.0 was communicated as part of TasNetworks response to each connection enquiry. To date, TasNetworks has not been made aware of any limitations or inability to meet the requirement and negotiations are continuing on that basis. This would suggest that a *minimum access standard* of 3.0 is not unreasonable and can be met by mainstream equipment suppliers that are offering plant and equipment to future transmission connected generating systems.

In regards to the specific *Rule* drafting, TasNetworks would like to offer alternative wording that may better capture the intent of the proposed *Rule* from a practical perspective.

Minimum access standard

- (a) The *minimum access standard* for a *generating system* and each of its *generating units* is that it must comply with the registered *performance standards* applicable to those facilities when the *short circuit ratio* as calculated at the *connection point* is not more than 3.0.

It is noted that AEMO intend to expand the *minimum access standard* requirements to include X/R ratio. TasNetworks will review the proposed amendments when they become available and provide comment as needed.

TasNetworks also proposes that ‘general requirements’ be added to S5.2.5.15.

General requirements

- (a) A generator must not unreasonably withhold capability where a *generating system* or *generating unit* is capable of operating at a *short circuit ratio* below 3.0.
- (b) A *generator* must specify the minimum *short circuit ratio* at which compliance with the registered *performance standards* can be achieved as part of its *connection agreement* with a *network service provider*.

The intent of the general requirements should be clear in the absence of a specific *negotiated* or *automatic access standard*, that is to capture the actual capability of the generating equipment being connected to prevent a ‘simple default’ to the *minimum access standard*. TasNetworks is also of the view that having the minimum acceptable *short circuit ratio* clearly documented, as required to

ensure that the registered GPS can be complied with, is a necessary piece of information for NSPs to properly administer the “Managing power system fault levels” Rule change going forward.

In terms of the definition of *short circuit ratio*, the following is proposed for discussion purposes:

short circuit ratio (SCR)

The *three phase fault level at the Connection Point or at a nominated point in a transmission network or distribution network* divided by the *rated active power of the generating system* (comprised of one or more *generating units*) for which the *SCR* is to be calculated.

Question 5 Managing active power control

There are two aspects of active power control that are impacted by the changes proposed by AEMO.

Schedule 5.2.5.11 Frequency Control

TasNetworks is supportive of the intent of the changes offered to Schedule 5.2.5.11, specifically:

- (a) Simplifications to the wording of the *automatic access standard*.
- (b) Inclusion in the *minimum access standard* that *generating systems* greater than 30 MW must implement control mechanisms capable of delivering a frequency control response for both under and over frequency events.

The latter is particularly significant for regions of the NEM where Frequency Control Ancillary Services (FCAS) may become a limiting factor for network operation in the future. TasNetworks would suggest that both South Australia and Tasmania are likely candidates. Tasmania already experiences periods of time when sourcing sufficient fast FCAS is problematic. This can result in hydro generating units being run at inefficient MW operating levels and/or the voluntary dispatch of synchronous condensers to boost network inertia (which has the effect of reducing fast FCAS requirements in Tasmania due to the calculation methodology applied by AEMO).

Going forward, all new *generating systems* of significant enough size should be made capable of providing a frequency control response where the technology and physical attributes of the plant do not present a limitation. TasNetworks agrees with the AEMO position that unless frequency control capability is installed and commissioned at the time a *generating system* is first connected to the network, it is highly unlikely that the capability will ever be made available given the much higher costs of retrofitting control systems and performing associated testing.

The intent of both the significant changes is clear however the following observations need to be considered with respect to the final drafting of the proposed Rules:

- (a) Hydro generating units are only capable of providing a proportional decrease or increase in active power output at a point in time well beyond the initial frequency deviation, i.e. once the unit has ‘settled’ onto its permanent droop characteristic. The transient response of a hydro unit cannot be made proportional to frequency and is heavily dictated by the dynamics of the water delivery system.

The Rule as worded could be interpreted to mean that a proportional response is required across all time frames which is not possible.

- (b) The initial response of a hydro generating unit providing governor control action is inverse to that required to control the measured frequency excursion. The hydraulic effects which cause the transient response are well known and a standard characteristic of hydro generators. TasNetworks has worked collaboratively with Hydro Tasmania and AEMO to ‘work around’ the existing wording in the Rules and document the issue in existing GPS. Given the changes being proposed, TasNetworks would encourage appropriate wording to capture the presence of such dynamics which are at present, preventing the automatic

access standard being achieved even though the governing performance of affected units is excellent.

- (c) There is no provision in the minimum access standard to address specific circumstances whereby it may not be possible to provide a frequency control response because of the physical design of the generating system. This is likely to be an issue for existing generators that may be undergoing upgrade and modernisation works, with such activities invoking the new Rule requirements.

An example in Tasmania is that one particular generating unit is located at the end of a long water delivery system which makes it very difficult to control the unit speed due to the high water start time. Synchronisation of the unit occurs via a rudimentary speed control system however the unit is not 'governed' in a traditional sense once online. Such a unit would be unlikely to satisfy the minimum access standard going forward. While it may be possible seek derogations or 'letters of no action' to cover such events, the opportunity exists to address such issues now.

As a result of the above comments, TasNetworks would like to offer the following.

Automatic Access Standard (\$5.2.5.11)

- c) The *automatic access standard* is:

(3) A *generating system's power transfer* to the *power system* must not:

- (i) Increase in response to a rise in *power system frequency* at the *connection point* unless that increase is:
 - A. Transient in nature; and
 - B. An inherent physical characteristic of the technology used within the *generating system*; and
 - C. A direct outcome of delivering *market ancillary services* to control the measured *frequency* excursion.

- (ii) Decrease in response to a fall in *power system frequency* at the *connection point* unless that decrease is:

- A. Transient in nature; and
- B. An inherent physical characteristic of the technology used within the *generating system*; and
- C. A direct outcome of delivering *market ancillary services* to control the measured *frequency* excursion.

(4) A *generating system* must be fitted with a *control system* capable of automatically:

- (i) Decreasing the *power transfer* to the *power system* in response to a rise in *power system frequency* at the *connection point*; and
- (ii) Increasing the *power transfer* to the *power system* in response to a fall in *power system frequency* at the *connection point*.

(5) The *control system* must:

- (i) Incorporate a *frequency droop* characteristic that facilitates a stable *frequency* control response when the *generating systems* is synchronised to a *network*; and
- (ii) Operate sufficiently rapidly and provide a sustained response over an adequate period of time for the *Generator* to be in a position to offer measurable amounts

of *market ancillary services* to the spot market for each of the *market ancillary services*.

Minimum Access Standard (S5.2.5.11)

d) The *minimum access standard* is:

- (1) *Unaltered from AEMO's proposal...*
- (2) Where a *Generator* can satisfy AEMO and the NSP that a *generating system* is incapable of providing a stable frequency control response due to practical design limitations that cannot be overcome using established control methods, the requirements of paragraph (c)(3) and (c)(4) will be deemed not to apply.
- (3) A *generating system* with a nameplate rating of 30 MW or more must be fitted with a *control system* capable of automatically:
 - (i) Decreasing the *power transfer* to the *power system* in response to a rise in *power system frequency* at the *connection point*; and
 - (ii) Increasing the *power transfer* to the *power system* in response to a fall in *power system frequency* at the *connection point* subject to the *generating system* being able to respond in excess of any plant characteristics that are accepted in accordance with paragraph (c)(1)(ii).
- (4) When necessary to be installed, the *control system* must:
 - (i) Incorporate a *frequency droop* characteristic that facilitates a stable *frequency* control response when the *generating systems* is synchronised to a *network*; and
 - (ii) Operate sufficiently rapidly and provide a sustained response over an adequate period of time for the *Generator* to be in a position to offer measurable amounts of *market ancillary services* to the spot market for at least one of the *market ancillary services*.

Negotiated Access Standard (S5.2.5.11)

- e) A *Generator* proposing a *negotiated access standard* in respect of paragraph (c)(1)(ii) must satisfy AEMO and the *Network Service Provider* that the proposed decrease in *power transfer* to the *power system* is as close as practical to the *automatic access standard* described in paragraph (b)(1)(ii).
- f) AEMO must advise on matters relating to negotiated access standards under this clause S5.2.5.11.

Schedule 5.2.5.14 Active power control

TasNetworks is supportive of the majority of the changes proposed to S5.2.5.14 and is in full agreement with AEMO as to the need and long term benefits of maintaining access to sufficient AGC capability.

Potential issues in relation to small non-scheduled generators are discussed in Question 6.

TasNetworks asks that the AEMC not associate the proposed Rule changes with observed frequency control issues currently being investigated as part of the *Frequency Control Frameworks Review*. TasNetworks believes that the current issues can and will be resolved and are not a justification for seeking to limit future AGC capability from generating systems.

Question 6 Reduction in system size thresholds

TasNetworks agrees with the observations made by AEMO that there is a growing trend for developers to undertake projects in the 5 MW to 30 MW range. TasNetworks is currently aware of

eight projects in the Tasmanian region that have proposed nameplate capacities between 10 MW and 30 MW, two of which are active connection applications. Another four potential projects lie in the 5 to 10 MW range.

Given that known projects already total well in excess of 100 MW, with the likelihood that developments of such scale will continue to be pursued, the operability of the future power system and the potential impacts that such developments will have on power system security need to be considered now. This is especially true for Tasmania where 100 MW of generation is significant and approaches 10 per cent of average network demand (approx. 1100 to 1200 MW). TasNetworks would suggest that other NEM regions would be similarly affected, even if only at a sub-regional level.

S5.2.5.14 (Active power control)

TasNetworks has no issues with the proposed changes to S5.2.5.14 (Active power control) in regards to removing the 30 MW threshold for scheduled and semi-scheduled generators. Such installations require communication capability to meet other Rules requirements and the additional imposts coming from the proposed S5.2.5.14 changes are not considered unreasonable to achieve.

However, consideration does need to be given to the management of small non-scheduled generating units/systems wanting to connect to the distribution network. There are a number of conflicting issues:

- a) While one or more 5 MW (say) generating systems may be immediately accommodated without risk to the broader network, at what point does the cumulative impact of such systems begin to matter? (Argument for seeking more control).
- b) Is it appropriate to start imposing control requirements on the 'last applicant wanting to connect' or build the capability in across all future generating systems even if not required at day one? (Argument for seeking more control).
- c) How is the connection of (say) 5 MW generation blocks any different to the natural growth of embedded, small scale rooftop PV which is allowed to connect outside of the Rules framework? (Argument against seeking more control in this form on the basis of equity).
- d) It could be reasonably argued that the control and communication requirements necessary to meet the minimum access standard may be onerous in some cases and could potentially be too expensive to be absorbed by a small scale project. Is this an appropriate outcome? (Argument against seeking more control on the basis of practicality under some circumstances, especially if communication coverage in the area is limited).

These are almost philosophical issues that go to the heart of the problem facing power system operators in a future world where centralised generation is gradually replaced by more and more distributed energy resources (DER). How to maintain appropriate visibility and control of a power system supplied by multitudinous individual sources?

On the basis that this issue is far too big to fully resolve at this point in time, TasNetworks would like to offer the following alternative arrangement to the minimum access standard that provides for the application of 'engineering judgement' when dealing with non-scheduled generating systems/units.

Minimum Access Standard (S5.2.5.14)

- b) The *minimum access standard* for a *scheduled generating unit or scheduled generating system, or a non-scheduled generating unit or a non-scheduled generating system* connected to a *transmission network*, is that it must have an *active power control system* capable of:
 - (1) Maintaining and changing its *active power* output in accordance with the its *dispatch instructions*; and

- (2) Receiving and automatically responding to signals delivered from the AGC, as updated at a rate of once every four seconds.
- c) The *minimum access standard* for a *non-scheduled generating unit or non-scheduled generating system* that is connected to a *distribution network* is that AEMO or the *Network Service Provider* may request for the purposes of discharging the *power system security* functions set out in Chapters 3 and 4, that it have an *active power control system* capable of:
 - (1) Reducing its *active power* output within 5-minutes to or below the level required to manage network flows that is specified in a verbal instruction issued by the control centre;
 - (2) Limiting its *active power* output to or below the level specified in subparagraph (1); and
 - (3) Subject to energy source availability, ensuring that the change of *active power* output in a 5 minute period does not exceed a value specified in a verbal instruction issued by the *control centre*.
- d) The *minimum access standard* for a *semi-scheduled generating unit or semi-scheduled generating system* is that it must have an *active power control system* capable of:
 - (1) Subject to energy source availability, maintaining and changing its *active power* output in accordance with the its *dispatch instructions*;
 - (2) Subject to energy source availability, not changing its *active power* output within five minutes by more than the raise and lower amounts specified in an instruction electronically issued by a *control centre*; and
 - (3) Receiving and automatically responding to signals delivered from the AGC, as updated at a rate of once every four seconds.

The outcome of the proposed modifications are to provide a decision making framework for AEMO and the NSP to determine whether the control of small, embedded generating system in the distribution network is necessary if the prospect of providing the necessary communication infrastructure is impractical or not economic. Where there is a potential impact on power system security (actual or reasonably foreseeable), the possibility to enforce provision of the control remains. TasNetworks takes the view that any connection to the transmission network should invoke the more strict requirements.

It should also be noted that this proposed change also links with discussions under Question 12 of this submission in regards to the need for an efficient negotiation framework.

While it is acknowledged that this approach doesn't fully address the philosophical questions posed above, it is considered a pragmatic way of moving forward at this point in time.

S5.2.5.13 (Voltage and reactive power control)

TasNetworks is broadly supportive of the changes proposed by AEMO. The need for continuous, predictable voltage control in both distribution and transmission networks is expected to become even more important as greater levels of intermittent generation is connected to the power system. Having adequate means to control network voltages to combat increasingly dynamic power flows is considered essential to the ongoing operability of electricity networks.

TasNetworks would like to offer the following observations in regard to the proposed changes and would also like to offer potential alternate wording to assist with the Rules drafting process.

- a) Given that many wind farms (and potentially solar farms) regulate voltage at the connection point through a droop characteristic, it would be preferable to remove the specific reference to the 0.5% error margin given what it infers.

Change S5.2.5.13(b)(2A)(i) to:

- (i) Regulates voltage at the *connection point* or another agreed location in the *power system* (including within the *generating system*) in accordance with an agreed voltage control strategy which may include the use of reactive droop compensation.

Change S5.2.5.13(d)(3)(i) to:

- (i) Regulates voltage at the *connection point* or another agreed location in the *power system* (including within the *generating system*) in accordance with an agreed voltage control strategy which may include the use of reactive droop compensation.
- b) As many buses in the NEM operate at elevated voltages relative to their *nominal voltage*, (with *nominal* and *normal* voltages being the same in all cases TasNetworks is aware of), it would be preferable to nominate an agreed voltage control range in terms of a 'delta' around an agreed target voltage (which may need to be defined separately). The same issue exists in both the *automatic* and *minimum access standard*.

Change S5.2.5.13(b)(2A)(iii) to:

- (iii) Allows the *voltage* set point to be continuously controllable across a range of at least $\pm 5\%$ of nominal voltage centred on the agreed *target voltage* at the *connection point* or *agreed location* on the *power system* without reliance on a *tap changing transformer*;

Change S5.2.5.13(d)(3)(iii) to:

- (iii) Allows the *voltage* set point to be continuously controllable across a range of at least $\pm 2\%$ of nominal voltage centred on the agreed *target voltage* at the *connection point* or *agreed location* on the *power system* without reliance on a *tap changing transformer*;

Definition of target voltage:

Target voltage

The average (50th percentile) operating voltage defined for a nominated location within the *power system*.

- c) As with S5.2.5.14 discussions above, TasNetworks believes that a degree of 'engineering judgement' should be permitted in relation to the minimum access standard. It may not be practical in all cases for a small embedded generating system in a distribution network to implement voltage control (in the traditional sense) and in some cases such control may not be necessary. TasNetworks would like to make clear that the move toward more generating systems providing voltage control 'as standard' is an appropriate outcome. However it should be remembered that the Rules also apply to distribution networks where smaller generating systems may be successfully accommodated using alternative control arrangements that do not necessarily meet the 'traditional' voltage control definition. It can be noted that the control of active power is a potential solution for some voltage control issues in distribution networks having a low X/R ratio.

TasNetworks would like to suggest that the minimum access standard provide some flexibility for embedded generating units.

Change S5.2.5.13(d)(3)(v) to:

- (iii) Where the *generating unit is an embedded generating unit*, and subject to the agreement of AEMO and the *network service provider*, voltage control may be substituted with facilities that regulate *active power*, *reactive power* or *power factor* (or any combination thereof) in an agreed manner that would assist the *network service provider* achieve the requirements of S5.1a.3 and S5.1a.4.

Change S5.2.5.13(g) to:

TasNetworks would propose that S5.2.5.13(g) be removed to accommodate the changes outlined immediately above. The default position is voltage control unless specifically agreed with AEMO and the *network service provider* therefore the purpose of (g) no longer exists.

S5.2.6.1 (Remote control and monitoring)

With respect to the removal of the 30 MW threshold in S5.2.6.1, TasNetworks is comfortable that the use of the word 'may' in both the automatic and minimum access standards³ provides an opportunity for AEMO, the NSP and the proponent to negotiate what is reasonable and practical, especially in relation to small embedded generating units connected to the distribution network. The alternative phrasing could have been 'must' and this would have been problematic for similar reasons as discussed under S5.2.5.14.

Question 7 Definition of continuous uninterrupted operation

TasNetworks agrees with AEMO that the definition of *continuous uninterrupted operation* should be improved/clarified. The definition needs to better reflect the following criteria which TasNetworks considers to be fundamental for maintaining power system security during and following fault events:

- a) A generating unit should not trip or "block"⁴ as a result of a disturbance that it is expected to ride through.
- b) A generating unit should respond during the fault in a manner consistent with the performance standards that have been agreed. The most significant response characteristic during the fault period relates to the provision of reactive current.
- c) Once a fault is cleared, the generating unit should recover its active power to its pre-disturbance output level in the agreed timeframe (assuming that the input energy source has not changed significantly in this period). Minimising the 'energy deficit' accumulated during any fault ride through response is critical for frequency control and managing rate of change of frequency (ROCOF).
- d) In addition, the generating unit should provide a reactive power response that is consistent with that agreed under S5.2.5.13 (Voltage and reactive power control) to help stabilise network voltages in the post fault period.

Operation should be continuous and the provision of all performance capabilities relevant to the power system operating conditions that prevail, should be provided in an uninterrupted manner. The existing definition does not clearly articulate these requirements.

TasNetworks has reviewed the updated definition published by AEMO in its supplementary material. The definition is considerably improved. TasNetworks would suggest that additional wording is incorporated into section (c) to clarify that active power should be compared with the pre-contingent output level and that any dynamic response agreed as part of the performance standards represents an acceptable cause for active and/or reactive power to vary.

The latter modification may also help address concerns with respect to S5.2.5.4 (specifically the *automatic access standard*). In TasNetworks reading of the Rule, the definition of *continuous uninterrupted operation* does not require continuous provision of rated active power down to 70% voltage as the performance standards of S5.2.5.5 would prevail allowing a reduction in generation output to whatever had been agreed. The additional wording is intended to make the

³ Example from *minimum access standard*: "The remote monitoring quantities referred to under paragraph (d) that AEMO may request include:"

⁴ Power electronic devices may pause or block while still staying connected, however operation is suspended.

interrelationship (and hierarchy) of performance standards clearer when assessing operating conditions outside of the normal envelope.

Definition: Continuous uninterrupted operation

In respect of a *generating system* or operating *generating unit* operating immediately prior to a power system disturbance:

- a. not *disconnecting* from the *power system* except under its *performance standards* established under clauses S5.2.5.8 and S5.2.5.9 and;
- b. during the disturbance, contributing reactive current as required by its *performance standards* established under clause S5.2.5.5; and
- c. after clearance of any electrical fault that caused the disturbance, not varying active power **from its pre-disturbance operating level** or reactive power unless required by **or agreed as part of**, its *performance standards* established under clauses S5.2.5.5, S5.2.5.11, S5.2.5.13 and S5.2.5.14,

with all essential auxiliary and reactive plant remaining in service, and responding so as not to exacerbate or prolong the disturbance or cause a subsequent disturbance for other *connected plant*.

Question 8 **Negotiated access standards requirements under specific clauses**

TasNetworks has reviewed the three clauses highlighted by the AEMC in relation to Question 8. Our comments for each of the specific technical performance standards are as follows.

S5.2.5.5 (Generating system response to disturbances following contingency events)

While TasNetworks supports the intent of AEMO's proposed changes to S5.2.5.5 we believe some changes could be made to clarify its intent. The inclusion of clause (d) raises questions as to whether this is the extent of the negotiated provisions or if other elements of the *automatic* and *minimum access standards* also need to be considered.

Assuming the AEMC is accepting of proposed changes to clause 5.3.4A (Negotiated access standards), TasNetworks would recommend that subclause (d) be removed completely from the Rule drafting of S5.2.5.5 as offered by AEMO. In TasNetworks' view, it offers no meaningful additional information or guidance for negotiating an appropriate access standard for this technical requirement.

Please note additional comments in relation to the drafting of the *minimum access standard* for S5.2.5.5 were included in our response to Question 3.

S5.2.5.11 (Frequency control)

Other than correcting the references presented in paragraph (d) (with reference back to various sections in paragraph (c)), TasNetworks is supportive of this particular change.

S5.2.5.13 (Voltage and reactive power control)

Relevant discussions have already been offered as part of our response to Question 6. In general, TasNetworks is supportive of a move to see more generators operating in voltage control where this provides an obvious benefit to the network. However, given that the Rules also apply to *distribution networks*, it is recommended that the *minimum access standard* retain some flexibility to accommodate small *embedded generating systems* that may be large enough to invoke the Rules framework, but easily (or possibly even better) accommodated by employing a different strategy other than traditional 'voltage control'.

Recommended changes to the Rule drafting have been offered as part of Question 6.

Question 9 Technical standards relevant to the alteration of generating plant/systems

TasNetworks has reviewed the proposed additions to clause 5.3.9 and is supportive of the proposed changes. There is sufficient linkage between the identified performance standards and the altered equipment to justify the additional references in Column 2 of the table⁵.

TasNetworks would propose a further addition to that identified by AEMO. It is suggested that S5.2.5.1 (Reactive power capability) should be added to both *excitation control system* and *voltage control system* on the basis that 'limiters' may well be incorporated into the control systems that directly impact on the reactive capability of the *generating unit* or *generating system* as determined at the *connection point*.

It has been standard practice in Tasmania to review the reactive capability of generating equipment as part of excitation system upgrade projects to assess the impacts of any new excitation limiter settings. This has been undertaken based on 'good engineering practice' in the absence of a formal requirement to do so in the Rules.

Question 10 Jurisdictional issues and harmonisation

TasNetworks considers it very important to have a consistent national approach to *generator access standards* wherever possible. It is in the best interest of all stakeholders to have a common Rules framework that can be applied consistently when assessing new generator connections (and proposed upgrade works) albeit that certain technical issues may be more or less critical in different areas of the NEM due to the characteristics of the local network.

The proposed changes go a long way toward addressing various concerns held by TasNetworks. As outlined in the covering letter, TasNetworks has identified that in Tasmania the minimum access standard is not appropriate for some technical requirements and negotiated performance standards are required. The proposed Rule changes, in conjunction with the proposed changes to the negotiations framework, are consistent with TasNetworks' initial thoughts on what we would be prepared to negotiate for various access standards. The changes would also provide significantly greater leverage to manage negotiation of future access standards.

While the ability to negotiate access standards and work to a common NEM-wide technology-neutral Rules framework brings with it obvious advantages, the one downside is the ability to manage very specific, local issues. While Rules can be written to manage such situations, there is a risk of imposing a broader burden which may not be necessary.

Depending on how the NEM continues to evolve:

- a) There will be an increased need to more regularly review and modify technical requirements within the Rules to keep pace with technological advancements and the identification of new issues related to power system security. TasNetworks' preference is for issues common across the NEM to be managed through the development of universally applied Rules.
- b) Depending on the commonality of issues across NEM regions, there may be future justification in having some limited regional specific technical requirements. These could still be encased in a common set of national Rules. As precedence, it is recommended that the AEMC consider the region specific technical requirements described in the European Network of Transmission System Operators for Electricity (ENTSOE) document⁶ "*Connection Requirements for Generators*". While the areas described are largely connected through

⁵ As provided in part (d) of Rules 5.3.9.

⁶ https://electricity.network-codes.eu/network_codes/rfg/

HVDC links and are not therefore synchronously coupled, the principle outlined here remains the same.

Question 11 Issues with current negotiating framework

In TasNetworks' experience there are difficulties with the current negotiating framework and we are happy to work through these issues with the AEMC. We have found that significant time and effort is expended on iterations of technical studies to demonstrate the requirements of the power system and the justification for seeking higher levels of performance.

A significant issue is the lack of clarity offered by the existing Rules in terms of the purpose of the generator performance standards; specifically whether the standards are designed to manage the 'power system as it exists today', the power system 'as it could be at some point in the future', or both. As already stated, TasNetworks views the generator performance standards as an important planning tool and thus places as much significance on potential future operating scenarios as today's obvious needs. TasNetworks believes that this is the intent of the Rules and sights the National Electricity Objective (NEO) as evidence, specifically the need to manage 'the long term interests of consumers'.

Unfortunately, this position can sometimes lead to discussions with generators such as 'why are you asking for this sort of capability when it is not needed'. In context, it may not be needed today, but may very well be critical in the not too distant future. The relevance of this has become more acute given the rate of change currently being experienced across the power system.

To help combat this issue, and improve the efficiency of negotiations occurring in the Tasmanian region, TasNetworks commenced an initiative in the first half of 2017 to formalise its 'minimum negotiating position' for the connection of new generators. A draft document has been completed which outlines the minimum level of performance that could be tolerated 'in the general case' where specific power system security issues do not demand an immediate higher level of capability.

As an example, TasNetworks has set a minimum acceptable reactive power capability of 0.95 p.f (power factor, leading and lagging) across all active power levels above 20% of *nameplate rating*. This is above the *minimum access standard* and below the *automatic access standard* of S5.2.5.1. The decision to adopt this position was based on a review of Grid Codes applied in other countries and engineering judgement, i.e. what was considered a reasonable contribution from industry standard plant and equipment.

Furthermore, the decision recognised that a future shortfall of reactive power would need to be mitigated by the installation of network based equipment with immediate cost impacts on *customers* via higher network charges. TasNetworks thought it unreasonable that a generator should be allowed to connect today with zero (or near zero) reactive capability when the Rules clearly envisage a higher level of performance to maintain the security and operability of the network longer term.

The objectives of TasNetworks connection requirements initiative were to:

- a) Actively manage the capability and security of the network (existing and future) in the interests of *consumers* (uphold the NEO).
- b) Provide developers with clear expectations of what is required to commence negotiations for connection (increase connection process efficiency).
- c) Manage the hosting capacity of the network to facilitate the future connection of additional renewable energy generators (alignment with broader government and environmental policies).

TasNetworks believes that the same outcomes can be achieved through the proposed changes to the negotiation framework whereby the requirement to commence negotiations at the *automatic access standards* are formalised. The approach still provides access to a negotiated outcome if a generator can demonstrate why automatic access cannot be reasonably achieved. The 'reasonableness test'

could include evidence that equivalent reactive power capability (both in terms of magnitude *and* controllability) necessary to meet the shortfall could be established in the network at lower cost.

Question 12 Rationale for a negotiating framework

TasNetworks supports maintaining a negotiating framework while a common set of Rules exist. As already identified by the AEMC, an alternative approach is to develop technology specific Rules, with potential additional variations depending on the size of the plant and its connection to either a distribution or transmission network. The framework adopted by ENTSOE is a noteworthy example of this type of approach, having enabled the standardisation of generator connection requirements for the entire European Union (EU).

The need to maintain sufficient flexibility is one of the most significant challenges in the current Rule change proposal initiated by AEMO, especially when considering distribution network connections. It also highlights the importance of the changes to 5.3.4A whereby all generators should initially target the automatic access standard and only reduce their offered capability where it is legitimately and demonstrably impractical or cost prohibitive to meet such requirements.

The purpose of the minimum access standard (and associated negotiated access standards) should be to provide options only under such circumstances and not be the least cost pathway for any and all generators to pursue.

The automatic access standard should be viewed as an integral part of the 'planning toolbox' that will enable the power system to evolve in a manageable way while continuing to provide mandated levels of supply security and reliability. The newer concept of 'resilience' should also be considered.

Question 13 AEMO's proposed changes to the negotiating framework

Consistent with the discussions provided in Question 12, TasNetworks is supportive of the proposed changes. Developers looking to connect new equipment to the network are best placed to determine any physical and/or economic limitations that may prevent meeting a particular automatic access standard. They have significantly better access to the experience and cost information sitting with equipment suppliers and designers (relevant to a particular development) than do the NSP sitting on the other side of negotiations.

It follows that it is significantly more difficult for a NSP to demonstrate that a generator 'can' offer something when the initial claim is that they cannot. Transferring the burden of proof to the generator is a reasonable outcome when access to information, on which such decisions should be based, is considered.

The changes are not expected to remove the need for negotiations. As outlined above, this is a reasonable outcome given the broad scope of the Rules. However, what the changes should encourage is the avoidance of unnecessary negotiations where capability is relatively easy to provide at minimal incremental cost as part of an initial design. In this sense, the changes should result in a more efficient process as only legitimate technical issues will be brought to the table for discussion.

As outlined in the introduction, TasNetworks considers that all network users have an increasing role to play in maintaining a secure power system. In this sense, the principles being applied to generators should be considered holistically and encompass plant and equipment being connected by NSPs, MNSPs and customers. While Schedules 5.3A and 5.3 are not part of this proposed Rule change, consideration can reasonably be given to the need for future reviews of these Rule sections.

Question 14 Nature of the issues raised

TasNetworks (like many NSPs) is experiencing an unprecedented level of interest from developers wanting to pursue new generator connections. In the last six months, seven have progressed to formal connection applications totalling over 400 MW of proposed generation capacity. All involve

asynchronous generator technologies in various forms. Over 1000 MW of potential generation capacity is currently registered as connection enquiries.

TasNetworks has identified that in Tasmania the minimum access standard is not appropriate for some technical requirements and negotiated performance standards are required. The proposed Rule changes will make the process of reaching agreement on the required performance standards more efficient and transparent. For example:

a) Schedule 5.2.5.1 (Reactive power)

TasNetworks determines the minimum acceptable technical requirement for each connection application, but has met with opposition in recent times as to the basis of this requirement.

b) Schedule 5.2.5.5 (Generating system response to disturbances following contingency events)

Inclusion of minimum fault current contributions and the definition of maximum active power recovery times under the minimum access standard set clear expectations where previously there were none. TasNetworks has determined the minimum Tasmanian acceptable technical requirement on the basis of foreseeable power system security impacts.

The increase in requirements for multiple fault ride through is also a necessary strengthening of the Rules. As part of connection application assessments, TasNetworks has only felt able to apply 'single shot' auto-reclose in the transmission network and up to three auto-recloses in the distribution network (all based on existing operational practices). This does not provide resilience from multi-fault and reclose events as may occur during storms, bush fires and other extreme events that are low probability but high consequence in nature. The potential impacts of such events were demonstrated in South Australia at considerable economic cost.

c) Schedule 5.2.5.11 (Frequency control)

TasNetworks has been attempting to enforce the existing automatic access standard in regards to the provision of frequency control capability. There has been a clear tendency for intermittent generators not to want to provide this capability on the basis that participation in the FCAS markets is voluntary. Access to future frequency control capability will be important in Tasmania.

d) Schedule 5.2.5.14 (Active Power Control)

The need for continuous control of intermittent semi-scheduled generating systems will become more important as their prevalence increases in Tasmania. The ability to have such generating systems controlled via Automatic Generation Control (AGC) is considered to be advantageous but can only be enforced with a Rule change.

e) Schedule 5.2.5.15 (System strength)

TasNetworks has stipulated a requirement for SCR capabilities (for power electronic based generating systems) on the premise of foreseeable power system security impacts. The Rule change makes clear the requirement to address this aspect of technical performance during the connection application process.

TasNetworks has the view that introducing Rule changes that are consistent with the intent of AEMO's original drafting, but refined based on additional considerations from stakeholders, will better position the industry to deal with the growing influx of new generator connections which are predominantly asynchronous in nature.

Question 15 **AEMO's proposed transitional arrangements**

TasNetworks agrees with AEMO that the Rule changes should be enacted as quickly as possible to minimize potential legacy issues. TasNetworks is currently managing an unprecedented level of

connection activity, with seven connection applications currently in progress totalling more than 400 MW of installed capacity, and numerous connection enquiries on our books. All are based on asynchronous generation technologies. TasNetworks believes it is critical that the changes proposed to the Rules are applied to as many of these connections as possible.

3. Additional recommended updates to the Rules

It is recommended that various references to superseded Australian Standards be updated as part of this review. The references that TasNetworks believes should be reviewed are:

- a) Schedule 5.a1.5 and Schedule 5.1.5 (Voltage fluctuations) – outdated reference to Australian Standard AS/NZS 61000.3.7:2001
- b) Schedule 5.a1.6 Voltage waveform distortion – outdated reference to Australian Standard AS/NZS 61000.3.6:2001
- c) Schedule 5.1.6 Voltage harmonic or voltage notching distortion – outdated reference to Australian Standard AS/NZS 61000.3.6:2001
- d) Minimum access standard of S5.2.5.10 (Protection to trip plant for unstable operation) – outdated reference to Australian Standard AS/NZS 61000.3.7:2001

Both standards that have been sighted have been superseded by more recently published IEC Technical Reports (TR).