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13 July 2018

Mr John Pierce
Chairman
Australian Energy Market Commission
PO Box A2449
Sydney NSW 1235

Lodged online via: www.aemc.gov.au

Dear John,

Draft Rule: Generator technical performance standards

TransGrid welcomes the opportunity to respond to the AEMC's Generator technical performance standards draft rule.

TransGrid is the operator and manager of the high voltage transmission network connecting electricity generators, distributors and major end users in New South Wales and the Australian Capital Territory. TransGrid's network is also interconnected to Queensland and Victoria, and is instrumental to an electricity system that allows for interstate energy trading.

TransGrid supports reforms that will enable both energy and system security services to be provided to consumers at the lowest possible cost. To achieve this and remain consistent with the National Electricity Objective (NEO), changes to the generator technical performance standards must be forward-looking and sufficient, ensuring the capability within the NEM can withstand a variety of foreseeable, present and future operating scenarios. However, it must achieve this in the most cost-effective approach, ensuring the lowest possible cost of establishing new connections is achieved.

We appreciate the opportunity to comment on the AEMC's Generator technical performance standards draft rule. If you would like to discuss this submission, please contact Rebecca El-Khoury on 02 9284 3299 in the first instance.

Yours faithfully

Caroline Taylor

Caroline Taylor
Acting Executive Manager, Regulation

TransGrid submission

Draft Rule: Generator technical performance standards

TransGrid

1. Introduction

TransGrid fully supports efforts to maintain power system security at the lowest cost to consumers and welcomes the opportunity to respond to the AEMC's Generator technical performance standards draft rule determination.

TransGrid is the operator and manager of the high voltage transmission network connecting electricity generators, distributors and major energy users in New South Wales and the Australian Capital Territory. TransGrid's network is also interconnected to Queensland and Victoria, and is central to interstate energy trading.

Australia is in the midst of an energy transformation. This is primarily driven by:

> Changing community expectations and choices.
> Advances in renewable energy technologies and increased penetration of asynchronous generation.
> Retirement of existing synchronous generation.
> Adjustments required in Australia's economy to meet our international climate change commitments.

These changes raise complex issues in relation to the design of the National Electricity Market (NEM), which must adapt and respond to these changes. The framework regulating the NEM must support the planning and operation of power system, and reflect desired policy outcomes – low-emissions, reliable supply of electricity at the lowest cost to consumers over the long run.

TransGrid supports reforms that will enable both energy and system security services to be provided to consumers at the lowest possible cost. To achieve this and remain consistent with the National Electricity Objective (NEO), changes to the generator technical performance standards must be forward-looking and sufficient, ensuring the capability within the NEM can withstand a variety of foreseeable, present and future operating scenarios. However, it must achieve this in the most cost-effective approach, ensuring the lowest possible cost of establishing new connections is achieved.

This submission sets out our views on the draft rule and is structured as follows:

> Chapter 2 sets out some general comments on the key aspects of the draft rule.
> Chapter 3 some specific comments on the generator technical performance standards draft rule.

2. General comments

2.1 Access standards

TransGrid notes that the setting of minimum standards must be very carefully considered, as there is a danger that if they are set too high it may preclude the evolution of the grid to a different, more-efficient way of operating. For example, it is conceivable that sometime in the future frequency control ancillary services (FCAS) will be provided in a manner quite different to the existing approach. As such, while security of the system needs to be maintained, changes to access standards should not be unnecessarily burdensome as this may pose a risk on current and future investments in renewable technologies.

As our generation mix transforms, one possible outcome would be renewable generation providing lower services, controllable loads providing raise services, and frequency regulation provided by storage (batteries and hydro). A minimum standard set inappropriately too high may prevent the efficient use of this diverse supply mix.

2.2 Negotiating framework

TransGrid notes the draft rule has included changes to clarify the aims, roles and responsibilities within the framework and ensure a balance of power in the negotiation. The draft rule requires connecting generators to target the automatic standard, and requires detailed reasons (which may include lack of evidence from the generator) from Australian Energy Market Operator (AEMO) and the Network Service Providers (NSP) to reject a proposed standard which is below the automatic standard.

2.3 Transitional arrangements

As an overarching principle, TransGrid supports rules which facilitate a clear and balanced connection process for generators which can be delivered within timely and reasonable timeframes for all parties involved. A clear and balanced process should support efficient and effective investment and promote the achievement of the NEO.

TransGrid notes that the new rules apply to all newly connected generating systems eight weeks after the date of the final rule determination. Whereas existing connections and those near future connections that have reached a full set of access standards on the commencement date are grandfathered under the current rules. Where existing generators are modified or refurbished they may consider their existing performance as a minimum, the automatic is derived from the new requirements, and the new negotiation framework is used.

It also recommended that any new access standards should recognise legacy issues when being applied to generating systems that are undergoing modifications

The draft rule includes new provisions in the negotiating process that are applied when a negotiation of performance standards relates to the alteration of equipment in clause 5.3.9. The draft rule states that, for alterations, the negotiating range is between the automatic access standard and the generator's corresponding existing performance standard, as opposed to the corresponding minimum access standard which apply to newly connected generators under the National Electricity Rules (NER).

Eight weeks after the final determination timeframe could be challenging as generation connection applicants aim to establish agreed generator performance standards to avoid project delays and rework. The industry may not have the resource capability to process all requests within eight weeks. The draft rule gives would be improved by further consideration or guidance to meeting this timeframe – including issues around resource allocation.

TransGrid suggests that the AEMC quantify the expected amount of assessment work and resources available, and consider a longer timeframe for transitional arrangements. If not, the AEMC will need to provide guidance on an approach to the prioritisation of generation proponents who have submitted an application to connect prior to the commencement of the new rules.

TransGrid notes that the draft rule 11.107.2 requires NSPs to use their best endeavours to provide written notification to all connection enquiry applicants within 10 business days after the final rule determination, and further relevant written information, in some cases in consultation with AEMO, within 20 business days. The draft rule also allows for NSPs to recoup the reasonable costs of providing the written notifications, and as such, may be able to charge the connection enquiry applicant accordingly.

TransGrid does not support draft rule 11.107.2. TransGrid considers that, at a time when resources are stretched, this additional requirement will put further pressure on these resources with little benefit. TransGrid also notes that this requirement may be in conflict with the new connection enquiry requirements under the NER which commenced on 1 July 2018.

Also, in respect of draft rule 11.107.2, TransGrid expects that connection enquiry applicants would not appreciate receiving written notification for a project that they have previously made an enquiry for, accompanied with a bill for the cost of providing such information. Additionally, this draft rule may not be enforceable since the applicants have not provided their consent to enter into a contract in order to be billed.

TransGrid strongly suggests the removal of draft rule 11.107.2. If not, we suggest the modification to the rule so that the NSP is required to use its best endeavours to provide written notification to connection enquiry applicants that they should be aware of the final rule determination when published. TransGrid considers it will be more beneficial to provide notification or advice on the new access standards requirements for proponents who progress their enquiry to application to connect, at that time.

3. Comments on proposed changes to technical standards

The table below provides specific comments on the generator technical performance standards draft rule, unless stated otherwise.

Standard or clause	Statement of issue or other comments	Recommendation
S5.2.5.1 Reactive power capability	TransGrid notes that the AEMC's intention is to leave this standard unchanged, and to add it to the list of AEMO's advisory matters. However, the redrafted minimum access standard is not equivalent to the existing standard. For example, the existing standard allows a generator to connect with a fixed (non-zero) power factor which could be leading or lagging reactive power. The new standard will not allow this and requires a minimum of zero reactive power, thereby requiring unity power factor.	TransGrid suggests the addition of an item under General Requirements requiring a connection applicant to record any condition (e.g. ambient temperature conditions) under which the proposed reactive power capability is specified. The maximum continuous rating (active and reactive) of many new generator connections is a function of ambient temperature.
S5.2.5.13 Voltage and Reactive power control	It is unclear whether or not AEMC's purpose under clause S5.2.5.13 is to drive clause S5.2.5.1.	If it is the AEMC's intention that clause S5.2.5.13 does not drive clause S5.2.5.1, then text within subclause S5.2.5.13(l) should be changed from "must be consistent with" to "are subject to".
	We note that subclause S5.2.5.13(b)(3)(x) of the NER has been deleted in the draft rule.	We propose it be reinstated as a common requirement for both synchronous and asynchronous generating systems.
	Power system stabiliser requirements - technical requirements for a power system stabiliser is only currently defined for synchronous generating systems.	It is suggested that technical requirements be separately specified in the automatic standard for asynchronous generating systems.
	In subclause S5.2.5.13(c1)(1), accuracy definition should be reviewed considering reactive power control mode where MVAr set-point can be specified as 0 MVAr. In this case, 0.5% accuracy is undefined.	TransGrid suggests the set-point accuracy to be defined as a percentage of the MVAr capability range.
	Considering subclause S5.2.5.13(c1)(3), TransGrid notes that when reactive power or power factor control mode is considered,	TransGrid suggests the deletion of part of the subclause as shown below:

	reactive power rise time does not bear any meaning to a 5% voltage disturbance at the location.	"with the generating system connected to the power system, and for a step change in setpoint~~, or a 5% voltage disturbance at the location agreed under subparagraph (1)~~"
	Under subclauses S5.2.5.13(d)(2B)(i) and S5.2.5.13(3)(i), accuracy definition requires further review considering reactive power control mode where the MVAr set-point can be specified as 0 MVAr. In this case 0.5% accuracy is undefined.	TransGrid suggests the set-point accuracy to be defined as a percentage of the MVAr capability range.
S5.2.5.3 Generating system response to frequency disturbances	The changes made may have the effect of reducing both the minimum and automatic standard by allowing additional conditions where continuous uninterrupted operation is not required.	TransGrid seeks to clarify whether this is the intention of the changes.
S5.2.5.4 Generating system response to voltage disturbances	TransGrid considers that the term "continuous uninterrupted operation" as applied in this clause remains ambiguous. Some confusion still exists due to the tying of the prohibition of change in active power to the period after clearance of a fault. Since voltage variation considered in clause S5.2.5.4 may be caused by a disturbance that is not caused by a fault, the draft rule does not always restrict changes to active power. Examples of such disturbances include tripping reactive plant, tripping transmission lines without a fault, and tripping generators. It appears reasonable to require that generators do not trip for voltage disturbances. However, tight restriction of consequential changes in active power output may not be reasonable, particularly for large step changes in voltage. To expect a generator's active power to remain constant (or only drop by 5%) for a 20% step down in voltage seems unreasonable for a minimum.	TransGrid plans and operates its network so that step changes in voltage are limited. Individual pieces of reactive plant are specified so that the voltage change is less than 5% when the plant is switched under most network configurations and conditions. A step change in voltage post tripping of a major network element (e.g. a transmission line) is limited to a maximum of 10%. TransGrid considers that it would be reasonable to restrict the magnitude of the step change of voltage a generator is subject to, without a change in active power output. In addition, TransGrid proposes to make changes to draft rule subclauses S5.2.5.4(a) and S5.2.5.4(b) as underlined below: "… must be capable of continuous uninterrupted operation where a power system disturbance causes the <u>any phase or combination of phase</u> voltage<u>s</u> at the connection point to vary within the following ranges …"
S5.2.5.5 Generating system response to	TransGrid welcomes the amendment of clause S5.2.5.5, in particular; the refinement of the logic and description of the set of events for which continuous uninterrupted operation is required. However, TransGrid notes that some ambiguity remains.	For clarity, TransGrid suggests further amendments to subclause S5.2.5.5(b)(1), as indicated by mark up below:

disturbances following contingency events		"(1) a *generating system* and each of its *generating units* must remain in *continuous uninterrupted operation* for a disturbance caused by: ~~(i) a *credible contingency event* other than a fault referred to in subparagraph (iv);~~ (i~~i~~) a three phase fault in a *transmission system* cleared by all relevant primary *protection systems*; (ii~~i~~) a two phase to ground, phase to phase or phase to ground fault in a *transmission system* cleared in: (A) the longest time expected to be taken for a relevant *breaker fail protection system* to clear the fault; or (B) if a *protection system* referred to in subparagraph (A) is not installed, the greater of the time specified in column 4 of Table S5.1a.2 (or if none is specified, 430 milliseconds) and the longest time expected to be taken for all relevant primary *protection systems* to clear the fault~~; and~~ (iii<u>i</u>~~v~~) a three phase, two phase to ground, phase to phase or phase to ground fault in a *distribution network* cleared in: (A) the longest time expected to be taken for the *breaker fail protection system* to clear the fault; or (B) if a *protection system* referred to in subparagraph (A) is not installed, the greater of 430 milliseconds and the longest time expected to be taken for all relevant primary *protection systems* to clear the fault~~,~~<u>;</u> <u>or</u> <u>(iv) any *credible contingency event* not referred to in subparagraphs (i),(ii) or (iii);</u> provided that the event is not one that would *disconnect* the *generating unit* from the *power system* by removing *network elements* from service; and"

	Undefined, islanding could be construed to include the separation of one region from the rest of the NEM, or creation of an island with a local load.	TransGrid suggests that the term “islanding” in subclauses S5.2.5.5(b)(1A)(vii) and S5.2.5.5(c)(1A)(vi) would benefit from a definition.
	It appears that the intention of the minimum standard definition in subclause S5.2.5.5(c)(1)(ii)(A) is to provide AEMO and the NSP the ability to come to a reasonable agreement in relation to allowing a generating system to not remain in continuous uninterrupted operation for some events. The subclause is prevented from achieving the intention for two reasons: > There is an overlap in the event definitions of subclauses S5.2.5.5(c)(i) and S5.2.5.5(c)(ii), since all of the events of S5.2.5.5(c)(ii) are credible contingency events. Subclause S5.2.5.5(c)(1)(ii)(A) only gives effect to the events defined in S5.2.5.5(c)(ii), and because the events are included in both (i) and (ii), S5.2.5.5(c)(1)(ii)(A) has no effect. > Subclause S5.2.5.5(c)(1)(ii)(A) allows a generator to trip for a single contingency. However, subclause S5.2.5.5(c)(1A), which defines multiple contingencies, does not contain a similar subclause.	TransGrid suggests: > Subclause S5.2.5.5(c)(1)(i) be amended to: “a *credible contingency event* other than a fault referred to in subparagraph (ii); or” > Subclause S5.2.5.5(c)(1A) be appended to include “unless AEMO and the Network Service Provider agree that the total reduction of generation in the power system due to the series of faults would not exceed a limit based on what AEMO and the Network Service Provider both consider to be reasonable in the circumstances;”
	TransGrid notes that there may be an inconsistency between the location of the voltage threshold reference at the generating unit terminals to commence the current injection in subclauses S5.2.5.5(b)(3)(i)(A) and S5.2.5.5(b)(3)(i)(B), and the location of the voltage recovery reference at the connection point at the end of subclause S5.2.5.5(b)(3)(i). A similar inconsistency appears in subclause S5.2.5.5(c)(3)(i).	TransGrid suggests that it would be appropriate for the voltage recovery reference to be consistently referenced at the generating unit terminals.
	The smaller ranges of 85% to 90% and 110% to 112% under the draft rule will remove the ability of the NSP to request a more effective setting outside the ranges.	In our submission to the AEMC’s consultation paper, TransGrid proposed to extend the range for the voltage thresholds to 80% to 90% and 110% to 120% of the nominal voltage in clause S5.2.5.5(i)(4) of the NER. TransGrid does not object to the smaller ranges for the automatic standard. However, we propose changing the ranges for the minimum standard to 80% to 90% and 110% to 120%.

	Subclause S5.2.5.5(h) appears to infer that automatic reclose equipment has the ability to clear faults, which may not be the case.	TransGrid suggests a review of this subclause of the draft standard.
Multiple fault ride through requirement – various clauses	TransGrid notes that various references related to multiple fault ride through requirements remain unclear. TransGrid notes, a lack of definitions across subclauses S5.2.5.5(b)(1A)(i)-(ix) and subclauses S5.2.5.5(c)(1A)(i)-(viii).	TransGrid believes following clarifications are required: > In places where voltage at the connection point is referred to, there is a need to specify if it refers to "any phase". For example, draft subclause S5.2.5.5(b)(1A)(i) refers to 50% voltage but it is unclear whether this refers to all three phases or in any phase. > In places where reactive current injection is referred to, both under the current rules and in the AEMC's draft rule, there is a need to specify if it refers to "in any phase" or "in all three phases". > The present draft rule refers to reactive current injection requirements specified as "facilities capable of". TransGrid seeks clarification on whether the expectation is for the capability only, and that the actual site implementation can be less that the specified capability. > Subclause S5.2.5.5(b)(1A)(iii) refers to one fault cleared in circuit breaker fail protection system with no voltage depression requirement specified. TransGrid seeks clarification on whether subclause S5.2.5.5(b)(1A)(i) requirements are specified with a primary protection system and subclause S5.2.5.5(b)(1A)(iii) requirements are specified with connection point voltage above 50%. Similarly, there is a need to specifically define the requirements relating to subclause S5.2.5.5(b)(1A)(v) in relation to the voltage depression and fault clearance requirements to be applied for this sub-clause.
Minimum standard	The events in the minimum standard defined in subclause S5.2.5.5(c)(1) appropriately do not include faults cleared in the time required by breaker fail. However it is included in such events in subclause S5.2.5.5(c)(1A).	TransGrid suggests that it would be appropriate to remove subclause S5.2.5.5(c)(1A)(ii)

Automatic standard	The clause infers that there are parts of the network where three-phase automatic reclosure is permitted and by inference parts of the network where three-phase automatic reclosure is not permitted. The specific use of the term “three-phase” appears to be alluding to single phase auto reclosure. In TransGrid’s network, a subset of transmission lines have facilities to trip and reclose a single faulted phase. However, the same facilities also have the ability to automatically reclose three-phases.	TransGrid suggests the review of subclause S5.2.5.5(b)(1A)(ii) of setting out the draft automatic standard.
	Notwithstanding subclause S5.2.5.5(i)(3), the general requirements for current injection is not always clear under different scenarios or behaviours.	TransGrid considers that the general requirements for current injection would benefit from a clear description of the behaviour required for balanced and unbalanced voltage depressions. For example, if only a single phase is depressed, it should be made clear whether the generating system should only inject current into that phase, or it is acceptable to inject current into all three phases.
Supervisory control and data acquisition (SCADA) capability	The draft rule assumes that the increased data point capability required through an enhanced compliance obligation can be met by all existing SCADA systems immediately from the commencement date the new rule.	While capability of some systems will be able to cope, this should not be assumed for all systems. TransGrid’s experience demonstrates some of these limitations and constraints including: > Current SCADA hardware (i.e. capacity to manage data points) and software (i.e. functionality to meet Cyber and HV Network security requirements) will reach maximum limit by 2020. > Although TransGrid is currently implementing a SCADA system replacement project, industry experience has shown that it usually takes about 5-10 years (at a minimum) to deliver a new system. > The technical capability and resources to adequately manage the on-going operation and maintenance of SCADA systems are limited. There is also a need for continued development of SCADA systems to ensure they adequately meet their compliance obligations as systems and the operating environment change overtime. TransGrid suggests that these limitations and constraints are reflected in the drafting of the new rules.