Draft report Stakeholder feedback template:

AEMO Review of technical requirements for connection (NER 5.2.6A)

Stakeholders making a submission on the recommendations set out in the AEMO draft report may use the below template to provide feedback. Please consider the confidentiality disclaimer at the end of this document.

Stakeholder: TasNetworks

Schedule 5.2 Conditions for Connection of Generators

Issue	Schedule 5.2 Generator Recommendation feedback
NER S5.2.1 – Outline of requirements	
Application of Schedule 5.2 based on plant type instead of registration category and extension to synchronous condensers	TasNetworks supports the broad principle of applying Schedule 5.2 on the basis of plant type rather than registration category. There are some implications that are worth considering such as who negotiates with whom when a transmission network service provider wishes to connect a synchronous condenser to its own network. There also may be situations where basing standards solely on the type of technology could be unnecessarily restrictive. The same technology could operate in different ways depending on whether it is a load/generation or a network and thus the performance expectations may be different. Additionally, given the increased likelihood of bi-directional connections (as, for example, wind farms include batteries behind the connection point) it could even be challenged why there is a different set of standards for generation and load.
NER S5.2.5.1 – Reactive power capability	
Voltage range for full reactive power requirement	TasNetworks supports the proposed change. TasNetworks already allows a more pragmatic range in our local connection guideline. At the connection point the reactive power supply (export) range is 0.90 p.u to 1.07 p.u and reactive power absorption (import) range is 0.97 p.u to 1.1 p.u.
Treatment of reactive power capability considering temperature derating	De-rating on high temperature is necessary with power electronics but it's critical that the maximum temperature is set appropriately. In Tasmania it would be unusual for multiple generators to be concurrently exposed to ambient temperatures > 35 deg C but not so in many mainland jurisdictions. In particular, the maximum ambient temperatures defined for storage devices requires careful consideration.
Compensation of reactive power when units are out of service	No additional comments.
S5.2.5.1, S5.2.5.5, S5.2.5.7, S5.2.5.8, S5.2.5.10	
Simplifying standards for small connections	TasNetworks supports the concept of simplifying standards when the connection party will have limited impact on the network. However, the definition of 'small' is relative. In Tasmania generators >5MW can have an impact on the network. Currently TasNetworks works with AEMO to determine whether a connection should be exempt from being a scheduled connection and this form of process should be available in networks where small is not <30MW.

Issue	Schedule 5.2 Generator Recommendation feedback
NER S5.2.5.2 – Quality of electricity generated	
Reference to plant standard	TasNetworks supports the removal of superseded standards.
NER S5.2.5.4 – Generating system response to voltage disturbances	
Overvoltage requirements for medium voltage and lower connections	TasNetworks supports this recommendation.
Requirements for overvoltages above 130%	There is a difference between temporary over-voltages (**TOV**) and transient over-voltages. It is not practical to "control" network transient over-voltages with very short time frames. They must be limited with passive devices. The TOV curve is deliberately silent on over-voltages below 0.02s because the TOV curve applies to root mean squared (**RMS**) quantities, which are not defined in sub-cycle time-frames. Lightning strikes and other short-term transients can cause very high voltage "spikes" at the point of connection. It is infeasible to prevent these voltage spikes and it should be clear that system disconnection (trip), which takes 2-3 cycles, does not offer overvoltage protection against such transients. However, with appropriately sized surge arresters, spark gaps etc. the risk to equipment can be acceptably reduced. Network users are obligated to protect their own equipment. Unless the transient over-voltage is due to a fault on the circuit connecting the plant to the rest of the network the plant should ride through. In case of a fault on this local circuit, other protections will trip. This approach aligns with the basic principle of protection discrimination and must be retained. It may be acceptable to allow a temporary insulated gate bipolar transistor (**IGBT**) block (approximately 0.02 s) since, although blocking will not protect the inverter from over-voltage, it could help ameliorate any consequential over-currents. The continuous uninterrupted operation (**CUO**) definition could be amended to allow such a short-term interruptions, e.g.1-2 cycles.
Clarification of continuous uninterrupted operation in the range 90% to 110% of normal voltage	TasNetworks' preference is that equipment should not disconnect for any voltage variations within the continuous operating band. However, a temporary power reduction for voltage reductions of more than 10% may be accepted, where 'temporary' is the time taken for tap-changer response. TasNetworks' preference is that the 10 % reduction is defined as a step change and the proponent is allowed 2s to restore their active power to pre-disturbance levels.
NER S5.2.5.5 – Generating system response to disturbances following contingency events	
Definition of end of a disturbance for multiple fault ride through	TasNetworks supports changing the definition to that proposed in option 4.
Form of multiple fault ride through clause	TasNetworks' preference is for a combination of options 2 and 3. Due to the nature of the Tasmanian network, TasNetworks would use a consistent set of study cases for each connection removing the concern about the level of resources required.
Number of faults with 200 ms between them	TasNetworks supports having the minimum access standard (**MAS**) for Multiple fault ride through (**MFRT**) defined using the six faults and 200 ms combination criteria, and allowing specific limitations to be carved out of these requirements.
Reduction of fault level below minimum level for which the plant has been tuned	Generators should be required to nominate a minimum guaranteed floor for stable operation (down to a short circuit ratio of 3) and a level where they would be permitted to disconnect. This would provide a 'floor' to design to. Tripping should be seen as the last resort. Instead generators should try to stay connected even if that means they are temporarily non-compliant with some aspects of their generator performance standards (**GPS**) during contingency events.
Active power recovery after a fault	TasNetworks supports the proposal to incorporate the changes made for the MAS into the equivalent wording for the automatic access standard (**AAS**).
Rise time and settling time for reactive current injection	From a "control theory" perspective, there is nothing exceptional in the power system's response to reactive current injection even under low system strength conditions and therefore the standard terms commonly used in control theory can remain. The dynamic model acceptance tests (**DMAT**) use a passive single machine infinite bus (**SMIB**) arrangement when assessing such performance and so clearly the observed dynamics are then only due to the

Issue	Schedule 5.2 Generator Recommendation feedback
	equipment under test. Under the controlled DMAT environment (and the similar "SMIB" tests used during "R1" assessment) the formal control theory wording should remain. However, with actual on-site "R2" testing and full model verification, other voltage regulation devices can impact the voltage profile and there is justification at the R2 stage for relaxing the wording.
Commencement of reactive current injection	TasNetworks supports this proposed change.
Clarity on reactive current injection volume and location and consideration of unbalanced voltages	In terms of reactive current, the word "injection" refers to supply, export, boost etc. i.e. a capacitive response and the National Electricity Rules (**NER**) is correctly drafted when referring to positive sequence voltage. However, care must be taken with the definition of reactive current in response to negative sequence voltages. There should be a requirement to minimise voltage deviation (i.e. reduce negative sequence voltage), which should therefore cause the current components that are in negative phase sequence to be absorbing reactive current in response to negative sequence voltages.
Metallic conducting path	TasNetworks supports this proposed change.
Reclassified contingency events	TasNetworks considers that the scenarios a proponent is required to maintain CUO under the MFRT obligation should encompass those credible contingency events of concern.

NER S5.2.5.7 – Partial load rejection

Application of minimum generation to energy storage systems	TasNetworks supports this proposed change.
Clarification of meaning of continuous uninterrupted operation for NER S5.2.5.7	There are several references to "be capable of continuous uninterrupted operation". For clarity TasNetworks proposes replacing the words "be capable of" with "remain in" for all occurrences within the NER.

NER S5.2.5.8 – Protection of generating systems from power system disturbances

Emergency over-frequency response	As noted above, due to the specific issues in Tasmania, TasNetworks prefers option 6 with the threshold being reduced to 5MW, at least in Tasmania.

NER S5.2.5.10 – Protection to trip plant for unstable operation

Requirements for stability protection on asynchronous generating systems	No comment.

NER S5.2.5.13 – Voltage and reactive power control

Voltage control at unit level and slow setpoint change	TasNetworks supports this proposed change.
Realignment of performance requirements to optimise power system performance over expected fault level (system impedance) range – Voltage control	TasNetworks supports this proposed change.
Materiality threshold on settling time error band and voltage settling time for reactive power and power factor setpoints	It may be unduly burdensome to measure the response of Q control and power factor control but if used they must be stable, e.g. provide an adequately damped response.
Clarification of when multiple modes of operation are required	TasNetworks supports this proposed change.

Issue	Schedule 5.2 Generator Recommendation feedback
Impact of a generating system on power system oscillation modes	TasNetworks supports this proposed change.

Definition – continuous uninterrupted operation

Recognition of frequency response mode, inertial response and active power response to an angle jump	These features can benefit the power system so a change to CUO definition should be allowed, as long as the inclusion of such features are included in the relevant clauses of the agreed GPS.

Schedule 5.3a Conditions for connection of MNSPs

Issue	Schedule 5.3a HVDC Recommendation feedback

NER S5.3a.1a Introduction to the schedule

Alignment of schedule with plant-type rather than registration category	TasNetworks supports the broad principle of applying Schedule 5.3A on the basis of plant type rather than registration category. There are some concerns that a blanket application may have unintended consequences and urge AEMO to consider whether the same standards should apply to all HVDC connections or whether some variation in standards depending on circumstances should be incorporated into Schedule 5.3A.

NER S5.3a.8 – Reactive power capability

Reactive power	No comment.

NER S5.3a.13 – Market network service response to disturbances in the power system

Voltage disturbances	No comment.
Frequency disturbances	No comment.
Fault ride through requirements	No comment.

NER S5.3a.4 – Monitoring and control requirements

Remote monitoring and protection against instability	No comment.

New standards

Voltage control	No comment.
Active power dispatch	No comment.

Multiple Schedules

Issue	Multiple schedule Recommendation feedback
NER Multiple clauses	
References to superseded standards	TasNetworks supports amending the references in S5.1.5, S5.1.6 S5.1a.5 and S5.1a.6 to the latest versions without dates.

Confidentiality disclaimer

Under clause 5.2.6A(d)(2), AEMO is required to publish all submissions received about this Review on its website. Please identify any part of your submission that is confidential, which you do not wish to be published. Please note that if material identified as confidential cannot be shared and validated with other interested persons, then it may be accorded less weight in AEMO's decision-making process than published material. AEMO prefers that submissions be forwarded in electronic format.