Update report Stakeholder feedback template:

AEMO Review of technical requirements for connection

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: Organisation name:

Hydro Tasmania. August 2023.

Schedule 5.2 Conditions for Connection of Generators

NER Schedule 5.2 issue	Schedule 5.2 (Generators) – feedback on revised recommendations and relevant draft NER amendments
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	
NER S5.2.5.1 – Reactive power capability	
Voltage range for full reactive power requirement	Hydro Tasmania (HT) acknowledges that NSP is best placed to identify the expected voltage profile of a network, however, without basic nomination principles or guidelines, leaving the 10% centre line nomination to a single party alone, could lead to potential issue when inconsistency is encountered between different participants, e.g. generator A had a centre line nominated at 1 p.u., subsequently generator B is required to have a different centre line at similar location due to the network shift caused by generator A. At most, +/-5% consistent with S5.2.5.13 (2B) (iii), should be allowed if the TNSP is able to nominate the centre line to also avoid conflicts may arise with this clause. Ungoverned TNSP nomination also releases the possibility of the TNSP biasing the centre line prohibitive of achieving 0.395*Pmax, and thus negating the intent of this change. To avoid that, HT suggests that certain principles need to be established. For example, the nomination should be pre-specified and published, ideally in a regional rather than individual unit. This also will help generators to manage the specification of the machine reactive capability in long term.

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	Additional, in the revised recommendation, an identical reactive capability is required for both absorption and injection. As previously submitted, the main power transformer reactive power consumption facilitates the GS leading reactive capability, but being a burden for lagging reactive capability, hence being challenging to be satisfied. The symmetrical reactive power requirement in the proposed rule change doesn't well reflect this fact. HT notices that the revised recommendation used word 'linearly', while it may be ok for the IBRs, it could be challenging for synchronous machines due to its non-linear characteristic between voltage and reactive capability.
Treatment of reactive power capability considering temperature derating	
Compensation of reactive power when units are out of service	HT is of the opinion that this clause fundamentally relates to auxiliary load specification/management, rather than the performance of generating unit, hence putting the requirement to auxiliary loads would be more logical, e.g. auxiliary loads power factor. In order to identify the impact on voltage e.g. [0.5%], obviously, the typical system X/R ratio (as proposed in the calculation) changes as the network evolving, given that, it is recommended: 1) The requirement is applied to new connection application only. 2) Remain the NSP technical judgment in parallel with the threshold, e.g. 0.5%, given the fact that some area in the system could be more robust to voltage variation, whereas some area could be more sensitive.
S5.2.5.7, S5.2.5.8, S5.2.5.13	
Simplifying small connections	The facilities for the TNSP to co-ordinate with AEMO as to whether a connection should be except from a scheduled connection should also be preserved, and in that some flexibility to the discretion of the TNSP in applying 7MW as a firm limit.
NER S5.2.5.2 – Quality of electricity generated	
Reference to plant standard	The proposed change, while maintaining reference to a plant standard, is acceptable.
NER S5.2.5.4 – Generating system response to voltage disturbances	
Overvoltage requirements for medium voltage and lower connections	AEMO recognises HT concerns of simultaneous >V and <f and that whilst a possibility would be rare, however there is no proposal to address this. AEMO notes "This means that technically a plant must be able to remain in CUO for combinations of abnormal voltage and frequency within the levels and durations of S5.2.5.3 and S5.2.5.4 if they occur simultaneously. " However HT proposes that upon inspection of protection settings, few, or no synchronous generators in the NEM would be able to comply with this requirement, nor would be willing to comply with this requirement based on resulting plant damage.

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	In terms of streamlining the connection process, the specific limitations for multiple contingency events causing high V/f ratios should be clear performance standards of a generator can be clearly documented. The typical fluxing capability as per AS/IEC 60034 or IEEE C57 could be referred for new generators.
Requirements for overvoltages above 130%	The clarifications in terms of clearly identifying which voltages ARE RMS and which relate to switching surges are acceptable. The explicit capping of the TOV in the 20 ms period is a sound extension of the rule. The related changes to clauses outside of NER S5.2 are also acceptable. The issue of >V/Hz should also be considered here.
Clarification of continuous uninterrupted operation (CUO) in the range 90% to 110% of normal voltage	
NER S5.2.5.5 – Generating system response to disturbances following contingency events	
Definition of end of a disturbance for multiple fault ride through	
Form of multiple fault ride through clause	•
Number of faults with 200 ms between them	AEMO notes Hydro Tasmania's previous comments on multiple fault impacts on synchronous machines and that "this is an example of a type of issue that the amendment is intended to address". HT is however still unclear on how this may be addressed given proposed MAS will require up to 6 disturbances. I.e There should be better guidelines and carve-outs in the MAS to allow for physical constraints governing the ability for synchronous machine multiple faults ride through where the effort is not in trying to demonstrate academic compliance, but moreover maximising plant capability within its physical limitations without concern of not realising an academic MAS (which may not even present a credible fault ride-thought scenario).
Reduction of fault level below minimum level for which the plant has been tuned	HT agrees that during and after multiple faults, the network condition could change significantly, including fault levels. However, since 6 faults within 200ms assessment is rather academic, it is unclear how this specification is going to be implemented to prove generating system compliance in reality. HT is aware this clause was introduced in 2018 with supporting evidence based on simulation results and historical data, however, very limited information can be found since then. HT would encourage AEMO to put some effort in a guideline,

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	including technical objectives, performance expectations, compliance evaluation practicality based on genuine system events (e.g. Callide event), to facilitate the technical understanding of this clause.
Active power recovery after a fault	•
Rise time and settling time for reactive current injection	•
Commencement of reactive current injection	
Clarity on reactive current injection volume and location and consideration of unbalanced voltages	–
Metallic conducting path	
Reclassified contingency events	
NER S5.2.5.7 – Partial load rejection	
Application of minimum generation to energy storage systems	
Clarification of meaning of CUO for NER S5.2.5.7	
NER S5.2.5.8 – Protection of generating systems from power system disturbances	
Emergency over-frequency response	Would be helpful to accommodate exemptions in the NAS. In case the generating unit can't achieve rapid reduction by 50% due to stability or safety reasons (e.g. hydraulic limitations), subject to NSP assessment and agreement. In addition, HT notes that the mandatory PFR implementation was applied for units >30MW (e.g. dispatchable units), while Hydro Tasmania understands the new threshold e.g. 7MW proposed due to the Tasmania system size, there are handful units (between 7MW and 30MW) in the Hydro fleet will not automatically satisfy the over frequency response requirement based on PFR settings. HT would like to open a separated discussion to find a best practice to accommodate.
NER S5.2.5.10 – Protection to trip plant for unstable operation	
Requirements for stability protection on asynchronous generating systems	Protection response by disconnecting the generating plant from the network always has a risk to amplify the issue, particularly the instability is identified by multiple IRSs in a region. It is HT's view that a reasonable execute hierarchy should be start with control/blocking mechanisms, then backed up by coordinated protection with reasonable time delay. HT strongly opposes the AAS requirement for PMU. At this stage, without detailed technical specifications and verification, this requirement appears premature to be implemented in the rule change. In contrast, there is a dedicated document MASS to specify the technical requirement of FCAS, including logger specification to data requirement.

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	It is HT's view that unless there is an absolute system security concern due to generating system performance, a PMU installation should be a negotiated outcome between the generator and NSP with the MAS requirement only, otherwise there should be no other obligation on the SG to install a PMU and/or any of the associated infrastructure without some form of reimbursement for installation and ongoing management and maintenance costs (this is very different from the FCAS infrastructure which essentially is recovered through FCAS markets). Or with the MAS requirement only to the extent of the SG to facilitate access and connection for a PMU to be installed by the NSP.
NER S5.2.5.13 – Voltage and reactive power control	
Voltage control at unit level and slow setpoint change	
Realignment of performance requirements to optimise power system performance over expected fault level (system impedance) range – Voltage control	
Materiality threshold on settling time error band and voltage settling time for reactive power and power factor setpoints	•
Clarification of when multiple modes of operation are required	–
Impact of a generating system on power system oscillation modes	HT is aware that the acceleration of the IBR has been one of the key drivers of the NER change, unfortunately, synchronous generator doesn't necessarily across in the issue, such as the unique 7-10Hz oscillation mode associated with the GFL inverter tuning experienced in the NEM as mentioned in the consultation draft report, despite synch condenser operation provides fault level support to mitigate the issue. So as big take away, HT would suggest that rather than relying on a consultation process to educate, update and discuss the emerging matters with the participants, can AEMO create a platform, so that the emerging issues, concerns, insights, rule change supporting evidence and discussion outcomes etc. can be shared and recorded in public, timely and traceable manner. As a result, to better engage with the participants and support the 3-5 years once NER change, ultimately, underpin the NEN transformation.
Definition – continuous uninterrupted operation	
Recognition of frequency response mode, inertial response and active power response to an angle jump	•

Schedule 5.3a Conditions for connection of MNSPs

Issue	Schedule 5.3a (HVDC links) – feedback on revised recommendations and relevant draft NER amendments
NER S5.3a.1a Introduction to the schedule	
Alignment of schedule with plant-type rather than registration category	
NER S5.3a.8 – Reactive power capability	
Reactive power	
NER S5.3a.13 – Market network service response to disturbances in the power system	
Voltage disturbances	
Frequency disturbances	
Fault ride through requirements	
NER S5.3a.4 – Monitoring and control requirements	
Remote monitoring and protection against instability	
New standards	
Voltage control	
Active power dispatch	

Multiple Schedules

Issue	Multiple schedules – feedback on revised recommendations and relevant draft NER amendments
NER Multiple clauses	
References to superseded standards	

NER structural amendments

Issue	NER structural amendments – feedback on revised recommendations and relevant draft NER amendments
NER structural amendments	
Drafting principles	
Proposed approach	

Consequential amendments

Issue	Consequential amendments – feedback on revised recommendations and relevant draft NER amendments
Definitions	
Definitions changes	
Technical changes	
Incorporating synchronous condensers	
Additions to information provision	
Relevant system – in relation to small plants exempt from some requirements	
S5.2.5.8 Over-frequency emergency generation reduction requirements	
S5.2.5.8 Protection settings and relationship to ride through clauses	
S5.2.5.8 Conditions for which the plant may trip and recording of conditions	
S5.2.5.8 Network Service Provider liability	
S5.2.5.11 Minimum operating level	
S5.2.5.11 Response direction for bidirectional units taking power from the system	
Drafting changes	
Drafting changes	

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.