Draft report Stakeholder feedback template:

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

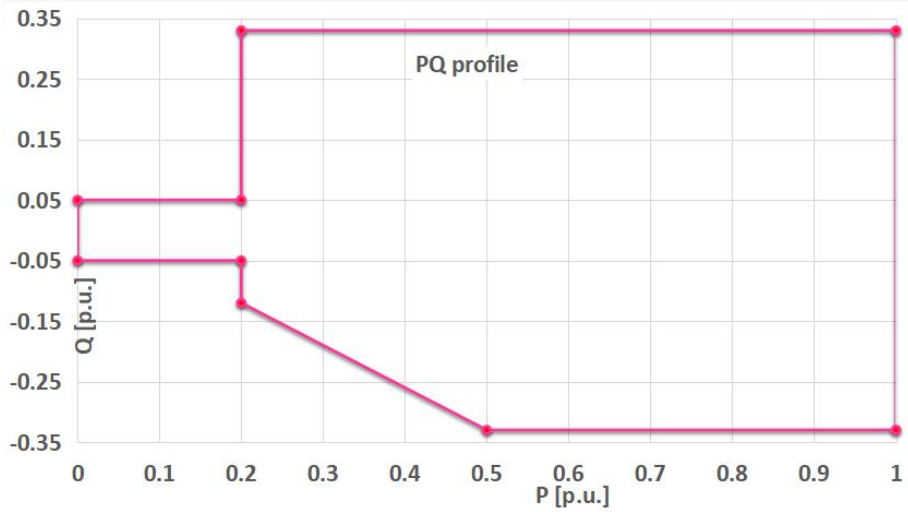
Stakeholders making a submission on the recommendations set out in the AEMO draft report may use the below template to provide feedback. Please consider the confidentiality disclaimer at the end of this document.

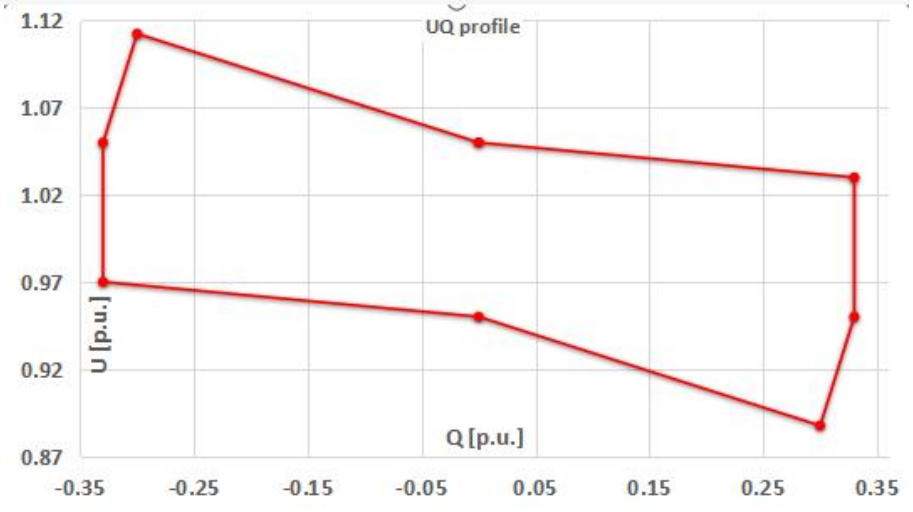
Stakeholder: Bo Yin Renewables Consultancy

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	
NER S5.2.5.1 – Reactive power capability	
Voltage range for full reactive power requirement	Please refer to reactive power capacity in GB grid code below for comparison. Three points needs further discussion. Firstly, As the amount of reactive power needed to regulate voltage to certain level depends on V-Q sensitivity at the regulation point , why reactive power capability of 0.395 pu instead of 0.329 pu should be required? How the amount of reactive power has been determined? Secondly, high inductive Q is needed at high voltage and high capacitive Q is needed at low voltage for voltage regulation. Therefore, UQ profile similar to GB grid code is more preferable. Thirdly, the Q capability defined in 5.2.5.1 is static reactive capacity obtained with the help of OLTC and MSC which might not be able to fully utilized in 5.2.5.13. So there should be no direct link between voltage droop setting and voltage range for full reactive power requirement in 5.2.5.1.
Treatment of reactive power capability considering temperature derating	
Compensation of reactive power when units are out of service	

Issue	Schedule 5.2 Generator Recommendation feedback





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	

NER S5.2.5.2 – Quality of electricity generated

Reference to plant standard	

NER S5.2.5.4 – Generating system response to voltage disturbances

Overvoltage requirements for medium voltage and lower connections	
Requirements for overvoltages above 130%	

Issue	Schedule 5.2 Generator Recommendation feedback
Clarification of continuous uninterrupted operation in the range 90% to 110% of normal voltage	As the CUO requirement if interpreted according to AEMO 's clarificatory document in 2018 will normally require **additional 10-15%** (of the installed plant capacity) reactive power equipment to be installed to fulfil. The suggested option 2 can not reduce the need to install additional 10-15% (of the installed plant capacity) reactive power equipment. Because the voltage dependent PQ capability specified in S5.2.5.1 is static Q capability, it can not be maintained during a voltage step which dynamic Q support is needed. Option 2: reactive capability must be maintained, and active power not substantially reduced, for voltages in the range 90 to 110% of normal voltage for voltage variations up to 10%, (assessed as a ramp over 5 seconds) within the reactive power range and voltage range specified in S5.2.5.1.

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	
Reduction of fault level below minimum level for which the plant has been tuned	
Active power recovery after a fault	May consider different requirement for the extended fault scenario where voltage retains around 70-80% of nominal voltage for a rather long time. In this scenario, active power should not wait until voltage recovers to 90% of .nominal voltage.
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	

Issue	Schedule 5.2 Generator Recommendation feedback
storage systems	
Clarification of meaning of continuous uninterrupted operation for NER S5.2.5.7	

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

Emergency over-frequency response	

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

Requirements for stability protection on asynchronous generating systems	Instability or oscillatory behavior in power plant has two types. The first one is oscillation with constant magnitude which can last several days. The other type of oscillation will build up quickly and eventually trip some of IBRs due to FRT or high DC voltage and etc. It might be very difficult or technology impossible for the generating system or IRS to have a detection device to identify whether the production unit or system is contributing to the instability. The other options such as taking corrective actions such as ramping down or changing control mode are more feasible.

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	It is worth discussing how to specify one droop gain of the voltage control to cover the large range of system impedance. It is worth discussing whether one set of control parameters is expected for the whole wide range of system impedance or a specific set of control parameters for the weakest grid?
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	

Definition – continuous uninterrupted operation

Issue	Schedule 5.2 Generator Recommendation feedback
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 Recommendation feedback
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 schedule Recommendation feedback
NER Multiple clauses	
References to superseded standards	

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