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By e-Submission
Dominic.Adams@aemc.gov.au

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Public

Australian Energy Market Commission
Dominic Adams
Australian Energy Market Commission
Level 6 201 Elizabeth Street
Sydney
NSW 2000

Dear Dominic

Generator technical performance standards

WSP (formally Parsons Brinckerhoff / PB Power) is an international consultancy and has an overall interest in the efficient and effective management of the Australian power system and appreciates that this requires careful coordination between both proponents and network service providers / operators.

Interconnected power systems are complex in nature and requires careful coordination between all parties in both planning and operating the power system. WSP do not represent any stakeholders or their views whether they be proponents, network service providers / operators and the comments provided below are on this context.

We understand that the changing generation mix with increasing levels of inverter connected generation present new challenges in terms of operating and maintaining a stable power system. However, it is also important to understand the implications of these requirements on the National Electricity Objective (NEO) and that the requirements are based on sound engineering reasoning to ensure efficient investment in the industry.

Yours sincerely

Winodh Jayewardene
Technical Executive – Network Connections & Performance

cc: WSP Australia Pty Limited - Paul Williams

Level 27, 680 George Street
Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001

Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
www.wsp.com

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NEGOTIATED ACCESS STANDARDS

REJECTION OF A NEGOTIATED ACCESS STANDARD (NAS)

We note AEMOs preference and the draft rule requirement that a connecting applicant aim for the Automatic Access Standard (AAS). Where the NSP or AEMO reject a NAS we note and welcome the draft rule which stipulates that detailed reasons should be provided along with a recommended negotiated access standard that would be accepted.

For the connecting applicant to be able to understand that the basis of the proposed NAS, the connecting applicant should be provided with any technical information to allow themselves to replicate any studies carried out by the NSP and/or AEMO.

Proposed wording is provided below (changes shown in underline) for the relevant clauses.

S5.3.4A (d1)(1):

> *"…..provide detailed reasons (including any supporting technical data or network information to support the reasons) for the rejection to the Network Service Provider, including"*

S5.3.4A (g)(1)(ii):

> *"…detailed reasons for the rejection (including any supporting technical data or network information to support the reasoning), including the extent to which each of the matters identified at subparagraphs (b)(1), (b)(1A), (b)(3) and (b)(4)."*

DETAILED RESPONSE UNDER SCHEDULE 5.4B AND TECHNICAL REQUIREMENTS

As part of the connection process, NSPs are required to provide details of technical requirements as per Schedule 5.4B(b). This often also includes whether the MAS, NAS or AAS should be met by the connecting party.

It would save all parties significant time and expense if NSPs would advise at this early stage whether a negotiated access standard would be acceptable. The tendency by NSPs is often to err on the side of caution and request compliance with the AAS.

We suggest that the NSP advise if a NAS would be acceptable along with a high-level reason. This will assist the connecting party design the generating system and plan their studies as part of the GPS development associated with the connection application.

For example, an asynchronous generator connecting into a part of the network with high levels of existing harmonic distortion may be required to meet the AAS of S5.2.5.2, but one connecting to a system with low levels of existing distortion may be allowed to meet a NAS.

INDEPENDENT TECHNICAL ADVISOR

Interconnected power systems such as the National Electricity Market (NEM) are highly complex and have very different characteristics depending on the location as well as size and nature of the new generation being connected. NSPs / AEMO arguably have the best understanding of the network and what the specific risks are at a particular location and this knowledge is built up over many years of experience. For the Connection Applicant to demonstrate that a higher level of performance is not required requires both the Connection Applicant and the NSP / AEMO to work together to identify and quantify the risks of not meeting the AAS. It would be very challenging to expect the Connection Applicant solely to demonstrate this and it could result in significant time and cost to the Connection Applicant with no support from the NSP.

If the NSP/AEMO and the connecting applicant cannot agree on a NAS, we suggest the opportunity to appoint an independent technical advisor to assist in mediating on any technical matters. This is similar to the approach adopted as part of the Transmission Connection and Planning Arrangements rule change.

GENERATING SYSTEM RESPONSE TO VOLTAGE DISTURBANCES

S5.2.5.4 AND CONTINUOUS UNINTERRUPED OPERATION (CUO)

We note the draft amending rule has some updates to the definition of CUO however it is largely unchanged from the current rules. There has been much debate in the industry (https://reneweconomy.com.au/new-rules-create-major-road-hump-for-wind-and-solar-projects-67685/) around interpretation of this clause and AEMO have published a document which states their expectations on allowable changes in active power (P) over various voltage changes. This document can be viewed here - http://www.aemo.com.au/-/media/Files/Electricity/NEM/Network_Connections/Transmission-and-Distribution/Clarification-of-S525-Technical-requirements.pdf (referred to below as “the Document”).

The Document makes two key points:

1. Reduction of P following a change in voltage from the typical connection point voltage to 90% is not acceptable
2. A step change in voltage greater than 10 % should be allowed as part of the plant design.

It is noted that the draft rule is not consistent with the approach in the Document, can cause confusion to connection applicants and result in increased costs because:

1. The typical operating voltage at the connection point varies from location to location. It can vary from 100 % to up to 107 % in some parts of the network (theoretically up to 110 %). Allowing for a voltage step change from 110 % down to 90 % would equate to a step of up to 20 %. Designing for a step change greater than 10 % will have a direct impact on capital cost for projects.
2. Except in the case of a contingency event, the voltage should not vary by more than 10 % of the normal voltage. Requiring equipment to be designed for a voltage step change greater than 10 % is not an efficient investment in the industry where this 10 % figure is consistent with the Rules.
3. There is the opportunity to increase the normal voltage to allow for this higher than nominal operating voltage, however we understand that NSPs are reluctant to go down this path as it requires AEMO approval and also coordinating with other participants.

We suggest that the AEMC consider providing clarity with regards to wording in the draft rule and the Document in order to provide certainty to all parties..

RIDING THROUGH VOLTAGES GREATER THAN 130 %

In relation to the draft rule S5.2.5.4(a)(1) the requirement states:

> *"over 130% of normal voltage for a period of at least 0.02 seconds after T(ov) "*

We note that the requirement for 'over 130% does not provide an upper limit. For example, is the expectation to withstand 140% for 0.02 sec, 180 % for 0.02 sec or more?

We suggest that the AEMC consider providing an absolute upper limit and duration. For example, 140% for 0.2 sec.

GENERATING SYSTEM RESPONSE TO DISTURBANCES FOLLOWING CONTINGENCY EVENTS

MULTIPLE FAULT RIDE THROUGH AND EXCLUDED EVENTS

In the event of multiple faults where either of the following occur:

- Instability caused by the multiple faults
- Reduction in system strength due to disconnection of other generating units or parts of the network

We believe it would be reasonable to allow generating units to disconnect and hence propose the following additional clauses to the draft rule S5.2.5.5(b)(1A).

> *"S5.2.5.5(1A)(x) cause the generating unit's active power, reactive power or voltage at the connection point to become unstable as assessed in accordance with the power system stability guidelines established under clause 4.3.4(h)."*
>
> *"S5.2.5.5(1A)(xi) cause a material reduction in system strength by removing network elements or synchronous generating units from service affecting the stability of the generating system;"*

Similar additions are recommended for the MAS.

RECORDING OF REACTIVE CURRENT CONTRIBUTION AMOUNT

The draft rule states the following with regards to recording the reactive current response.

Clause S5.2.5.5 (b)(1A)(5)

> *"For the purposes of subparagraphs (b)(2) and (b)(3), the performance standards must record the capacitive reactive current response and inductive reactive current response (where applicable) agreed with AEMO and the Network Service Provider."*

This may be interpreted as requiring a response waveform and understand that the intent is to capture the percentage contribution and hence propose the following change:

> *"For the purposes of subparagraphs (b)(2) and (b)(3), the performance standards must record the capacitive reactive current ~~response~~ and inductive reactive current ~~response~~* <u>contribution determined as per (b)(3)(i)(A) and (b)(3)(i)(B) respectively</u> *(where applicable) agreed with AEMO and the Network Service Provider."*

100 MW REDUCTION AND CAPABILITY UNDER THE MINIMUM ACCESS STANDARD

The draft rule clause S5.2.5.5(c)(1)(ii)(A) states:

> *"AEMO and the Network Service Provider agree that the total reduction of generation in the power system due to that fault would not exceed 100 MW, or a greater limit based on what*

AEMO and the Network Service Provider both consider to be reasonable in the circumstances; and"

Where a greater limit than 100 MW is considered reasonable by the NSP and AEMO, the connection applicant would benefit in understanding the technical reasons as to why this greater limit is applied hence the following is proposed for this clause:

> *"AEMO and the Network Service Provider agree that the total reduction of generation in the power system due to that fault would not exceed 100 MW, or a greater limit based on what AEMO and the Network Service Provider both consider to be reasonable in the circumstances (including providing detailed technical reasons as to why a greater limit is suitable); and"*

GENERAL REQUIREMENTS AND SYNCHRONOUS GENERATOR CONTRIBUITON

The draft rule clause S5.2.5.5(j) states:

> *"For a generating system comprised solely of synchronous generating units, the reactive current contribution may be limited to 250% of the maximum continuous current of the generating system."*

Other sections of this clause S5.2.5.5 refer to the contribution at the generator terminals (eg S5.2.5.5(b)(3)(i)(A) hence clarification should be given for this clause as to where the contribution is measured.

A similar comment applies to clause S5.2.5.5(k)

VOLTAGE AND REACTIVE POWER CONTROL

REGULATING VOLTAGE TO THE NORMAL VOLTAGE (AAS AND MAS)

Clause S5.2.5.13(b)(2B)(iii) states:

> *"allows the voltage setpoint to be continuously controllable in the range of at least 95% to 105% of normal voltage at the connection point or agreed location on the power system, without reliance on a tap-changing transformer;"*

In the case of a small generator connected onto a strong part of the network where the operating voltage is higher than the normal voltage (for example 1.04 pu). The small generator would not have sufficient reactive power capability to regulate the voltage down to the normal voltage (usually 1pu).

We propose the following amendment to this clause such that the above concern is addressed:

> *"allows the voltage setpoint to be continuously controllable in the range of at least 95% to 105% of ~~normal~~ agreed target voltage at the connection point or agreed location on the power system, without reliance on a tap-changing transformer, and subject to the reactive power capability established under S5.2.5.1;"*

A similar comment applies to the MAS under clause S5.2.5.13(d)(2B)(ii).

ACTIVE POWER CONTROL

AGC CAPABILITY FOR SYSTEMS LESS THAN 30 MW

Under the MAS, clause S5.2.5.14(b)(3)(iii) requires:

> *"receiving and automatically responding to signals delivered from the automatic generation control system, as updated at a rate of once every four seconds (or such other period specified by AEMO as required)."*

This requirement is placed for the MAS and although this can be implemented locally, it can present challenges for small distribution connected generators without a communications interface with AEMO and result in substantial costs to the project.

We suggest that the AEMC consider removing this requirement to receive AGC signals for the MAS which could otherwise result in significant cost to smaller generators where they are not required to receive AGC signals.