2 May 2022

NSW Department of Planning, Industry and Environment

Lodged via email: Electricity.Roadmap@dpie.nsw.gov.au

Dear Sir/Madam,

NSW REZ access standards intended to apply to Central-West Orana REZ: consultation package

The Clean Energy Council (**CEC**) is the peak body for the clean energy industry in Australia. We represent over 1,000 of the leading businesses operating in renewable energy, energy storage and renewable hydrogen. We are committed to accelerating Australia's clean energy transformation.

The CEC welcomes the opportunity to comment on the NSW Department of Planning, Industry and Environment's (DPIE, the Department) Consultation Paper on the Central West Orana (CWO) Renewable Energy Zone (REZ) draft Access Standards as part of the Electricity Infrastructure Roadmap.

This submission was prepared on the advice of Engevity and has built on the detailed input from a range of CEC members.

The development of effective and equitable arrangements for maintaining security and resilience, while maximising the hosting capacity of the various NSW REZ developments, is a high priority area for the CEC. In general, the CEC is supportive of the approach taken by EnergyCo to try and find the most efficient way to connect and host the large number of generators expected in the REZs. We have provided a number of detailed comments to improve on what is already a solid foundation for a new connection process.

EnergyCo's decision to provide flexibility by relaxing the NER generator access standard requirements for some of the proposed NSW access standards is welcome and will assist in addressing challenges during the connection process.

However, the introduction of some other new requirements appears to be at odds with some of these pragmatic relaxations. In particular, onerous requirements related to SCR standards and reactive power capabilities may materially increase costs for connecting generators and ultimately for NSW energy customers.

The historic approach to generator performance standards in the NEM is for generators to bear excessive responsibility for providing security and resilience capability, through the focus on a 'bottom up' approach, where generators are required to bring significant capabilities when connecting, in the name of system resilience to uncertainty. This has resulted in material delays in the connection process and has increased capital costs, all of which are passed onto customers.

The CEC acknowledges that generators have a role to play in maintenance of overall security and resilience of the system; this is the whole point of requiring generators to meet access standards. In some cases, it may be reasonable for certain generators to make changes, or install additional

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equipment, in order to maintain a reasonable level of system security. However, if this is taken too far, there is a real risk of redundant or scale inefficient assets being constructed, all of which can add significant cost and delay to the connection of new generation, creating cost and potentially reliability impacts for customers.

We consider that secure and resilient outcomes can still be maintained, through more equitable approaches that take advantage of scale economies to deliver system needs. The CEC therefore encourages EnergyCo to consider how responsibilities are best shared between Network Service Providers (NSPs), AEMO and generators to deliver overall system hosting, security and resilience targets.

In particular, the CEC suggests that EnergyCo consider the system strength model developed through the *Efficient management of system strength on the power system* rule change, which are now being implemented by AEMO. This approach, which was generally supported across industry, NSPs and across the planning and operations sides of AEMO, allows for utilisation of the many scale efficiencies that are available only to NSPs and AEMO for the provision of this critical system service. The CEC is concerned that any significant deviation from this approach, particularly through the application of particularly onerous access standards for SCR in the NSW REZ, creates a marked risk of decreased efficiency and increased costs for consumers.

The CEC also encourages EnergyCo to reassess the focus on requiring generators to meet a single access standard at the initiation of a project, with no room for negotiation of any standards. While this may in theory deliver some efficiencies through reduced negotiation time, it can also lead to inefficient overbuild of assets, to provide generator capabilities that may be unnecessary or even inappropriate for the point of connection.

EnergyCo should reassess its various proposed changes in light of the proposals being considered through the connection reform initiative (CRI). The CRI represents a new way of collaborative working between AEMO and industry, and will help deliver regulatory reforms that benefits generators, NSPs, AEMO and customers.

EnergyCo should also consider how the proposed changes in the CRI related to minimum access standards for S5.2.5.5, might be utilised and drawn into the design of the NSW Access standards and connection process. The CRI has identified that certain of the S5.2.5.5 requirements may be inappropriate in some network conditions and has therefore identified that a ‘zero minimum’ for these standards may be appropriate in some conditions. Similarly, a zero minimum might be appropriate for some of the requirements under S5.2.5.1, on the basis that reactive support from generators may not be needed in certain parts of the network, leading to the installation of redundant and costly assets.

We therefore recommend that EnergyCo consider whether a negotiated / range-type approach to setting the REZ access standards might be more appropriate in some specific circumstances, for certain access standards, particularly S5.2.5.1 and S5.2.5.5.

Finally, we have identified that PoC requirements for some of the standards may not be appropriate and could have the effect of materially increasing the cost of connections. The proposed SCR requirement of 1.8 under access standard S5.2.5.15 is particularly likely to be problematic here.

By way of supporting evidence for the above, we tested these proposed standards with a solar PV and two wind turbine OEMs, who agreed with the materiality of the issues we have identified with S5.2.5.5 and S5.2.5.1. These OEMs identified that they could not meet the PoC requirement without the installation of additional equipment such as syncons or additional reactive plant.

The following high-level comments are provided and a response to each of the key REZ access standards is provided in the following section.

1. The need for generators to accept performance **(the REZ Access Standard) prior to commencement of project specification and construction presents a risk to generators** - commitment to meeting this performance in the absence of any design information, Original Equipment Manufacturer (OEM) and generating unit selection or undertaking any power system studies is the key concern. Performance is usually developed based on actual design and power system information, not prior to equipment selection or assessment of the characteristics of the power system.
2. Investment certainty to generators to connect to the CWO REZ based on the draft REZ Access Standards can only be met by including additional reactive plant such as static synchronous compensators (STATCOMs) (S5.2.5.1), synchronous condensers (syncons) (S5.2.5.15) and excluding use of Doubly Fed Induction Generation (DFIG) technology (S5.2.5.1). This would result in **additional costs** for generators which will ultimately be passed on to consumers.
3. A **'top down' approach is required to support the 'bottom-up'** approach in the REZ Access Standards. The REZ Access Standards are considered the 'bottom-up' approach to specifying power system requirements by imposing technical capability obligations on generators. However, these bottom-up obligations should be balanced with a 'top-down' assessment considering whether network level solutions can be utilised, such as for reactive power and system strength in particular. Developing an optimised solution that draws on both the top-down and bottom-up approach is the best way to identify the overall least cost solution to address power system needs.
4. The **batching process** is generally welcome and may help to alleviate many of the challenges previously faced. The responsibility for tuning however is not clear and requires clarification. Furthermore, EnergyCo should consider the key learnings from the CRI process on development of this approach and look to coordinate with AEMO as the next stage of this work is progressed.
5. Management of **risks associated with future changes in the power system** (such as an increase in rate of change of frequency (ROCOF) or reduction in synchronous fault levels) should not solely be the responsibly of generators but rather managed by sound power system planning. As identified in point 3 above, this is crucial to delivering lowest cost energy for consumers in the long run.

S5.2.5.1 Reactive power capability

No.	Item	Comment	Recommendation
1	Relaxation of the performance requirements below the Automatic Access Standard (AAS)	The CEC in principle welcomes the relaxation of requirements, and this is expected to result in cost savings to generators by avoiding the need to install additional reactive plant or oversize the installed plant. This will in turn reduce the cost of investing in new generation, which will flow through to lower costs for consumers. Refer comment four below regarding challenges in prescribing performance requirements in the absence of any design information.	
2	(Full) reactive power requirements at low output.	Some technologies (e.g., DFIGs) cannot meet these requirements at low output (<10 % of the Maximum Capacity) as reactive power is limited to around 10 % to 30 % of the full capability due to the converter size. Note that DFIGs have other benefits to the power system not provided by full converter WTGs so should not be excluded based on low output reactive power capability. Additional reactive plant will be required to meet the draft REZ standard (dynamic plant such as SVC/STATCOM or complex reactor/capacitor bank switching arrangements)	1. Relax the requirements in the draft REZ Access standards for reactive power at low output (<10 % of the Maximum Capacity). 2. Define the Rated Active Power (and hence application of S5.2.5.1) from 10 % to 100 % of the Maximum Capacity
3	Requirement to meet REZ access standards at 1.1 per unit (pu) and 0.9 pu voltages for MV connected Generating Systems without a power transformer	This is a barrier for projects connecting at MV. Assessment of this clause allows for reliance on a tap changer and hence projects connecting at MV will be at a disadvantage compared to the same size project with a power transformer and onload tap changer.	The CEC recommend that this clause be assessed on the HV side of the connecting power transformer (fitted with an OLTC). Hence creating a level playing field for such generating systems.

4	Need to meet the REZ Automatic Access Standard	The CEC understand that the driver to meet the Automatic Access Standard is to avoid the need to follow the negotiation process with AEMO and hence streamline the connection process. Given the various asynchronous technology types proposed and varying balance of plant design, commitment to meeting the proposed REZ Access Standard is not possible in the absence of any concept or detailed design.	1. Allow a negotiated access standard for this clause or allow a margin of error in the proposed REZ Access Standard. 2. The reduced capacitive reactive power capability at high active power output be reduced from 90 % to 80 % of the rated active power given the increased losses, particular on larger Generating Systems.

Justification for deviation from the draft REZ Access Standard

Power system impacts	*The power system and / or REZ network infrastructure needs will drive the reactive power requirements of all generators. In the absence of any information on the power system needs (for example by undertaking PV or QV assessments), impacts of an individual generator on the wider power system cannot be assessed.*
Technical plant impacts	*Additional reactive plant will likely be required to meet the prescriptive requirements.*
Commercial impacts	*Additional capital expenditure to install reactive plant. Risk of not being registered due to ability to meet the REZ performance standards (see below)*
Risk	*Ability to meet this REZ Access Standard is dependent upon:* • *The selected generating unit make and model (hence its reactive power capability)* • *Detailed design (cable data and transformer impedances, the latter of which results from factory acceptance testing is required)* *Neither of these are known at the time a generator is expected to commit to meeting the REZ Access Standards and hence there is a risk that a Generating System may not be able to meet the REZ Access Standard which would only eventuate prior to Registration.*

S5.2.5.3 Generating system response to frequency disturbances

No.	Item	Comment	Recommendation
1	+/-6 Hz/sec ROCOF	The basis of needing to withstand this very large ROCOF is unclear noting that the 4 Hz/sec ROCOF in the NER is already set at a high level. The CEC also notes the following • Need to withstand or plan the power system for this higher level has not been identified in AEMO's ISP. • There are likely to be synchronous machines within the REZ (pumped hydro or synchronous condensers). Both of which will not be able to maintain synchronism for such a large ROCOF. • A +/- 6 Hz / sec ROCOF exposure for generators within the REZ would require the NSW electricity network to be exposed to the same ROCOF. This has not been identified as occurring for either a credible event or a protected event and the risk of NSW islanding is considered unlikely. Any future changes to the power system are planning issues and should not be one that REZ generators should have to manage. • Under Frequency Load Shedding is likely to be ineffective at a ROCOF of 6 Hz / sec (for example in SA, UFLS is only effective up to a ROCOF of 3 Hz/ sec).	Revert the requirement for withstanding a +/- 6 Hz / 0.25 sec and +/- 3 Hz / 1 sec ROCOF to what is presently in the NER.

Justification for deviation from the draft REZ Access Standard

Power system impacts	*None expected (power system will be planned to manage a ROCOF of 4 Hz/sec by procuring the required FCAS or inertia services.*
Technical plant impacts	*Where synchronous condensers are required to be installed, they are unlikely to maintain synchronism for a ROCOF of +/4 Hz for 0.25 seconds.*
Commercial impacts	-

Risk	*Inability to meet the requirement of the draft REZ Access Standard*

S5.2.5.4 Generating system response to voltage disturbances

No.	Item	Comment	Recommendation
1	Generating Systems Connecting at Medium Voltage (without a power transformer fitted with an OLTC)	The CEC understands that projects connecting to the REZ will be 250 MW or greater in capacity. Hence it is not clear how/why a MV connection would be appropriate for such a large capacity (the highest current rating for 33 kV switchgear being ~142 MW (2,500 A).	Clarify the need for connecting Generating Systems at MV.
2	Applicability of overvoltage limits for MV connections	The CEC welcomes the draft standard to have overvoltage limits applied at the high voltage side of the associated power transformer fitted with an OLTC ("Point of Application").	
3	Continuous Uninterrupted Operation (CUO) and MV connections	Assessment of CUO for voltage step changes and ability to maintain active and reactive power is typically assessed at the connection point. The methodology to be applied under the draft REZ Access Standards is not clear for MV connections.	Consistent with the assessment for over-voltages, the CEC recommends that CUO be assessed at the 'Point of Application' for MV connected generating systems.

Justification for deviation from the draft REZ Access Standard

Power system impacts	*No change when compared to a Generating System which has a power transformer fitted with an OLTC*
Technical plant impacts	*As per above.*

Commercial impacts	-
Risk	-

S5.2.5.5 Generating system response to disturbances following contingency events

The CEC in general welcomes the relaxation of some of the performance requirements under S5.2.5.5. The ability to meet the REZ Access Standard in the absence of equipment selection, design information and network information however presents a risk to generator connections that will not be mitigated until power system studies are undertaken as outlined below.

EnergyCo has based many of the performance criteria under this clause based on a statistical comparison of other generators in the NEM. The CWO REZ however will be the first of its kind in the NEM with over 3 GW of asynchronous generation connected in close electrical proximity, hence historical data will not be a reliable indicator of future performance. If a statistical comparison is to be used, it should be based on a subset of the wider NEM with a similar power system (e.g., similar asynchronous penetration levels, synchronous fault level and X/R ratio).
The CEC recommends that there be an overarching mechanism accessible to the NSP and AEMO to allow the REZ Access Standards to be tailored, based on power system needs, if there are risks to power system stability or security. This will only be known while undertaking the batched power system studies. EnergyCo should look to the work being done around clause S5.2.5.5 in the CRI, which recognises the value of relaxing the minimum levels of capability under this clause where it is the most appropriate outcome given network conditions.

No.	Item	Comment	Recommendation
1	Commitment to performance in the absence of any technical information	The CEC is concerned that generators are expected to commit to performance requirements (and risk not being connected if these requirements cannot be met) in the absence of any of the following: - Technology selection - Concept or detailed design development - Unknown network conditions (synchronous fault level and X/R ratio)	-

		- Power system studies	
2	Active Power Recovery (APR) time of less than 250 ms	- A longer APR of up to 250 ms is generally welcome. A longer time of up to 300 ms is likely required for grid forming inverters. - Post fault APR time is not solely a function of the technology & tuning of an individual generator, it is a function of the external network (synchronous fault level and X/R ratio). Weaker networks with high proportions of IBRs generally require a longer APR to not exasperate post contingency over-voltages. - In the absence of any network information at each of the connection hubs or wider network studies it will not be possible to comment on the appropriateness of the proposed 250 ms APR time.	-
3	Reactive current (iq) contribution	- Specifying requirements at the terminals is generally welcome - The terminal requirement being subject to at least 2 % at the connection point effectively requires both 4 % at the terminals as well as 2 % at the connection point. Having both of these requirements will limit the options for developing solutions behind the connection point (e.g., if reactive plant is installed on the MV bus to meet 2 % at the connection point, there shouldn't be a need for 4 % at the terminals). - CEC members have provided differing feedback on the 2 % at the connection point requirement. Some feedback accepts a 2 %, ranging to others who argue for no contribution or a terminal requirement only. The biggest concern is that the 2 % figure can be difficult to meet in weak grids and/or large projects and will require the installation of reactive plant (synchronous condensers) when there may not be any need to provide 2 % from a network requirements perspective. The issue is not related to tuning capability, but the physics of the power system during the fault where large amounts of reactive current	1. Reactive current contribution should be either at the terminals or connection point but not both. 2. Remove the need to provide 2 % at the connection point if there is a need for multiple generators to install additional reactive plant behind the connection point where a centralised solution would be more efficient. 3. Exempt grid forming inverters from the iq rise/settling time requirements (as are synchronous generators)

		injection can result in large changes in voltages due to the low fault level. - There are likely to be system strength solutions within the REZ upstream of the connection points which would provide reactive current during contingencies. A centralised solution would be more efficient than stipulating prescriptive requirements for individual generators (e.g., a single STATCOM to support network voltage would be more efficient than multiple individual generators having their own synchronous condensers). - Grid forming inverters perform similar to synchronous generators and cannot meet the iq rise and settling time requirements.	
4	Reactive current rise/settling time and damping	The relaxation of the rise time and removal of the settling time is generally welcome and a slightly longer rise time is recommended. The need for an adequately damped response over the duration of the fault will be problematic due to the challenges in assessing damping while faults are applied and there are changes in voltage (and hence changes in current).	1. Allow an iq rise time of 40-80 ms. 2. Replace the requirement for 'an adequately damped response over the duration of the fault' to ensuring the 'iq response does not exacerbate or prolong the disturbance'.
5	Grid forming Inverters and inductive reactive current	The requirement for inductive reactive current (6%) is unrealistically high for grid forming inverters and is best managed by appropriate system level solutions based on appropriate planning studies.	Remove the requirement for grid forming inverters to provide inductive reactive current.

Justification for deviation from the draft REZ Access Standard

Power system impacts	*Power system needs should be assessed based on both Generating System capabilities as well as power system needs and assessing the option of providing network-based solutions. E.g., Given the large power transfer capability of the CWO REZ and the long HV and EHV transmission lines, reactive plant is likely to be required at the energy hubs and placement of reactive plant should be based on the network and power system needs.*
Technical plant impacts	-
Commercial impacts	*The need for any auxiliary plant (and associated costs) to meet performance requirements are subject to the outcome of batched studies which are yet to be undertaken. This creates uncertainty to debt and equity providers and increases project risk.*
Risk	*Commitment to performance in the absence of technology selection, design information and any power system studies presents the largest risk.*

S5.2.5.10 Protection to trip plant for unstable operation

The CEC appreciates the importance of identifying voltage oscillations in the power system and, where possible, whether a generator is contributing to an oscillation. There are however challenges that will need to be resolved to implement such a system in real-time:

- Computing generator contributions to oscillations is challenging when undertaking post event analysis, let alone in real-time and there is no accepted and demonstrated methodology in the NEM. For example, the cause of 19 Hz oscillations in the West Murray Zone[1] are still relatively unknown despite months of analysis of large amounts of data.
- The frequency of oscillations due to control interactions is extremely wide and unpredictable when compared to electro-mechanical oscillations.

[1] https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/participate-in-the-market/network-connections/west-murray

- A solution for computing if a generator is contributing to an oscillation neither exists in the NEM nor has been accepted by NSPs and AEMO

No.	Item	Comment	Recommendation
1	Confirmation of design for instability detection	This is proposed to be confirmed with the NSP / AEMO prior to registration and is likely too late in the connection process to alleviate connection risk.	The algorithm for computing generator contributions to oscillations and suitable equipment be agreed during the design phase, well before registration given the novel nature of the proposed solution.

S5.2.5.13 Voltage and reactive power control

No.	Item	Comment	Recommendation
1	Need for a Power Oscillation Damper (POD)	The need for a POD should not be mandated in the absence of any power system needs, as this would risk additional costs to projects, which will be passed on to consumers as higher energy costs. It is unclear if EnergyCo has undertaken any power system studies to assess the need for a POD, noting that there aren't any PODs currently in service on the NSW transmission network, indicating that there are no power system needs.	Remove the need for a POD and in the absence of any network needs and undertake power system studies to identify at what location(s) a POD should be installed based on an assessment of participation factors.

S5.2.5.15 Short Circuit Ratio (SCR)

The need to have capability to operate stable for an SCR of 1.8 at the connection point will require most Generating Systems to install reactive plant such as Synchronous Condensers and result in inefficient investment in system strength solutions as outlined below. This will markedly reduce the overall efficiency of the REZ design, unnecessarily increasing costs for consumers.

No.	Item	Comment	Recommendation
1	SCR of 1.8 at POC translates to a lower SCR at the terminals	1. An SCR of 1.8 at the POC equates to less than 1.4 at the terminals for projects as small as 50 MW (refer Figure 1 below)[2]. 2. An SCR of less than 1.4 is lower than what some OEM's have demonstrated stable operation for (both in terms of modelling and actual project experience).	Apply the 1.8 SCR requirement at the Generating Unit terminals.
2	A SCR of 1.8 at the POC would be a disincentive for larger projects	1. Although larger projects generally result in lower overall LCOE, the higher balance of plant impedance will result in a lower terminal SCR below the capability of the technology. Hence be a disincentive to larger projects. 2. The SCR at the terminals for very large projects could be less than 1 (refer Figure 1 below).	Apply the 1.8 SCR requirement at the Generating Unit terminals.
3	Use of "SCR" for large projects is not appropriate	Larger projects would have multiple physical connection points into the transmission system.	The CSR method or WSCR method would be more appropriate to consider the impact of the adjacent *Generating Units* (refer CIGRE document TB 671 – "Connection of wind farms to weak AC networks").

[2] https://www.linkedin.com/pulse/considerations-use-short-circuit-ratio-scr-winodh-jayewardene/

4	Expected SCR at each Energy Hub	The expected SCR at each of the energy Hubs is currently unknown with respect to the required SCR of 1.8.	The 1.8 SCR capability requirement should not be more onerous than the actual lowest SCR expected at each connection point within the REZ as this would else result in unnecessarily costs to generators and consumers.
5	The need for efficient investment in system strength solutions	The recent AEMC rule change relating to the *Efficient Management of System Strength* moved toward centrally coordinated and delivered system strength solutions to manage many of the risks projects faced.	Prescribing onerous SCR requirements for individual generators in the absence of any information on the actual SCR within the CWO REZ would be a move away from the positive outcomes of the recent AEMC rule change. In particular when multiple generators are required to install system strength solutions such as syncons. For example, if two 300 MW+ projects cannot meet the SCR of 1.8 at the POC requirement, rather than each generator installing synchronous condensers, a single synchronous condenser upstream of the connection point would be more efficient.
6	Risk of future fault level changes being passed on to generators	Draft REZ Access Standard Clause S5.2.5.15(2)[3] requires a remedy for a future change in fault level "*... (such as the occurrence of an event that results in a change to the three-phase fault level at the Connection Point)*".	Changes in the power system are out of the generators control along with any costs associated with remediation and hence should not be borne by an individual generator.
7	Draft REZ Access Standard Clause S5.2.5.15(1)[4] capability at a SCR of 1.8		Clarify that this is a capability, and that actual performance will be tuned based on the lowest expected SCR at the connection point at the time of connection.

[3] https://www.energy.nsw.gov.au/sites/default/files/2022-04/appendix-a-template-for-nsw-rez-access-standards-intended-to-apply-to-cwo-rez.pdf
[4] https://www.energy.nsw.gov.au/sites/default/files/2022-04/appendix-a-template-for-nsw-rez-access-standards-intended-to-apply-to-cwo-rez.pdf

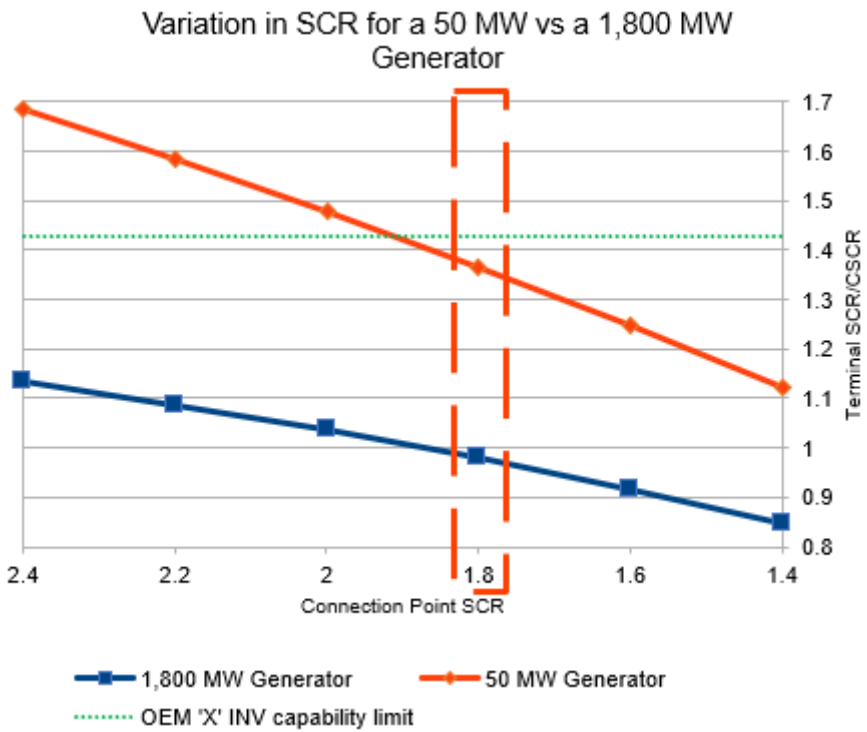

Figure 1 Connection Point SCR vs Terminal SCR for two Generating System Sizes (cable impedances excluded for simplicity)

Justification for deviation from the draft REZ Access Standard

Power system impacts	*The need for meeting the SCR of 1.8 at the connection point should be compared with the lowest expected SCR within the CWO REZ. Any future reductions in network fault levels are outside the reasonable control of connecting generators and should be managed through a power system planning process.*
Technical plant impacts	*Larger Generating Systems with a large balance of plant impedance would result in a SCR at the Generating Unit terminals below the equipment capability (and in some cases below 1).*

Commercial impacts	*Additional capital and operating expenditure associated with reactive plant such as synchronous condensers.*
Risk	*Uncertainty regarding capability to comply, additional tuning and studies to demonstrate (in addition to the studies required to demonstrate actual performance)*

S5.2.5.16 Voltage Vector Shift

No.	Item	Comment	Recommendation
1	Vector shift protection for anti-islanding and increasing minimum setting from 20 to 40 degrees.	Use of voltage vector shift protection for anti-islanding is unreliable, unpredictable and hence often not used. Desensitising it to 40 degrees will effectively disable it and a different method for anti-islanding is required (a topology-based scheme is more secure and dependable). Note that this type of protection can be used on both asynchronous and synchronous generators.	Remove the reference to anti-islanding protection (which if used can be under clause S5.2.5.8).
2	New requirement to ride through a 40-degree phase shift	1. The need to ride through contingencies is captured under S5.2.5.5 and models tested for a 40-degree phase shift as part of the DMAT, hence this requirement is already captured when assessing models. 2. The SCR and X/R that this is required to be met is not stated and should be no lower than the lowest SCR expected at the connection point for the purposes of GPS compliance assessment. 3. Generator ride through requirements under S5.2.5.5 have corresponding system	1. Remove the requirement to withstand a 40-degree phase shift given S5.2.5.5 captures contingencies the generator is to ride through and there is currently no system standard to limit phase shifts 2. If a 40-degree vector shift withstand requirement is maintained, clarify that the GPS compliance assessment SCR & X/R is to be no less than the lowest expected SCR & X/R at the proposed connection.

		standards. Any phase shift ride through requirements should have a corresponding system standard to limit phase shifts which are managed by NSPs / AEMO.	
2	Impact on synchronous plant	Synchronous plant such as synchronous condensers may not be able to maintain synchronism for very large voltage vector shifts.	Limit application to asynchronous generators noting that S5.2.5.5 provides obligations for a generator (including its auxiliary plant which it relies upon) to ride-through contingencies.

S5.2.5.2 Quality of Electricity Generated

No.	Item	Comment	Recommendation
1	The need to meet the Automatic Access Standard for harmonic emissions	The incremental cost to size harmonic filters to meet the automatic access standard could be significant for a very small overall system benefit.	Allow a negotiated access standard where there is no risk to planning levels being exceeded and a cost-effective harmonic filter cannot be designed to comply with all emission limits. Noting that this flexible approach is already applied by Transgrid.
2	Harmonic filters within Generating Systems	There are likely to be multiple harmonic filters within the REZ with these mostly within the Generating Systems. Resonances within the REZ may be best addressed via filters being installed upstream of the Generating Systems leading to lower overall costs.	Assess the use of network based harmonic filters where they provide a more efficient solution to individual harmonic filters within each Generating System.

Thank you for the opportunity to comment on the consultation paper. We appreciate the open and transparent process adopted by EnergyCo in developing these access standards. The CEC is ready to engage further and provide further input and suggestions, building on our extensive and highly experienced staff and membership base.

If you would like to discuss any of the issues raised in this submission, please contact Jordan Ferrari, Policy Officer, jferrari@cleanenergycouncil.org.au or Christiaan Zuur, Policy Director – Energy Transformation czuur@cleanenergycouncil.org.au.

Kind regards,

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