NEOEN

Mr Ashok Kaniyal
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Australian Energy Market Commission
Level 6
201 Elizabeth St
Sydney NSW 2000

Lodged online via www.aemc.gov.au

Dear Ashok,

Re Rule Change Project ERC0272 – Efficient Reactive Current Access Standards for Inverter-based Resources

Neoen welcomes the opportunity to respond to the AEMC's Consultation Paper regarding the Rule Change requests from Renewable Energy Revolution Pty Ltd, and Goldwind Ltd/Siemens Gamesa/GE International Inc./Vestas.

Neoen is France's leading independent producer of renewable energy, and one of the fastest-growing worldwide. Neoen is a responsible company with a long-term vision that translates into a strategy seeking strong, sustainable growth. We have over 2 GW of generation in operation and under construction globally, including in Australia's National Electricity Market (NEM): Hornsdale Wind Farms (309 MW) and Hornsdale Power Reserve (150 MW/193.5 MWh battery system including Virtual Machine Mode capability) in SA; Parkes, Griffith, Dubbo, and Coleambally Solar Farms (combined 255 MW in NSW); Western Downs Green Power Hub (400 MW solar farm) and Kaban Green Power Hub (152 MW wind farm) in QLD; and Victorian Big Battery (300 MW/450 MWh battery system), Bulgana Green Power Hub (204 MW hybrid wind/battery system) and Numurkah Solar Farm (110 MW) in VIC.

In this submission, we provide our responses to the questions posited in the Consultation Paper, in the order in which they appear.

QUESTION 1: ASSESSMENT FRAMEWORK

Neoen supports reforms which both enable energy and system security services to be provided to consumers and the market in the shortest possible timeframe and at the lowest efficient cost, and consistent with the principles of the National Electricity Objectives (NEO). Neoen particularly agrees with the following assessment criterion stated in the Consultation Paper:

> *"Changes to the connection process will also be assessed on whether they increase transparency and simplicity while maintaining the integrity of the process and ensuring generators are capable of supporting a stable and secure power system" (p.6).*

The issue of transparency and simplicity are crucial in the connection process. Countless connection applicants (including Neoen) have been frustrated not only by the complexity of the wording of NER Schedule 5.2, but by the opaque veil obscuring AEMO's and NSPs' (often varying) interpretations of the Rules and applications of those interpretations to each project. Neoen seeks the opportunity to engage with AEMO and NSPs regarding new and existing connections on an informed basis and consider that transparent exchange of information and power system study outcomes is an essential element of this. More often than not, these provisions of the NER are applied in a "one size fits all" manner, rather than being tailored to individual projects' technology, connection points, and the genuine needs of the local transmission/distribution network.

In making its determination of the proposed Rule Changes around reactive current access standards, and in the interest of allowing decarbonisation in the NEM to continue, delivering secure, reliable and cost-efficient energy to consumers, it is incumbent upon the AEMC to ensure the principles of transparency, simplicity, and – importantly – flexibility are integrated, by determining a Rule able to be implemented by

the renewable energy generation technology of both today and tomorrow with technical and financial certainty.

QUESTION 2: HAS THE COMMISSION CHARACTERISED THE PROBLEMS CREATED BY EXISTING ARRANGEMENTS FOR SECURITY AND RELIABILITY CORRECTLY?

Neoen is of the view that the application of the existing reactive current injection standards is inefficient in that it is both too prescriptive and, in many cases, too onerous.

For example, recent precedents show that a "weaker" connection point (say one with a low short-circuit ratio) is possibly unable to withstand a reactive current injection rate of 2% of maximum continuous generating system current per 1% change in connection point voltage. Conversely, a stronger connection point may be able to withstand a higher reactive current injection rate (say the automatic access standard levels of 4% capacitive / 6% inductive), but may not actually need it.

The primary goal should be that the standards are worded in such a way as to allow for flexibility depending on the generating system technology, distance from connection point, and – importantly – the local network's characteristics and needs. It is Neoen's understanding that the original Rule determined by the AEMC was intended to allow for flexibility in agreeing a current injection level consistent with the connection point characteristics; however, given there is little guidance within the Rule itself, this intent has been lost in the application of the Rule.

QUESTION 3: HAS THE COMMISSION CORRECTLY CHARACTERISED THE PROBLEMS THAT CURRENT ARRANGEMENTS MAY BE PRESENTING FOR THE EFFICIENT ALLOCATION OF RISKS?

Traditionally, large synchronous generators delivered reactive current to faults by their very nature. The power system and its protection systems has developed with reliance upon these underlying attributes. With the retirement of such machines, the NER (as interpreted by NSPs and AEMO) has left the onus of filling this gap equally on new asynchronous and synchronous generators. One could be forgiven for interpreting that asynchronous generators are being unfairly penalised for the withdrawal of certain capabilities from the transmission system by the synchronous plant retirements by having to invest large sums of money into the enhancement of generating unit models/capabilities and potentially expensive ancillary plant, such as STATCOMS.

Any Rule Determination by the Commission should endeavour to spread the responsibilities for delivering voltage control more equitably between Generators and the Primary NSP. Neoen would be interested in engaging with the AEMC further to develop a practical approach.

QUESTION 4: MORE TRANSPARENT AND SIMPLER GRID APPROVALS

As mentioned in our response to Question 1 above, it is crucial that the existing minimum access standards be simplified and transparent in order to allow new generator proponents to develop and connect their projects with technical and financial confidence.

Having a pathway to offer performance that delivers the essential stability at a connection point while maintaining compliance with the NER and offering cost-efficient services to electricity consumers is vital to the continued evolution of the power system and the energy supply pipeline.

QUESTION 5: EVIDENCE TO SUPPORT CHANGING THE POINT OF COMPLIANCE FROM THE CONNECTION POINT TO GENERATOR UNIT TERMINALS

Neoen is of the view genuine flexibility should be inherent in the standard to allow for cases where compliance at generating unit terminals is more practical and achievable than at the connection point.

Notwithstanding, Neoen's position at this point in time is that the proposed changes to the minimum access standards proposed by the CRI[1] appear to be a practical way to allow for generators with generating units spread across varying (long) distances from the connection point (e.g. a wind farm) to be compliant with the standard.

Neoen notes that due to the complexity and high speed of the control systems that respond to power system faults, the devices that manage this are the individual generating units; for this reason it is beneficial to consider the responses at the generator unit terminals for fault conditions. At the same time, it is important that the performance at connection point is given consideration in the sense of ensuring that there is no degradation in network performance, but the detailed response at generating unit terminals is a more manageable assessment location.

Furthermore, we emphasise that any potential risks to power system security arising from altering the minimum access standard would be mitigated by the NER requirements for a new plant to not degrade power system security. In other words, we would expect that the Primary NSP and the connection applicant would collaborate to propose a reactive current injection rate that meets the specific needs and idiosyncrasies of the connection point and local network as part of negotiating an appropriate performance standard.

QUESTION 6: WHAT SHOULD THE MINIMUM REACTIVE CURRENT CAPABILITY BE?

Further to our response to Question 5 above, Neoen is of the view that in order to streamline the connection process and enable plant to be designed considering the characteristics and needs of both its technology and the local network, further flexibility and clarity are needed in S5.2.5.5(u).

Whilst the CRI has proposed changes to this clause, Neoen believes that these changes further narrow the interpretation and application of the Rule, leaving limited scope for future-proofing and a holistic consideration of renewables integration into the network.

Instead, we propose the following wording be considered:

[1] That is, to reduce the minimum access standard to at least 0% reactive current injection per 1% change in connection point voltage.

(u) For the purpose of paragraphs (f) and (n):

(1) the reactive current contribution may be limited to the maximum continuous current of a *generating system*, including its operating *asynchronous generating units*;

(2) the reactive current contribution and *voltage* deviation described may be measured at a location other than the *connection point* (including within the relevant *generating system*) where agreed with *AEMO* and the *Network Service Provider*, in which case the level of injection and absorption will be assessed at that agreed location;

(3) ~~the reactive current contribution required may be calculated using phase to phase, phase to ground or sequence components of voltages. The ratio of the negative sequence to positive sequence components of the reactive current contribution must be agreed with AEMO and the Network Service Provider for the types of disturbances listed in this clause S5.2.5.5~~

the *Connection Applicant* may propose one of the following methods for calculating the required reactive current contribution, based on the *generating units'* design and specifications:

(i) phase to phase,

(ii) phase to ground, or

(iii) sequence components of voltages,

and the nominated method must be recorded in the *performance standard*;

(4) where the method in subparagraph (3)(iii) is nominated, the ratio of the negative sequence to positive sequence components of the reactive current contribution must be agreed with *AEMO* and the *Network Service Provider* for the types of disturbances listed in this clause S5.2.5.5; and

(5) the *performance standards* must record all conditions (which may include temperature) considered relevant by *AEMO* and the *Network Service Provider* under which the reactive current response is required, provided the conditions are consistent with the *generating unit's* features and the site-specific nature of the *connection point*.

QUESTION 7: WHAT ARE THE BENEFITS OF ALIGNING REACTIVE CURRENT CAPABILITY TO LOCATIONAL SYSTEM STRENGTH NEEDS?

See response to Question 2 above.

QUESTION 8: EVIDENCE TO SUPPORT CHANGING THE POINT OF COMPLIANCE FROM THE CONNECTION POINT TO THE GENERATOR UNIT TERMINALS

See response to Question 5 above.

QUESTION 9: WHAT CHALLENGES DOES THE CURRENT VOLTAGE TRIGGER RANGE PRESENT FOR INVERTER-BASED GENERATORS IN MEETING THE EXISTING REACTIVE CURRENT CAPABILITY MINIMUM ACCESS STANDARD?

Neoen supports the OEMs' proposed changes to S5.2.5.5(o) for the reasons cited in the Consultation Paper:

- *"over the course of a fault and for a short period after fault clearance, the voltage control is performed locally and independently of the connection point measurements and the power plant controller.*
- *low voltage ride-through logic, which determines the amount of reactive current that needs to be injected after a fault, is based on voltage measurements made at the generating unit terminals" (p.24).*

Moreover, the LVRT and HVRT entry and exit thresholds are fixed settings at generating unit level. Certainly in modelling simulations studying various operating conditions of both the network and the generating system[2], it is possible to determine – at least theoretically – a range of connection point voltages which could be prevalent when the generating units' LVRT/HVRT (fixed) thresholds are reached. However, since the connection point voltage range for LVRT/HVRT entry/exit is not directly controllable in real plant, it is not a prudent point for compliance assessment; there is no guarantee that the range will be adhered to under all conditions.

Hence, only a controllable parameter should be subject to compliance assessment. In this case, it is the fixed settings at generating unit level.

QUESTION 10: WHAT ARE THE KEY ISSUES WITH THE RISE AND SETTLING TIME STANDARDS?

As outlined above, Neoen supports any Rule Change which introduces maximum flexibility for proponents and the network, so that plant are designed considering the generating unit technology and the site-specific network characteristics and requirements.

With this in mind, Neoen supports the CRI's proposed wording for S5.2.5.5(o) regarding rise and settling times.

QUESTION 11: HOW SHOULD THE MINIMUM ACCESS STANDARDS THAT APPLY TO ACTIVE POWER RECOVERY BE CLARIFIED?

Neoen supports the CRI's proposed wording for S5.2.5.5(n)(2).

QUESTION 12: IMPLEMENTATION CONSIDERATIONS THAT THE COMMISSION SHOULD TAKE INTO ACCOUNT

Neoen is of the view that such an important Rule Determination should be well-considered together with other related Rule and process changes (e.g. CRI reforms), and implementation of all changes should be concurrent.

CONCLUSION

On behalf of Neoen, I wish to thank you again for the opportunity to contribute this submission to the Rule Change consultation.

Should you have any questions or seek to follow up this submission at any time, please feel free to contact me via email at scott.partlin@neoen.com.

We look forward to engaging with the AEMC and stakeholders further on this and future consultations.

Kind regards,

Scott Partlin,
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Neoen Australia

[2] Due to the variety of possible combinations of generating unit and main transformer tap positions at any instant.