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Dear Mr Mugglestone

Queensland Renewable Energy Expert Panel – Issues Paper

The Australian Energy Market Operator (AEMO) welcomes the opportunity to comment on the Queensland Renewable Energy Expert Panel's (Panel) consultation paper on providing credible pathways to achieving 50% renewable generation in the State.

As the independent system and market operator of the National Electricity Market (NEM), this response is focused on the questions related to power system operations and the design of the NEM.

AEMO appreciates the Queensland Government's consideration of power system security in the development of its policy to achieve the 50% renewable generation target. A policy that has not incorporated consideration of the security and operability of the power system could create adverse impacts, which could ultimately affect consumers whether through price or the reliability of supply. It is also important to recognise that the 50% target represents the average annual generation. To achieve this on average, there will be periods of time where the instantaneous renewable generation is much greater and probably 100% or more on occasions. This needs to be considered when assessing the impacts on power system security.

The 50% target is ambitious and will inevitably present operational challenges, the nature of which will depend on the policy mechanisms chosen and their implementation timeframe. For example, a policy that has a large focus on distributed energy will present different changes to the power system than a policy focussed on utility scale generation.

In considering these challenges to system operations in its policy design, the Queensland Government also has the opportunity to be at the vanguard of transitioning energy markets by supporting complementary measures and technologies that would facilitate the operational success of the 50% renewable generation target. These mechanisms could also assist in managing any risks that may arise from the changing landscape. For example, frameworks that ensure the industry has access to information on the installation of distributed energy resources such as residential battery storage systems. AEMO is happy to discuss with the Panel the potential operational challenges that may arise and the related development opportunities.

Core to AEMO's role is ensuring its operations adapt to the changing environment; whether change is driven by technology, consumer behaviour, economic factors or policy measures. AEMO produces a number of forecasting and planning documents that consider reliability. More recently, those have been extended to also address power system security. These studies, such as the Electricity Statement of Opportunities (ESOO) and the National Transmission Network Development Plan (NTNDP), assess the needs of the power system

under a range of scenarios and provide advice to the market on opportunities for investment. The large scale renewable energy target (LRET) is included in these studies, as would any legislated policy that were to be implemented in future.

Complementary to these studies, AEMO has established the Future Power System Security (FPSS) program which aims to adapt AEMO's processes to continue to maintain security in the face of an evolving energy landscape. These changes will test the capacity of the current frameworks as the generation mix continues to change and as distributed energy resources increase. AEMO will work with stakeholders, the CoAG Energy Council and the Australian Energy Market Commission (AEMC) to devise and implement technical and or/regulatory solutions in accordance with the National Electricity Objectives¹.

Through the program underway, AEMO will be exploring technical challenges in operating the power system securely that should be relevant to Queensland. Regardless of the details of the policy mechanisms the Government elects to implement to achieve its target, common changes in the Queensland system will be:

- An increase in large-scale renewable generation that displaces, either temporarily or permanently, traditional thermal generation.
- A proportionate increase in intermittent and asynchronous generation and a potential reduction in the supply of frequency control services.
- An increase in the level of distributed energy resources (DER) including rooftop photovoltaics (PV), residential battery storage, and demand management systems.

The displacement of traditional thermal generation and its replacement, often by generation that is connected to the power system by inverters, changes the dynamics of the power system. This changes the type and availability of services ancillary to energy production that can be utilised to operationally manage the power system. For example, at present, only conventional generation participates in the frequency control ancillary services markets. AEMO is working to determine whether there are technical barriers to other technologies participating.

The Panel has asked what capabilities should be considered as requirements for new renewable generators of different technologies. The technical capabilities required by generation connecting to the power system are set by the generator performance standards in the National Electricity Rules and the connection process. These standards are designed to be technology neutral, and are determined based on what the needs of the power system are. As part of the FPSS work, AEMO is assessing whether these standards will need to be modified based on analysis of what technical challenges will emerge. Changes to the technical performance standards imposed on new generation are part of the suite of options available to address the identified challenges. Other options include the introduction of new regulated services and the introduction of (or changes to) market mechanisms; or a combination of all of these.

The other avenue of standards development is through Standards Australia which consider product performance and are important to generation and storage connected within customers' premises. The review and development of the AS4777 standard for inverters (small-scale) over the last few years provide a good example of standards development to reflect the needs of the changing environment.

Greater penetrations of DER can challenge the way the system is operated if there is limited visibility of these devices. Furthermore, when they supply a large proportion of the total electricity demand, they displace scheduled generation and therefore reduce the level of operational control that AEMO has to manage events. While individually small, in aggregate DER can be significant contributors to generation and load shifting. For example, there is

¹ Further information and reports from the FPSS program are available at <http://aemo.com.au/Electricity/Market-Operations/Power-system-security>

over 4 gigawatts (GW) of rooftop PV installed across the NEM. Comparing this with the largest single power station in Australia, Eraring Power Station which has a capacity of 2.9 GW. Queensland currently has over 1.5 GW of rooftop PV installed, which is already comparable to the installed capacity of Gladstone Power Station (1.68 GW).

Information about the DER in the system and its technical performance is critical to AEMO's ability to predict the behaviour of the power system under different conditions and therefore to a secure and reliable operation. AEMO is currently identifying what data and information from DER is essential for its operational functions. Mechanisms will need to be put in place to ensure that this information is collected, stored in a consistent and accessible form, and transferred to the appropriate bodies (such as AEMO and transmission and distribution network operators). The Queensland Government can play a key role in working with AEMO and other agencies on establishing these essential mechanisms. In particular, there is an opportunity for the distribution network service providers in Queensland to play an active role in data collection and management.

Similar to power system security, aspects of the NEM design cannot be considered in isolation. AEMO operates the NEM according to the National Electricity Rules and associated procedures, applied consistently across NEM regions. The AEMC runs a consultative process for rule changes that are sought to address limitations in the design. AEMO feeds into this process as the independent market operator to provide applicable insights and analysis. AEMO will also raise rule changes up to this process where appropriate or necessary to promote the National Electricity Objective.

The competition in metering and related services rule change is an example of a rule change that can be considered an enabler of the objectives stated in the issues paper². This rule facilitates market forces to deliver change directly through their relationship with the customer, and has removed barriers to retailers and small customers accessing new technologies. The ability of retailers to leverage new technologies, such as rooftop PV and batteries, and to provide new retail products and offerings has been enhanced. AEMO notes that the rule change may not be applicable for the regions within Queensland that are not open to full retail contestability.

In the areas of market design or power system operations, the Queensland Government can assist by maintaining transparency in its policy and, depending on the policy outcome, to work with AEMO and other entities to establish appropriate mechanisms for the transfer of any new data-streams that may be created and would be important to power system security and reliability.

There will also be the opportunity for the Government to encourage the solutions, whether they be technologies, frameworks or infrastructure that will facilitate the successful integration of a high level of renewable generation.

If you wish to discuss these issues further or require further information on our FPSS program, please do not hesitate to contact me on (08) 8201 7350.

Yours sincerely

David Swift
Executive General Manager – Corporate Development

² The Rule Change was published 26 November 2015 and comes into effect from 1 December 2017. For more information see <http://www.aemc.gov.au/Rule-Changes/Expanding-competition-in-metering-and-related-serv>