Ref. A5234316

20 June 2023

Ms Anna Collyer
Chair
Australian Energy Market Commission
PO Box A2449
SYDNEY SOUTH NSW 1235

Sent via email

Dear Ms Collyer

DEVELOPMENT OF REGIONAL/SUBREGIONAL FREQUENCY CONTROL ANCILLARY SERVICES (FCAS) AND/OR OPERATING RESERVE MARKETS

Powerlink Queensland (Powerlink) welcomes the opportunity to put forward our proposal to improve the utilisation of generator connecting transmission infrastructure by expanding or developing regional or subregional Frequency Control Ancillary Services (FCAS) and/or operating reserve markets to the Australian Energy Market Commission (AEMC).

Our proposal recognises that the decarbonisation of the electricity system will require the development and connection of a significant amount of renewable generation over the coming years. We expect much of this new generation capacity will connect to the transmission network through Renewable Energy Zones (REZ).

We consider existing arrangements can result in capacity limitations for REZs connected to the transmission network backbone through high capacity double circuit transmission lines. This places limits on the potential size of REZ developments. Smaller REZ developments mean more REZs are required, which may result in less efficient use of the transmission network and higher connection costs for renewable generation developments. These higher connections costs will inevitably flow through to consumer bills resulting in higher cost of supply and consequential impacts on affordability and global competitiveness for industry. The requirement to build more REZs could also result in potential delays in meeting renewable and emissions objectives and targets and greater impacts to landholders and communities from the development of additional transmission corridors.

To overcome these potential consequences and facilitate the electricity system's transformation, Powerlink proposes to amend the National Electricity Rules (Rules), if required, and relevant subordinate instruments, such as Australian Energy Market Operator (AEMO) procedures, to enable the expansion or development of regional and subregional FCAS and/or operating reserves markets and allow the potential for greater raise FCAS procurement.

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Greater flexibility in how contingency events can be managed at a finer geographical scale will help to:

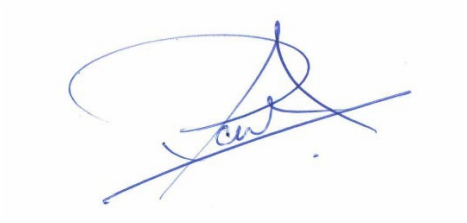
- maximise generation connected into a double circuit REZ architecture;
- create scale-efficient connections for REZs that facilitate a faster energy transition and minimise the direct costs of connecting infrastructure;
- minimise the impact on and disruption to communities from connection infrastructure;
- encourage increased and more efficient use of the transmission network;
- reduce the number of REZs required to bring in required volumes of renewable generation to meet government policies and targets;
- lower overall costs of the energy transition to consumers; and
- meet emissions reduction objectives at a lower overall cost.

More detail on current market arrangements and our proposed market reforms is provided in the attachment.

We appreciate the engagement we have had with AEMC staff members on this reform proposal and their willingness to provide advice to help us refine our proposal. We have also commenced productive discussions with AEMO to investigate options and implications of these potential changes. We provide this submission to further support changes associated with operating reserve market Rule change currently underway.

If you have any questions regarding this submission or would like to meet with Powerlink to discuss this matter further, please contact Enrique Montiel (Principal Engineer, Network Planning) on (07) 3860 2743 or email enrique.montiel@powerlink.com.au.

Yours sincerely



Paul Simshauser
CHIEF EXECUTIVE

ATTACHMENT: DETAILED PROPOSAL
REGIONAL AND SUBREGIONAL FCAS AND/OR OPERATING RESERVES MARKETS

Current arrangements for new transmission infrastructure and FCAS

The National Electricity Market (NEM) has evolved to carry contingency raise FCAS reserves to allow for a maximum credible loss of generation of 750MW, which corresponds to the largest generating unit in the NEM. The actual amount of raise FCAS enabled by the NEM Dispatch Engine (NEMDE) during a dispatch interval depends on the largest output dispatched from a single generating unit, which may be less than 750MW[1]. FCAS is generally sourced from across the entire NEM, unless a credible contingency would split the NEM into multiple islands.

Renewable Energy Zone (REZ) developments coordinate the connection of multiple wind and/or solar generation projects that operate at relatively low capacity factors to the transmission network. Often these connections take the form of radial transmission lines from the areas where the resource is abundant to the main transmission network. From a scale-efficiency perspective, the cost structure of transmission lines is the main influence of transmission connection costs. For the Queensland network, this suggests scale efficient REZ developments would have a network capacity of around 2,000MW, with a highly utilised double circuit transmission line rated at 275kV or 330kV.

The intermittency of renewable generation results in average generation being significantly lower than installed capacity and its flexibility means that the output can be reduced or shut down (and restarted) quickly. The combination of these characteristics means it is efficient to establish a REZ's installed generation capacity above its network capacity. However, the allowable reduction of generation following a line trip sets important design limitations at two key timeframes for the sizing of a REZ's generation capacity that can be supported by a double circuit REZ architecture.

Immediately following the trip of one of the lines in the double circuit, aggregate generation in the REZ must be reduced quickly (run back) to the emergency rating of the remaining line. The maximum amount of generation that can be run back following a credible contingency needs to be replaced elsewhere to maintain supply-demand balance. This would generally be achieved by the response of FCAS resources enabled and procured through NEMDE. This would set the maximum size of runbacks triggered by a credible contingency event to approximately 750MW.

To return the power system to a secure operating state within 30 minutes after the first trip event, FCAS reserves need to be restored by dispatching operating reserves that can come online and/or ramp up within that period. Additionally, if the outage of the REZ connection is sustained, the remaining aggregate generation for the REZ must be reduced to the FCAS quantity that can be enabled (i.e. limited by the largest credible generation contingency event size). Given the REZ generation is now connected by a single line, the loss of this generation is now a credible contingency and sufficient raise FCAS is required to cover this potential loss.

The REZ's maximum generation capacity to resecure the system following the maximum runback and in preparation for the next event depends in part on the quantity and location of available operating reserves. These include generation already online with available headroom and appropriate ramp rates and fast start generation resources, such as batteries and gas-powered generation.

[1] Powerlink is aware that there have been some instances where higher FCAS has been enabled and co-optimised with the size of wind and solar generation in Victoria and NSW.

Under current FCAS arrangements, resecuring the network following a line trip would constrain generation on the remaining circuit to at most 750MW, regardless of available feeder rating. Additionally, the REZ's maximum generation dispatch following the first line trip may be further constrained due to other network limitations if there is uncertainty around the location of enabled FCAS resources and which specific resources will respond first to the potential loss of the remaining REZ line.

By way of example, the maximum generation in a north Queensland REZ following a line trip would currently be 240MW if we needed to allow for the following conditions:

- transfers from central Queensland are high;
- FCAS would be sourced from outside north Queensland; and
- there is a requirement to maintain existing voltage stability limit on the network between central and north Queensland.

Powerlink acknowledges these challenges could also be resolved through discrete infrastructure, such as a third transmission circuit to the REZ or a network-connected battery with reserve capacity and which is set to respond to offset the net reduction for energy export from a REZ following a contingency event. However, this is unlikely to represent the lowest-cost approach to allow for more scale-efficient REZ developments.

Drawbacks of the current arrangements

The design limitations for double circuit REZs resulting from interactions with existing FCAS and operating reserve arrangements impinges on the allowable transfers under system normal ratings and following a contingency event. In turn, this limits the potential size of REZ developments and results in connection assets that are not scale-efficient.

The decarbonisation of the electricity system will require the development and connection of a significant amount of renewable generation over the coming years. In Queensland alone, this could be an additional 22GW of transmission-connected renewable generation by 2035. For a given level of renewable generation, the smaller the potential size of REZ developments, the more REZs required. In turn, this may result in less efficient use of the transmission network and higher connection costs for renewable generation developments. These higher connection costs will inevitably flow through to consumer bills ultimately resulting in consequential impacts on affordability and global competitiveness for industry. The requirement to build more REZs may result in potential delays in meeting renewable and emissions objectives and targets and greater impacts to landholders and communities from the development of additional transmission corridors.

Powerlink's proposal for regional and subregional FCAS and/or operating reserves markets

Powerlink proposes to amend the National Electricity Rules (Rules), if required, and relevant subordinate instruments, such as AEMO procedures, to develop regional and subregional FCAS and/or operating reserves markets and allow the potential for greater raise FCAS procurement. Greater flexibility in how contingency events can be managed at a finer geographical scale will help to:

- maximise generation connected into a double circuit REZ architecture;
- create scale-efficient connections for REZs that facilitate a faster energy transition and minimise the direct costs of connecting infrastructure;
- minimise the impact on and disruption to communities from connection infrastructure;
- encourage increased and more efficient use of the transmission network;

- reduce the number of REZs required to bring in required volumes of renewable generation to meet government policies and targets;
- lower overall costs of the energy transition to consumers; and
- meet emissions reduction objectives at a lower overall cost.

A higher amount of raise FCAS enabled and higher levels of operating reserves that recognises local requirements would increase the potential generation capacity in REZ developments and enable increased utilisation of the network connection. More localised arrangements for FCAS and/or operating reserves would value the trade-off between higher raise FCAS and/or operating reserve service costs and the cost savings from the development of more scale efficient connection infrastructure. Localised FCAS and/or operating reserves would likely protect against possible contingency events from a number of REZs. Given generators currently pay for raise FCAS, it would be possible to design consistent cost-recovery arrangements to align incentives for generators who stand to benefit from higher REZ capacity.

The use of market process to supply raise FCAS and reserve services is likely to be a more efficient and cost-effective approach relative to higher investment in network solutions within each REZ development. This is particularly true where batteries and various forms of demand response are expected to become increasingly widespread and allow for the delivery of these services across different timescales, more widely across the NEM and should lower the procurement cost.

The additional FCAS and operating reserves would not be required at all times, so the requirements could be dynamic. Although current FCAS arrangements allow co-optimisation of FCAS and energy markets, Powerlink understands that the co-optimisation process does not normally trade-off reducing or increasing the amount procured by reducing or increasing the amount of credible generation loss (although it may occur in some situations). The greatest cost savings and efficiency benefits would result from the co-optimisation of FCAS and operating reserve service provision with energy dispatch. This would trade off the cost of FCAS and savings in the energy market to allow greater credible generation contingency sizes. A less complex, and possibly transitional, arrangement may be to reassess the maximum credible contingency size on a regional or sub-regional basis periodically until a full market co-optimisation could be implemented. In any case, a degree of certainty in the arrangements would be required to allow offering scale-efficient connections in REZs.

Expected benefits of Powerlink's proposal

The development of regional and/or sub-regional FCAS and operating reserve service markets and increasing the amount enabled at times of high REZ generation would be associated with reduced costs associated with transmission infrastructure requirements. This reflects that additional constraints on the development of renewable generation leads to the need to develop more expensive forms of generation or developments in more remote locations that require additional transmission infrastructure. More scale-efficient REZ developments would also reduce adverse community impacts from transmission infrastructure developments. The benefits of additional FCAS would be shared with all REZs over a geographic area.

Hosting a larger amount of generation per REZ would enable a faster energy system transition. Limiting the pace of the energy transition would likely lead to additional economic and environmental costs, which would not be in the long-term interests of electricity consumers.

Powerlink appreciates that the co-optimisation of the FCAS quantity procured with the energy market may introduce additional complexities to the market design. We are also cognisant

that the development of regional FCAS markets may increase procurement costs for these services, given the smaller set of providers available within a region or subregion able to fulfil requirements for these services.