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Dear Mr White,

Victorian Reactive Power Support, Project Assessment Draft Report

We welcome the opportunity to comment on AEMO's Project Assessment Draft Report (PADR) for the Victorian Reactive Power Support project under the Regulatory Investment Test for Transmission (RIT-T).

EnergyAustralia is one of Australia's largest energy companies with around 2.6 million electricity and gas accounts in NSW, Victoria, Queensland, South Australia, and the Australian Capital Territory. We also own, operate and contract an energy generation portfolio across Australia, including coal, gas, battery storage, demand response, solar and wind assets with control of over 4,500MW of generation capacity in the National Electricity Market (NEM).

The Victorian generation mix continues to rapidly change. Continued strong investment in renewable asynchronous generation in the western half of the state and changes in consumer demand requirements due to Distributed Energy Resources (DER), such as rooftop solar, is creating challenges for AEMO to manage the security of the power system. Under minimum demand conditions) higher voltages can occur requiring AEMO to utilise short-term operational measures such as de-energizing High Voltage (HV) transmission lines and/or requiring generators to synchronise to manage these voltage levels.

AEMO's PADR has identified that its preferred solution to address the identified need (being addressing high voltage levels across the transmission network) is the installation of 4 reactors and 1 synchronous condenser at a capital cost of $85 million[1]. Customers pay for any network investment and bear all the risk that forecast benefits do not eventuate; therefore, it is important that any long-term network spend, and its projected benefits is sufficiently scrutinised to ensure it is in the best interest of customers. To this end, EnergyAustralia is disappointed in the initial level of detail provided in the PADR. The coming years will be critical in ensuring that customers do not take on excessive and unnecessary network investment risk. For example, there is currently up to $6b of proposed new transmission investment at various stages of the RIT-T process[2]. It is therefore imperative that modelling presented by AEMO and TNSPs to form the business cases for investment (on behalf of customer) is of an exemplary high standard, is clear,

[1] In 2019 dollars.
[2] EnergyAustralia internal analysis.

transparent and sufficiently detailed reflecting the risk that customers face in funding these long terms assets.

While we appreciate that at times network solutions will be the preferable for some security issues, we urge that caution should be taken to ensure network options are not seen as the only solution to these challenges. Given future uncertainty in the NEM there may be significant option benefit from implementing a staged solution, relying on shorter term operational solutions in the interim. Synchronous generators (and other non-network options) are able to provide services (through contracting) providing AEMO with tools to manage both system security and reliability challenges.

EnergyAustralia continues to advocate for transparency during all RIT-T projects to ensure network spending is judged to be robust across a wide range of scenarios, and unequivocally in the best interest of customers.

Assumptions

We thank AEMO for providing their full assumption book, on request, in a summarised, accessible form. We expect that an assumption book, including any changes, will again be published alongside the forthcoming PACR.

After reviewing AEMO's assumptions EnergyAustralia is still not clear on:

- The basis and need for so many interventions and the trigger or criteria used to count the events before and after any augmentation - for example whether it is the simulated voltage at a bus, the number of synchronous units on-line at one point in time, a minimum load level, or some other qualified or quantified measure that AEMO has selected;

- Terminal values used at the end of the modelled horizon;

- The reactive power and system strength requirements under a range of scenarios, including the sensitivity to:

    - Demand levels;

    - Number of synchronous generators online;

    - Level of asynchronous generation and from what location; and

    - Network configuration.

    - Can AEMO provide examples of typical system conditions when managing reactive power and system strength becomes an issue?

- Assumptions around generator on and off times (technical characteristics) and these associated start costs.

- What generator closures are assumed in the modelling vs what generators does the model close?

It is our understanding that AEMO has used the updated 2019 Planning and Forecasting assumptions, but it is not clear why the 2018 Electricity Statement of Opportunities (ESOO) minimum demand levels have been used.

Changes to minimum demand level assumptions

AEMO highlights that since the publication of the Project Specification Consultation Report (PSCR) it has produced a new set of minimum demand forecasts as part of its 2018 ESOO forecasting processes. EnergyAustralia notes that these minimum demand levels are significantly higher than the 2017 ESOO forecasts. This large year on year change highlights the challenges in forecasting in the NEM, particularly given new and existing government policies around DER. We would encourage AEMO to provide more commentary on the reasons why there has been such a large change between forecasts, particularly given that the minimum demand levels will drive market benefits of the network investment significantly, and we ask AEMO to highlight the sensitivity of the RIT-T outcomes to these variations. It remains unclear what the 2019 ESOO modelling indicates around minimum demand levels as this assumption is currently not available to participants.

Capacity expansion modelling results

EnergyAustralia has the below comments around the provided capacity expansion modelling results:

- In the neutral capacity outlook, the modelling closes 730MW of natural gas generation in 2024 presumably after the energisation of the SA-NSW interconnector[3]. This output appears inconsistent with the results of the 2018 ISP and also what ElectraNet assumed in its EnergyConnect conclusion report[4] in which 1,400MW is closed. We note that the slow and fast scenarios are different again and we would encourage AEMO to provide clarification on these outputs and some form of direct reconciliation to establish confidence in outcomes and consistency.

- ElectraNet modelling for EnergyConnect also built an additional 700MW of grid scale pumped storage to satisfy the capacity requirements in South Australia on completion of new interconnection. This again is not consistent with the AEMO modelling in the PADR which built none.

- In the neutral capacity outlook an additional ~1,000MW of gas generation is built in Victoria from 2024 onwards without any associated reduction in generation capacity elsewhere. In this period maximum demand only increases by ~600MW based on the POE 50. It is not clear to EnergyAustralia what is driving this capacity expansion.

To provide confidence to stakeholders it is critical that modelling results are consistent across projects, for example capacity expansions. We expect the PACR to provide

[3] In the neutral scenario.

[4] Both the 2018 ISP and the ElectraNet PSCR had the closure of ~1,400MW of gas generation in SA upon completion of the interconnector. We note that the

commentary around the drivers of the capacity expansion modelling, especially where results differ from previous modelling results.

Additional modelling outputs required

It is imperative that AEMO provides to participants as much information as possible on the modelling outcomes to support the PACR.

For example, it is important that the Plexos model outputs (or similar) are available to participants, or in this specific case given the nature of the problems being resolved the power flow simulated voltages across the Victorian transmission backbone. Providing some of this technical data will allow industry to clearly visual the phenomena being modelled and build trust and confidence in the model outcomes and the consequential investment proposal. This ensures that stakeholders can complete a critical review of the modelling outcomes and understand how the benefits are realised. It is not enough to simply provide generator capacity expansion plans at a high level (for example) without further supporting information that allows stakeholders to explore the drivers of these expansions. While it is beneficial to have a breakdown of the yearly market benefits (and costs) of the network options it does not provide any additional information on how these market benefits are derived. The modelling results provided around generator expansion and retirement allows for an understanding of the location, time and type of generation changes, but to verify these outputs additional information needs to be provided on how existing and new plant is dispatched, for example capacity factors.

Preferred option

The preferred option from the PADR has been identified by AEMO as option 2 which has a capital cost of $85m, which consists of installing:

- 2 x 100MVAr shunt reactors at Keilor at the 220kV level.
- 2 x 100MVAr shunt reactors at Moorabool at the 220kV level.
- 1 x +200/-100MVAr synchronous condenser at South Morang at the 330kV level.

EnergyAustralia notes that the only difference between option 2 and 1B is the addition of the synchronous condenser at an additional cost of $60M. AEMO notes that option 2 provides additional benefits over and above the purely static reactor solution (option 1B) by increasing the VIC-NSW interconnector export limit as well as providing additional benefits from reducing the need for market intervention to maintain system strength.

The PADR identifies that the market benefits through a network option to address voltage control issues are primarily through changes in fuel consumption. AEMO does not need to either direct a generator on or activate a Non-Market Ancillary Service (NMAS) contract to manage voltage levels (i.e. absorb reactive power) if the preferred option is completed. Option 2 also provides an additional stream of market benefits through minimising the need to direct synchronous units for system strength which AEMO identifies as an emerging problem.

From the current level of information provided in the modelling results it is not clear how the system strength and export limit (VIC-NSW) benefits are calculated or how realistic

the assumption/modelling results underpinning these benefits are. For example, how does this RIT-T interact with the Victoria to New South Wales Interconnector (VNI) upgrade project that is also currently being investigated by AEMO[5]? How does the timing of the synchronous condenser impact any additional interconnector expansion benefits (and vice versa)? We would encourage AEMO to provide more information on the modelled dispatch of existing and new plant as well as inter-dependencies and interaction with other RIT-T projects so stakeholders can critique how these market benefits are realised.

Incremental market benefits

The modelling results presented in the PADR and associated supporting materials highlight concerns regarding the incremental benefits of installing additional reactors and/or the synchronous condenser. While we do not dispute that there is likely to be fuel savings through installing network assets to assist in managing voltage levels, and that dynamic reactive control is very valuable - what is not clear is the merit of claiming what appears to be marginal benefits particularly with the installation of the synchronous condenser reactive plant.

By inspection from table 7 in the PADR[6] it appears there are diminishing returns from the installation of additional reactive plant and that after the installation of 4 shunt reactors (option 1B) the incremental market benefits appear to decline.

When calculating the Discounted Profitability Index (DPI) (NPV/Capital cost) we see the following result, highlighting that Option 1A presents a high and compelling result, notably compared with AEMOs preferred option 2.

	1A	1B	1C	1D	2
Cost ($)	19.1	25.4	31.7	38.8	84.7
NPV ($m)	63.9	71.7	74.9	74.7	89.2
DPI = NPV / Cost	**3.3**	**2.8**	**2.4**	**1.9**	**1.1**

We would encourage AEMO to further explore the risk profiles and benefit realisation of the options presented and take this into consideration.

Furthermore, EnergyAustralia requests that AEMO provides more information and clarity on the incrementation benefits of avoiding additional directions or activations of NMAS contracts for both voltage and system strength, for example time duration curves of the various scenarios. We would highlight that given the uncertain nature of the future outlook of the NEM that it may in fact be in the best interest of the customer to address the gap through a combination of network investment and NCAS contracts reflecting the likelihood and magnitude of various scenarios.

This is particularly the case as we see that in all options proposed there is still a requirement for a significant number of interventions totalling many hours out to 2028.

[5] https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/Victorian_Transmission/2018/Victoria-to-New-South-Wales-Interconnector-Upgrade-RIT-T-PSCR.pdf

[6] PADR, page 38, https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/Victorian_Transmission/2019/Victorian-Reactive-Power-Support-PADR.pdf

Sensitivities and scenarios

It is EnergyAustralia's view that simply varying key assumptions one at a time to test the sensitivity of the market benefits for each credible option does sufficiently test the robustness of the forecast market benefits. The PACR should seek to test a wider range of sensitivities, for example varying multiple input assumptions in parallel, to reflect the uncertain nature in the forecast of benefits from each credible option. This should present a more realistic summary of the expected benefits of the preferred option.

Conclusion

We look forward to reviewing the PACR for the Victorian Reactive Power RIT-T. EnergyAustralia expects that transparent and clear modelling, results, sensitivities and scenarios will be presented to allow stakeholders to be satisfied that the preferred option is in the best interest of customers. Sufficient supporting information must be made available for stakeholders to be able to understand the drivers of the market benefits and how these are realised.

Customers pay for and bear the risk that long-term network assets do not deliver the promised benefits and AEMO needs to satisfy stakeholders that the preferred option is in the best interest of customers.

If you would like to discuss this submission, please contact **Andrew Godfrey on 03 8628 1630** or **Andrew.Godfrey@energyaustralia.com.au.**

Regards

Sarah Ogilvie
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