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Australian Energy Market Operator

Dear Sir,

It is very encouraging to see the development of the ISP as a master plan for the electricity systems and grid and we thank the committee for the opportunity to comment on the Integrated System Plan Consultation Paper.

In answering the question *"What is the best way to achieve the policy objectives of affordable, reliable, secure power and meeting emissions targets?"* there needs to be a recognition that the transition to renewable energy is not principally driven by policy as it has been in the past but now also by lower cost renewable energy generation. This transition needs a master plan like the ISP so that there is an orderly transition and not significant disruption to our electricity supply which has been very reliable and secure in the past.

The plan needs to consider not only current government policies but also what are plausible outcomes in the near future. When studies of 100% renewables were done only a few years ago many thought that these were implausible but now this future is real and it is being driven by technology and cost with these changes coming quicker than many thought. You only need to consider what has happening in the last 12 months

- The Whyalla Steel works are going to be powered by renewable energy
- The world's largest battery is now operating in South Australia
- The cost of solar power continues to fall rapidly
- Pumped Hydro proposals are becoming a reality
- At times the South Australian grid has been powered 100% by renewable energy.
- A solar thermal plant is going to be built in South Australia

This is already having profound changes on the electricity system. Many predictions in the past have underestimated the rate of change. As technologies gain momentum and gain acceptance they tend to accelerate. High retail electricity prices combined with significant technology changes and lower costs is driving this change. To consider *"What are the least-regret generation and transmission developments which are most robust to different outcomes?"* the modelling needs to include an additional very low cost

renewables scenario which would reflect a more rapid change than we currently consider reasonable. This should be done as a matter of risk management even if the current probability is only moderate.

The problem facing the NEM is that the time to build the likely required transmission infrastructure may be overtaken by plausible events. Even "expected" events like Hazelwood closing are having significant effects in the NEM. There is now significant congestion in the NSW/QLD corridor as is reflected in Transgrids 2017/2018 MLF's for that area with the revised power flows.

As the cost of electricity from renewables continues to fall (here and around the world) there will be a time when they nominally cost less than the existing coal powered generators. This could lead to much earlier closures of existing coal generators than the nominal lifetime dates shown in figure 4 in the consultation paper. There is a large step change in this chart stating in 2032 when four large generators in the NEM could be retired. If this were to move forward by say 5 years then the NSW system would need an addition firm capacity of over 5,000MW and also more interconnectors by the mid 2020's. It may be challenging to build the proposed interconnectors in that timeframe.

As part of the planning process this type of scenario should be considered in the modelling as a fourth case. It could be described as "Very Low Cost Renewables". It might be characterised by changing the following parameters as described in Table 1. of the consultation paper for the Fast Change case.

Rooftop PV Capacity	Neutral	to	Strong
Emissions reduction	52% 2005 – 2030 90% 2005 – 2030	to to	75% 95% by 2040
Government Targets	No NSW Mechanism	to	NSW RET like QRET
Grid Scale Storage Costs	Neutral cost reductions	to	Rapid cost reductions
Small PV + battery costs	Neutral cost reductions	to	Rapid cost reductions
Gas Demand	Strong	to	Neutral

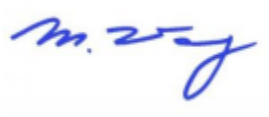
The consultation paper goes on to pose the following questions

> "*What are the **least-regret** generation and transmission developments which are most robust to different outcomes?".* All the interconnectors in and out of Victoria and NSW should be given priority as they are where the large demand is and are central to the operation of the grid. This should be done as part of the master plan being developed as the ISP and not solely relying on the current RiT T process. The locations of possible REZ should give a strong weighting to the locations that have been proposed by wind and pumped hydro renewable energy developers as they are site specific and much less emphasis on solar as it can be located in broad areas west of the dividing range. Priority should be given to those REZ close to the load centres.
>
> *"Could large-scale renewable generation in targeted zones provide an **efficient** solution for future power system development, and what storage and transmission investment would be needed to support such an outcome?"* For efficiency the zones would be close to the demand and grid and have more than one renewable resource with a combined high utilisation of the transmission infrastructure. The combined effective grid capacity factor of the REZ could be set at say 45% to 50% before batteries were considered. This can be achieved with wind and solar together in the right locations.

"What is the optimal balance between a more interconnected NEM , which can reduce the need for local reserves and take advantage of regional diversity, thereby more efficiently sharing resources and services between regions, and a more regionally independent NEM with each region self-sufficient in system security and reliability?" This question has been considered by most of the studies that have been undertaken into 100% renewables in Australia and what would be needed. They all point to a much more interconnected grid. The diversity of weather patterns is very important along with the time of day effects. Increased regional self-sufficiency would lead to higher generation and storage costs.

Thank you for the opportunity to comment on Questions 1.1 and 1.2. I would be happy to discuss the points raised with the committee.

Yours faithfully,



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