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4 May 2021

Hon Ted O'Brien MP
Chair – Inquiry into future need for dispatchable energy generation and storage capability in Australia
PO Box 6021
Parliament House
Canberra ACT 2600

Hon Mr O'Brien;

ANLEC R&D Submission: Inquiry into future need for dispatchable energy generation

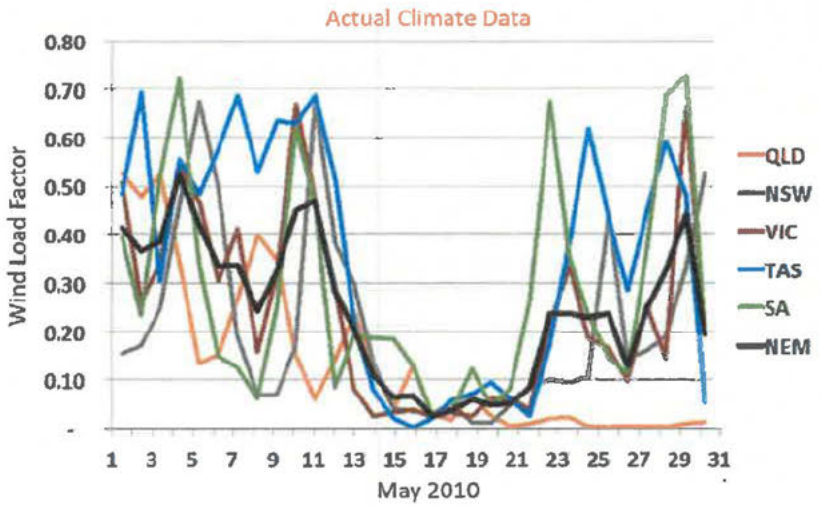
Thank you for the opportunity provide a submission to the Standing Committee on Energy and the Environment.

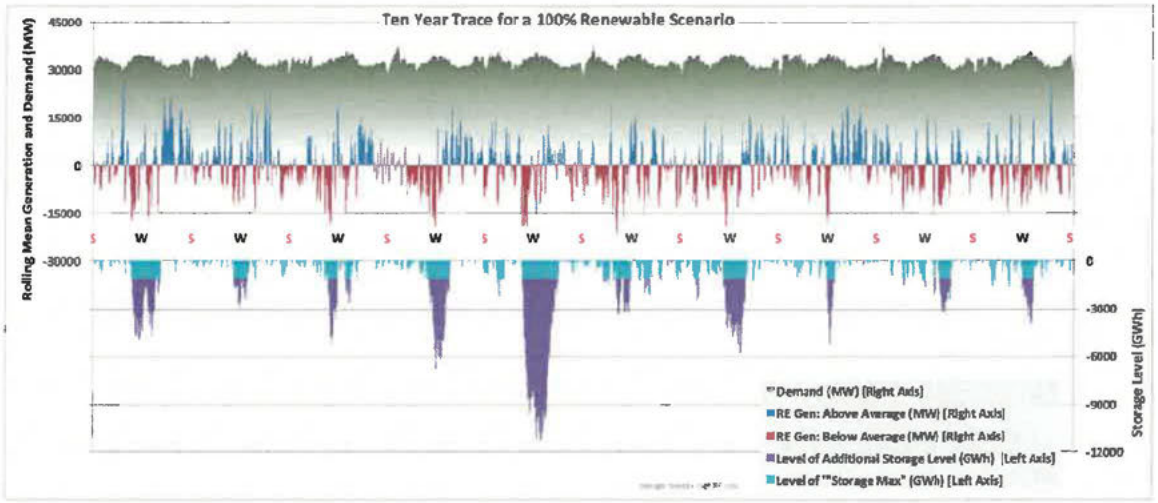
This Inquiry is important because there is a pressing need to distinguish between dispatchable energy generation and energy storage capability (which is dispatchable, though should not be classified as "energy generation"). These distinctions become even more important as we transition to a low emissions energy system dominated by variable renewable energy (VRE).

A future low emissions grid will need "all technologies". Assembled with the right combination of assets at the lowest "total system cost" it will keep Australian energy prices competitive for the wider economy.

In this submission, The latest innovative modelling (to minimise systems cost) shows that the vulnerability for a low emissions NEM grid is ***not summer*** *– rather it is the winter*. It is prudent for long term asset planning to take account of such vulnerability. In a grid that is dominated by VRE, the attached analysis referred to, shows there is a minimum "firm and dispatchable" generation asset component that is required to keep the grid viable and stable. The committee is encouraged to visit the following website for and appreciation of a lowest cost asset generation portfolio for the NEM. https://modelling.energy/

Australia regularly experiences high pressure weather systems that sit over the continent and deliver a quietude to wind generation that can last for several days. Actual data in the figures below show that this weather impact over the past decade is most evident annually in winter and to varying extent (2010 is the worst year shown).





Under such climatic conditions, if wind systems are not generating to their potential across several days, the grid has to be underpinned by firm dispatchable capacity to bridge such episodes. The energy storage requirements to support the grid across several days are prohibitively expensive and unlikely to deliver the lowest cost grid system.

To a first approximation, **the economic penalty for a sub-optimal power generation asset fleet is about $20 billion/per year for net-zero emissions targeted by 2050**. This cost penalty will be incurred if firm and dispatchable low emissions power generation technologies (e.g.: fossil fuel+CCS and/or Nuclear) are not available to the NEM in 2050.

The attached submission provides reference to the latest systems assessments for achieving a stable grid, with sufficient dispatchable energy generation capacity and storage to deliver net-zero emissions targets at lowest cost to the consumer. These studies underpin the following recommendations:

Recommendation 1:

AEMC should transparently publish - every two years - the target Australian long-term asset generation portfolio – a 25-year outlook. It should include the underpinning analysis and assumptions to demonstrate transparently how the future asset portfolio will maintain lowest cost to the consumer and deliver Australian energy price competitiveness.

Recommendation 2:

Ensure the cost of energy storage necessary at the margins of Australian weather is included in any assessment and provision of electricity reliability.

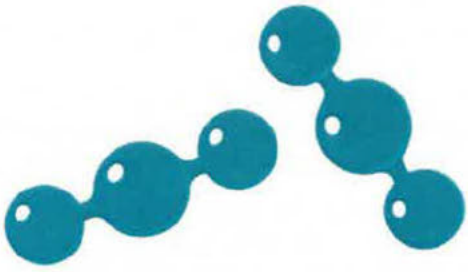
Recommendation 3:

Develop policies that encourage and enable investment in the larger capital assets that include technologies such as carbon capture and storage. These assets are essential low emissions infrastructure for the delivery of a future stable and reliable grid. An independent AEMC determined target power generation asset portfolio over 25 years can focus and help integrate the necessary policy development for reliable low emissions grid stability.

Yours faithfully;

[redacted]

Dr Noel Simento
Managing Director



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ANLEC R&D Submission to the House of Representatives Standing Committee on Energy and the Environment –

Inquiry into the current circumstances, and the future need and potential for dispatchable energy generation and storage capability in Australia.

Dr Noel Simento – Managing Director

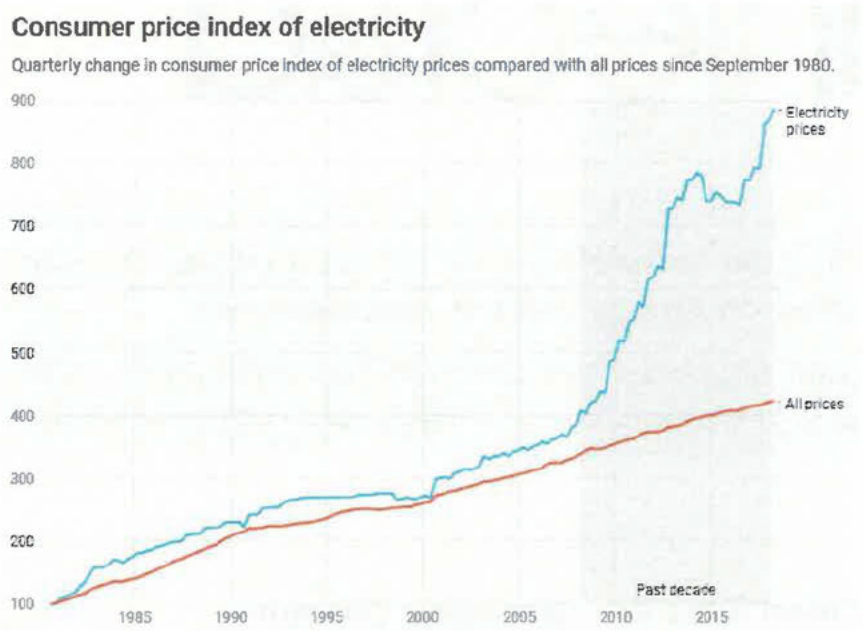
Reliable Electricity Generation at Lowest Cost – With Decarbonisation

1 Context

This is a submission to House of Representatives inquiry into the current circumstances, and the future need and potential for dispatchable energy generation and storage capability in Australia.

Australia has opportunity to re-design its power generation infrastructure having regard to the lowest possible emissions of greenhouse gas in the coming decades. Power generation assets being long lived (30+ years) decisions are required now to ensure we retain a competitive energy sector that encourages economic growth.

Figure 1 shows the adverse impact of the electricity retail price on consumers.



The cost of energy underpins economic growth and it is reasonable to conclude this cost escalation is costing the Australian economy more than it should.

2 A Reliable Electricity Sector – with low emissions.

Reliability in the Australian electricity sector will face several pressures over the coming decades that include:

- Retirement of old asset stock – reliability in keeping the lights on
- Lowering emissions through an "unprecedented" asset build rate – capital injection/costs
- A step-change in demand – especially if transport moves to EV's in an economic growth scenario

Under these conditions – there is no scenario in which the electricity system and its product electricity gets cheaper[1]. The consumer pays either in their bills or in their taxes.

The best objective is to minimise the cost of the system by minimising capital expenditure on the asset portfolio of the system.

Future power generation assets must be chosen that are best placed to deliver reliable electricity at lowest cost with lowest emissions. It needs an a NEM asset optimisation strategy that meets viable build schedules. These are long lived assets and are not easily un-wound after deployment.

Based on this premise recommendations are offered for consideration to ensure reliable electricity supply can be delivered at lowest cost in a system that is being rapidly driven to decarbonisation:

3 Inquiry Terms of Reference: Current and future needs;

Recommendation 1: Every 2 years, update the long-term target power generation asset portfolio

AEMC should transparently publish - every two years - the target Australian long-term asset generation portfolio. The longest asset lifetime of typically 30 years should be the forecast period. It should include the underpinning analysis and assumptions to demonstrate transparently how the future asset portfolio will maintain lowest cost to the consumer and deliver Australian energy price competitiveness.

No technology should be excluded *on the basis of their price or regulatory status today. The AEMO Integrated Systems Plan (ISP) 2020[2] seems to exclude both fossil fuel+CCS and nuclear technologies from consideration. These technologies can offer grid services that can deliver a lowest cost system of the future.*

The most recent Strategic Assessment for Low Emissions Electricity Generation was published by AEMC in 2017[3] using both data and market experiences prior to that date. An update of this assessment is urgently needed as a priority and is long overdue. The transformation of the power generation asset base currently underway is sufficiently rapid to warrant that such assessment updates are required regularly.

An independent AEMC determined target power generation asset portfolio over 25 years can focus and help integrate the necessary policy development for reliable low emissions grid stability.

4 Inquiry Terms of Reference: Efficiency, cost, timeliness of development and delivery, and other features of various technologies;

Recommendation 2:

Ensure the cost of energy storage necessary at the margins of Australian weather is included in any assessment and provision of electricity reliability.

There have been at least two public assessments published in the last 12 months[4,5] that highlight the role and quantum of energy storage necessary in a low emissions asset portfolio.

Both these studies recognise that the electricity system requires to cater to variations in weather at the margins of Australian experience rather than some contrived "average day". Put simply – the lights have to stay on in the worst weather conditions.

In the AEMO Integrated Strategic Plan 2020, some systems costs are treated as "exogenous" ie: given "for free" to the system. Note several scenarios of the AEMO ISP 2020 have very large energy storage requirements. All such storage costs are likely not included in their system costs. For example – any behind-the-meter storage is treated as exogenous. This assumption is sub-optimal and unreasonable.

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[1] Decarbonising Electricity – The lowest cost path to net zero emissions
[2] AEMO Integrated Systems Plan 2020
[3] AEMC and CCA joint report: Towards the next generation: delivering affordable, secure and lower emissions power
[4] Snowy 2.0 and Beyond: The value of large-scale energy storage
[5] Go for net zero: A practical plan for reliable, affordable, low-emissions electricity

It does not recognise that an unnecessary dollar spent by a consumer on behind-the-meter storage – is a dollar not available to other parts of the Australian economy.

A recent Australian study[6] has also shown the high costs for long term energy storage can be mitigated by alternative technologies to deliver reliability and save the consumer around $20 billion per year in a net-zero emissions decarbonised grid.

International Studies[7],[8] published by both Stanford and Princeton Universities in the USA adopt similar system assessment methods for California and the USA respectively. These results show similar outcomes for system reliability and system cost minimisation and validate conclusions drawn from studies of the NEM.

Recommendation 3: Integrated Policy necessary for a reliable low emissions grid stability

Policies that encourage and enable investment in the larger capital assets such as carbon capture and storage are necessary. These assets are essential low emissions infrastructure for the delivery of a future stable and reliable grid. The effectiveness of various policy instruments and their application in several jurisdictions has recently been published in the context of the Australian NEM.[9] It provides the nature and schedule of integration necessary to deliver a cost effective combination of low emissions technology assets.

Studies[10] are increasingly forecasting low emissions power generation asset portfolios with very large dependencies on both energy storage and grid interconnection to replace the loss of traditional firm capacity. Targeting the lowest total system cost shows that all technologies – including low emissions firm capacity supplied by technologies such as fossil fuel with CCS and nuclear are necessary for a reliable grid.

5 References

1. Geoff Bongers, Andy Boston, Stephanie Byrom & Nathan Bongers. Decarbonised Electricity. The lowest cost path to net zero emissions. Gamma Energy Technology P/L, Brisbane, Australia, February 2021.
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5. Wood, T. and Ha, J. (2021). Go for net zero. Grattan Institute. ISBN: 978-0-6450879-0-1
6. Boston, A., Bongers, G., Byrom, S. and Bongers, N., (2020). The Lowest Total System Cost NEM – the impact of constraints. Gamma Energy Technology P/L, Brisbane Australia.
7. E. Baik, Stanford University, The Role of CCS in decarbonising California's electricity grid, International Virtual Conference on Greenhouse Gas Control Technologies (GHGT-15), March 2021
8. E. Larson, C. Greig, J. Jenkins, E. Mayfield, A. Pascale, C. Zhang, J. Drossman, R. Williams, S. Pacala, R. Socolow, EJ Baik, R. Birdsey, R. Duke, R. Jones, B. Haley, E. Leslie, K. Paustian, and A. Swan, Net-Zero America: Potential Pathways, Infrastructure, and Impacts, Princeton University, Princeton, NJ, December 15, 2020
9. Byrom, S., Bongers, G., Boston, A. and Bongers, N., (2021). Decarbonising the NEM: A Policy Advice Paper for Achieving Net Zero. Gamma Energy Technology P/L, Brisbane Australia.

[6] The impact of NEM constraints on system costs to decarbonize the grid
[7] The role of CCS in decarbonising California's electricity grid
[8] Net-Zero America: Potential Pathways, Infrastructure and Impacts.
[9] Decarbonising the NEM: A Policy Advice Paper for Achieving Net Zero.
[10] Ibid page 4, References 2 and 5