SUBMISSION TO THE INQUIRY BY THE AUSTRALIAN FEDERAL HOUSE OF REPRESENTATIVES STANDING COMMITTEE ON ENVIRONMENT AND ENERGY INTO THE FUTURE NEED AND POTENTIAL FOR DISPATCHABLE ENERGY GENERATION AND STORAGE CAPABILITY IN AUSTRALIA

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I make this Submission in good faith and in a personal capacity only. I am not employed by, nor do I represent, any vested interest, commercial, political, or otherwise. I am a chemical engineer, holding degrees in applied science, chemical engineering and business administration, plus post-graduate qualifications in environmental studies and energy studies. I am a Fellow of the Institution of Chemical Engineers, a Fellow of the Australian Academy of Technology and Engineering, and a Foundation Fellow of the Australian Institute of Company Directors.

Proposal

Unfortunately, this Call for Submissions on a wide range of related subjects carries the impression of being unduly broad and untargeted to enable focus on the important work of trying to settle on a viable electricity Grid configuration for the National Electricity Market (NEM) in Eastern Australia.

It has been obvious for the past several years that the increasing anxiety around the world about the implications of climate change would require urgent, but comprehensive, thought and planning at a National, State, and local level to devise the most effective way to re-configure the NEM and its associated supply system to deal with very significant change, both on the demand side as well as the supply side, of the electricity generating and delivery system across the Eastern half of Australia.

This has resulted in the rapid growth of variable renewable energy (VRE) sources, mainly wind and solar installations, supplemented now by increasing amounts of rooftop solar and battery storage at scale by individual States in what appears to be an uncoordinated way.

In the absence of a more comprehensive Plan by the Federal Government, this seems to have built up an ‘ad-hoc’ collection of resources in individual States, which may or may not function cost-effectively to keep the lights on at times of supply or demand stress across the NEM Grid.

It would appear to be late in the day to be now looking more closely at what is needed in the way of ‘dispatchable’ generation and / or storage resources to cover for these kinds of events, especially the unpredictable intermittency and variability of VRE resources. Having said that, the issue must now be considered urgently as it has apparently received scant attention to date.

In my view, the most effective way to do this is for the Commonwealth, in cooperation with the States and sharing the cost accordingly, to commission a comprehensive and urgent Study on the issue as it appears to be evolving at this time.

This should be done by a competent electrical engineering group in cooperation with the Energy Security Board, whose Chair has drawn attention at various times to a lack of coherent planning and a clear path mapped out at a national level to an agreed emissions target. This work should cover : --

- modelling of the system hardware as it stands now and as it is expected to be under certain growth assumptions, plus known hardware developments,

- an overlay of typical weather events and other longer-term trends due climate-change, plus intrinsic unpredictable interruptions to generation both VRE and dispatchable,
- current and potential future power requirements,
- emerging technologies, including the possibility of SMRs as a component of the system,
- Total System Costs, with special attention to costs of integrating VRE to comprise a stable generating system, plus the benefits of different combinations of technologies with an outline of timing and risks involved.

This Study should be agreed with the States and undertaken without delay. It is only by doing this an expert comprehensive way that the full scope of issues, benefits, and costs can be properly known and assessed. Looking only at stand-alone LCOE costs of various forms of generation is not sufficient.

This would then allow better decisions about future hardware for the NEM, both VRE and dispatchable, and the rules by which they both must operate to ensure reliable supply.

This need is highlighted by the recent Renewables Integration Study conducted by the Australian Energy Market Operator (AEMO) which notes, *inter alia*, that: --

- *" Under every ISP (Integrated System Plan) scenario, the NEM's least-cost future features large increases in renewable generation -- utility wind and solar connected to the grid and distributed solar photovoltaics (DPV) installed by households and businesses -- with dispatchable generators, large-scale and distributed energy storage, demand-side participation , and sector coupling (such as with gas and transport)…..to handle very high instantaneous penetrations of wind and solar generation ……the NEM could be operated securely with up to 75% instantaneous penetration of wind and solar …"*

  or if certain recommended actions are not taken, "*…… the identified operational limits will constrain the maximum instantaneous penetration of wind and solar to between 50% and 60% in the NEM. "*

  This portends the uncomfortable fact that integrating variable renewable energy sources into a complex always-available electricity generation, transmission, and distribution grid system is not simple, and will get increasingly expensive as the share of VRE increases.

- In this regard it is worth quoting from a recent edition of World Nuclear News (16 March 2021) by Sama Bilbao y Leon, Director General of the World Nuclear Association, viz. –

  " The grids of today are becoming more and more divorced from the characteristics of a resilient system -- one that has the physical availability of generating capacity at all times, one that operates smoothly and with stable economics in all conditions, including sudden shifts in demand or changing and extreme meteorological conditions.

  By abandoning dogmatism and allowing a return to science-based policymaking, it is possible to avert the predicament we are facing. Nuclear power and renewables can, if planned properly, be exemplary partners as we strive towards building a clean energy world following the pandemic, while ensuring that we do so without leaving a large percentage of the world's population behind.

  We need to reform energy markets so that they incentivise long-term investments in clean energy and resilient infrastructure. It is imperative that we put an end to the short-term thinking and short-term financial incentives that have placed us in the situation we are in

today. A good starting point is to properly recognise the unrivalled grid stability offered by nuclear power. By marrying the best features of nuclear power plants, renewables, and storage, we can achieve deep carbonization within the identified timeframes and in the most cost-effective manner. "

These comments should cause us to reflect on what we now see developing in Australia, viz. a collection of uncoordinated actions by individual States, acting perhaps more from perceived political advantage than from a carefully planned approach that aims to meet the key requirements for a long-term, resilient, electricity grid.

In this regard, the Canadian Government has developed a long-term Plan about how it will transition the nation's economy towards net-zero greenhouse gas emissions by 2050.

This Canadian Plan draws upon experienced engineering support to recommend design, engineering, construction, operations and maintenance actions over the next 30 years to realise Government plans for a balanced resilient system that includes nuclear reactors, renewables, and hydro, all based on the simple proposition that *" A piecemeal approach simply will not work. "* (World Nuclear News 16 March 2021).

Conclusion

Australia is facing serious challenges in trying to ensure reliable emissions-free electricity from the NEM to provide essential electric power for its ongoing prosperity.

The establishment of the National Electricity Market (NEM) in the 1990s was a signal achievement in bringing together a collection of State-based electricity generating networks into a single market structure, based mainly on coal-based generation plus some gas and hydro.

This is now in the process of radical change as concerns about climate change force the eventual retirement of fossil-fuel-based generation, the growth of variable renewables generation, and no certainty about how best to configure the Grid for the future.

It is clear that uncoordinated decisions on an individual State basis, when the Grid itself covers some 5000 km through five States and one Capital Territory, are not the best way to reconfigure such a complex mechanism for this low-carbon future. A more considered long-term approach is needed.

For example, advanced modular nuclear power will be able to make a significant contribution to the reliability and cost-competitiveness of the Grid and to reducing national carbon emissions, and should be considered. If we start now this technology could be ready as old coal-fired plants will be exiting the market in numbers from 2028 to 2035, and without compromising near-term decisions.

It is only by means of a grid-wide competent detailed engineering study, agreed to by all those entities involved with costs to be shared on an equitable basis, can these issues be sorted out and a comprehensive Plan developed, including appropriate market design. This is now urgent.

Barry Murphy
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