<u>Objection submission to rule change on *Including distribution resilience in the national electricity rules (ERC400)*</u>

Dear AEMC,

Thank you for seeking our views on whether to include distribution network resilience in the National Electricity Rules.

The answer is simple: How about just prioritising INDEPENDENT AUSTRALIAN POWER THAT ISN'T DEPENDENT ON CHINA & THE WEATHER!!

As RESILIENCE means:-

***'capacity to withstand'**

***'or to recover quickly from difficulties;**

toughness'

***'Resilience means being able to cope with tough events.'**

***'What best defines resilience? the ability to not fold under pressure and bounce back. Resilience is a key ingredient in the process of adversity and recovery. It's about how you bounce back from a tough situation.'**

It is completely obvious that writing about 'Distribution Network Resilience' - including it in the National Electricity Rules - as proposed by Lily D'Ambrosio MP, Victorian Minister for Energy and Resources, will do nothing to make the totally flawed, unreliable, intermittent, weather dependent, Fake Green RenewaBULL Solar Wind Energy Poverty Grift & Ponzi Scheme/Scam that she promotes adnauseam - resilient!

Minister D'Ambrosio needs to comprehend her own flawed plans & wake up to the reality that they will NEVER work with an actual average Wind Capacity Factor of 30% & 20% or less for Solar, along with totally incapable & bankruptingly costly BESS!

There is no point in AEMC pretending there would be any Electricity Consumer Benefits whatsoever!

More costs to consumers will not improve DNSPs' ability to prepare for, manage during, and recover from severe events, and reduce the impact to consumers of long-duration outages - ONLY RELIABLE, AFFORDABLE, SECURE AUSTRALIAN COAL & NUCLEAR POWER WILL DO THAT.

Just look at the Broken Hill disaster!

Industrialised Wind/Solar & incapable BESS are useless without far superior, ready on demand AUSTRALIAN COAL POWER!

Outcomes for consumers: Would the rule change support outcomes for consumers by improving distribution network resilience to extreme events, at a cost that consumers are willing to pay?

NO

In no way are we long suffering, tortured customers prepared to pay anything further for such an idiotic, failing Electricity System Experiment - stupidly dreamt up by ideological blockheads who don't care one bit if we suffer austerity & die from hyperthermia due to Government inflicted Energy Poverty/Deprivation = Cost of Living Crisis - due to greedy, self-benefiting Predatory Networks & Market Manupulating Companies who fleece the public with their pathetic & ruinous RenewaBULL infrastructure.

Safety, security and reliability: Would this enable reliable, secure and safe provision of energy at efficient cost to consumers?

NO

ONLY RELIABLE, SECURE, AFFORDABLE, EFFICIENT AUSTRALIAN COAL & NUCLEAR POWER WILL 'enable reliable, secure and safe provision of energy at efficient cost to consumers,'

Would the rule change take into account the likely impacts of climate change on safety, security and reliability outcomes?

NO

THE CLIMATE CON IS A SCAM!

AEMC RenewaBULL RULES are putting all our lives at risk, with safety, security and reliability outcomes all decimated by their fanciful 'Cloud Cuckoo Land' ideology that DOES NOT WORK IN PRACTICE!

Principles of efficiency: Would the rule change deliver allocative efficiency across investment and planning timeframes?

NO

This Rule Change is all about unjustly ripping off Consumers - transferring our money to greedy, Fake Green Networks & RenewaBULL Operators who will never provide a reliable, efficient, secure, affordable workable system.

• Principles of good regulatory practice: Would the rule change promote predictability, stability and transparency for DNSPs, the AER and consumers regarding how distribution network resilience expenditure will be assessed in the economic regulatory framework?

NO

There is NO Consideration of or Transparency for Consumers at all as we are tortured at every turn by untrustworthy Regulators, Networks & Energy Companies who all have vested interests at our expense.

WHERE IS OUR RELIABLE, AFFORDABLE ELECTRICITY SERVICE?

In a country so blessed with plentiful, superior energy resources - the envy of the world, it is unconscionable that we have such dodgy policy makers & regulators who are deliberately depriving us of our own reliable, affordable Australian Coal & Nuclear Power.

With Trump's Election in the U.S, he has vowed to Dump the Paris Agreement, the Climate Scam, the Fake Green New Deal & to make America Energy Independent; With a newly Elected Federal Coalition likely to follow suit in Australia, this will result in a plethora of stranded assets & no reliable, affordable power at all if AEMC continues to bow to Woke lunacy - irresponsibly leading us all down the RenewaBULL Road to Ruin!

If the Regulators are SO inept & incompetent that it would take them 8-10 yrs to re-write Regulations for Australian Nuclear Power, then Australia needs a new reliable, secure, efficient Regulatory Body who relies on reputable, independent, peer reviewed Engineering Facts, Scientific Rigour, Integrity & Ethics as well as adheres to all aspects EQUALLY of the National Electricity Law Objective.

AEMO is completely failing to meet the Objective of the National Electricity Law - to promote efficient investment in, & efficient operation and use of, electricity services for the long term interests of consumers with respect to:-

(a) price, quality, safety, reliability and security of supply of electricity;

and

(b) the reliability, safety and security of the national electricity system;

and

(c) the achievement of targets set by a participating jurisdiction

(i) for reducing Australia's greenhouse gas emissions; or

(ii)that are likely to contribute to reducing Australia's greenhouse gas emissions.

The Government & AEMO/Regulators are NOT focussed on ALL factors equally as required, they solely hone in on 'the achievement of targets set by a participating jurisdiction, which was only tacked on in 2023 with (c)'reducing Australia's GHG emissions' - laughably having to qualify it with (ii)'likely to contribute to reducing Australia's GHG emissions' because they well know it's not true - due to the intensive energy footprint/embedded energy of Solar/Wind/BESS that they deliberately fail to include & factually calculate for their whole life-cycle - essential for truthful comparison of all forms of power generation.

https://wattsupwiththat.com/2024/05/23/coals-importance-for-solar-panel-manufacturing/

From

Lynette LaBlack

Please add this Reference to my Objection Submission - Whether to include distribution network resilience in the National Electricity Rules

Thank you

Lynette LaBlack

Reference:-

There are NO Reliability, Efficiency, Security or Economic Benefits at all from the Fake Green RenewaBULL Swindle - Designed to Rip Off Consumers, Sponge on Private CER Against Our Will & Enable Beijing to Control Australia's Electricity Grid.

This RORT can NEVER be resilient as it depends on the vagaries of the weather, is Astronomically Costly, Environmentally Disastrous & DOES NOT MEET THE OBJECTIVES OF THE NATIONAL ELECTRICITY LAW.

***Paul Miskelly's - Storage requirement for 100 percent Renewables on the Eastern Australian Grid - Initial Findings**

Storage requirement for 100 percent Renewables on the Eastern Australian Grid - Initial Findings

Executive Summary - Notes for policymakers

As stated in the Conclusions below:
It would seem that Australian government authorities have not performed and made publicly available any analysis that provides any indication whatsoever, in a readily understandable way, how many "Big Batteries" will be required in Eastern Australia to meet the 100-percent Renewables' Storage requirement, how they will be sourced and paid for, what are the energy requirements for their production, what are the waste disposal and CO2 emissions resulting therefrom, importantly, where these batteries are to be sited, and, given their relatively short service life, how they will be recycled and re-used.

It beggars belief that none of this absolutely necessary preliminary, investigative work seems to have been addressed by the relevant Australian Planning Authorities.

The findings of this analysis are:

From an analysis based on the AEMO Operational Demand data for calendar year 2023, to even begin to consider a 100-percent Renewables scenario for the Eastern Australian Grid:

1. The present wind and solar energy facilities complement will need to be increased, as a minimum, by a factor of 3.31.
2. The minimum Storage Requirement to provide coverage during the worst extreme, prolonged minima in output of the renewables, must be able to supply the full Demand for a minimum period of 24 days. This translates to a Storage Requirement of 12,077,136 MWh, equivalent to some 27,000 Geelong Big Batteries, or some 94,000 Hornsdale Big Batteries.

According to: https://victorianbigbattery.com.au/faqs/ , the Geelong battery covers an area of the same size as the Geelong Kardinia Park GMHBA Stadium field. This is an area of some 2 hectares.

Some 27,000 Geelong Big Batteries would occupy an area, a minimum area, of some 54,000 hectares. This does not include the area required for the corridors for the necessary connecting transmission lines. It is clear that government policy is to acquire rural lands for this purpose, rural lands which are predominantly farmland, that is, land used for food production. This makes it a very significant land grab. This land take is in addition to the considerable amount required for the additional wind and solar "farms", each of which itself constitutes a very significant land grab.

Taking over farmland to build facilities to produce intermittent energy is a violation of Article 2, Section 1(b) of the Paris Agreement (2015).

Article 2 1(b) of the 2015 Paris Agreement states:

"This Agreement… aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

"(b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, **in a manner that does not threaten food production";** See: https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf .

Policymakers need to understand, very clearly, that these storage batteries are merely a band-aid; they would not be necessary except for very serious shortcomings in the forms of generation that these batteries are required to support.

A battery does NOT extract energy from the wind or the sunshine. These batteries are required simply because both solar and wind generation are highly intermittent forms of generation and these forms of intermittent generation have a major failing: neither is dispatchable. These forms of generation are also incapable, unlike conventional generation, of providing the very necessary inertia required for grid system security. The batteries would not be required if these forms of generation were a plug-in replacement for real, conventional generation.

The batteries then are a necessary band-aid. That they are required as a band-aid does not justify the requirement for the vast land-grab that will result from their use. The battery unit itself is NOT a "renewable", or any other form of, generator.

Also, policymakers need to understand, for this renewables plus battery storage scenario to even begin to be a feasible option:

1. that the battery storage cannot simply be added incrementally over a period of time from some low starting value. It must be available as the amount as stated, that is, 12,077,136 MWh minimum, and it must be fully charged at the time of switch-over to 100-percent renewables.
2. that the renewables complement must be at the level as stated,

before shutting down any of the remaining dispatchable generation. Attempting to shut down existing dispatchable, fossil-fuelled generation before the above capacity requirements are met, in full, will merely lead to frequent, unpredictable, widespread blackouts.

Policymakers also need to consider the following:

1. Neither the required units of renewable generation nor the battery storage units "grow on trees" or "pop out of thin air". At present, all such units are fully imported, increasingly from suppliers whose intentions toward Australia are recognised by Australia's Security Services as being rather less than benign. At any time, these suppliers could impose a trade embargo on the supply of this equipment, instantly posing a profound risk to National Security. See also Wilson (6).

2. Each Geelong-scale Big Battery will occupy the space, involve the land take, as quoted above, of an AFL football stadium, and then some. Where and how are are some 27,000 Geelong Big Battery equivalents going to be sited?

3. What considerations have been given to the transmission line requirements to connect so many of these grid-scale batteries to the Eastern Australian Grid?

4. Where are these grid-scale batteries to be manufactured? What amount of CO_2-producing fossil-fuels will be required to mine the ore, extract, refine and manufacture, the enormous number of battery modules required?

5. Given the massive scale of the battery requirement, and the known probability of risk of fire, the provision and cost thereof of permanent firefighting facilities and staff, similarly on a massive scale, must be factored into the operations of these battery storage units.

Abstract

Francis Menton, in a recent article (1) , discusses a scholarly paper by a certain Balazs Fekete and colleagues (2), and a blog post article by Fekete himself (3), discussing their experiences in getting the paper published. In the paper, Fekete *et al* concluded, for the fairly large region of the US that they considered, comprising 18 adjoining northeastern States, that a value of storage, equivalent to some 25 percent of the total annual demand for that region, is the minimum requirement. On an average demand basis, this 25 percent is equivalent to some 91.25 days of demand.

Putting that into the Eastern Australian context, 25 percent of annual demand for the year 2023, based firmly on AEMO operational data, is some 20,970 MW (the average annual demand for 2023), times 24 hours/day times 365 days/year times 25 percent, or, 45,924,300 MWh.
To put that number into some sort of real item of equipment, that is the equivalent of 102,054 Geelong Big Batteries. (The Geelong BB has a stated storage capacity of 450 MWh.)
Clearly, these are enormous numbers, implying an enormous and unprecedented infrastructure requirement, the like of which has never been attempted in Australia, if indeed anywhere.

To seek to put the likely requirement into the context of the Eastern Australian grid, I thought to apply the analytical method described by Fekete *et al* (ibid.) to the Eastern Australian grid, where, instead of having to deduce likely electricity generation performance from regional wind behaviour and solar irradiance characteristics, as Fekete *et al* (ibid.) were, it seems, required to do, presumably because they did not have access to electricity performance data for their region, I could use directly the publicly-available, actual AEMO-supplied operational data, thus hopefully removing a significant source of uncertainty in the results from the analysis.

The first step was to sub-total, respectively, the hydro, wind farm, and solar farm data, from the AEMO's NEMWEB site at every 5-minute timepoint from the year 2023 Dispatch_SCADA data. I also collected the AEMO's Operational Demand and estimated Rooftop PV data for 2023. Each of these latter datasets is supplied at 30-minute timepoints, so I presumed to interpolate these values to the intermediate 5-minute timepoints. This approach allowed the use of the Fekete *et al*. methodology at every 5-minute timepoint.

Note: I did not include pumped-hydro in the hydro subtotals. At present, the operators of pumped-hydro plants are not constrained to purchase the pumping component from renewables' sources, so I have presumed that these sources provide what is essentially delayed fossil-fuel generation.

Methodology

Essentially, as I understand it, the Fekete *et al* (ibid.) methodology is applied in the following way:

(a) At the first, or earliest, timepoint in the series of interest, sum the renewables' subtotals (MW), subtract the corresponding demand (MW), the result is the deficit/surplus value at that timepoint.
(b) Convert this deficit/surplus value to MWh, noting that the time period is 5 minutes, and store it as the accumulated deficit/surplus.
(c) Repeat at the next timepoint, but for this, and successive timepoints, add the surplus/deficit from each previous timepoint. (Where it is understood that to "add" is an algebraic addition: a deficit carries a minus sign, so, "adding" a deficit value is essentially subtracting it).
(d) Continue in this fashion, recording the deficit/surplus value at each timepoint, and accumulating a total deficit/surplus value across the entire time span of the operational data.

This process, as Menton (1) observes, is very similar to the procedures used in normal financial profit and loss accounting. It is important to mention "deficits" because, at present, given that the renewables capacity on the Eastern Australian grid is still far short of being able to supply the present demand requirement, running this accumulation process with the current values of the renewables' subtotals quickly results in a very large, negative value, that is, a large deficit, and hence a failure to supply sufficient generation to meet demand.

Before atempting the analysis, it is useful to attempt to place limits on the various likely values, where that is possible. For example, what might be the maximum possible value of the Required Storage, presuming the absolute worst-case conditions?
As the lower limit, the Required Storage cannot be less than zero.
Presumably, the absolute maximum value might be that required to meet one year's Demand. (It may safely be presumed that having all forms of generation shut down for more than a year, which is what this value implies, would be deemed to be totally unacceptable.)
This value is readily determined: Average Demand (MW) times 24 hours times 365 days per year,
Inserting the value for Average Demand for calendar year 2023 in the equation:
20966.7409399774 MW times 24 times 365 MWh per year, resulting in a value for the upper limit of the maximum Required Storage of: 183,668,651 MWh (per year).
The range for the value of the Required Storage that would meet the variations in the Total Demand during one year, must lie somewhere within the range: [0 - 183,668,651] MWh.

To attempt to study what would be a likely 100 percent renewables configuration, I thought to run a number of different scenarios where, in each, in turn, I multiply the present wind and solar sub-totals by a positive number, starting at two, and then calculate the accumulation for the entire period (all 5-minute time points for 2023). If that multiplier produces a negative value for the running total of the accumulation – signifying a blackout - then increase that multiplier number and repeat the deficit/surplus calculation for the entire preiod. Repeat as necessary, increasing the multiplier for each scenario attempted until an overall surplus – no negative values in the running accumulation - results. To give some sort of context, the first, the "multiply-by-two" scenario is equivalent, to a first approximation, to doubling the installed wind and solar farm capacity. Unsurprisingly, this scenario also results in a large deficit, but it is not as large as the first case.

Note: in devising this strategy, I chose not to use multipliers on the Hydro and Rooftop PV subtotals for the following reasons:

i. given community attitudes regarding hydro dams, it is extremely unlikely that there will be a significant increase in hydro capacity in the foreseeable future,
ii. Rooftop PV capacity is already so large that it is straining grid stability limits in the middle of the day on almost every day, so it is extremely unlikely that even a doubling of capacity, for example, would continue to be actively encouraged by government policy. (Also, the figures provided by the AEMO for rooftop PV performance are an estimate only.)

In an earlier version of this work, I sought to commence the stepwise process with a Storage of zero, hoping to build it up over time to some sort of steady-state by starting with a sufficently large multiplier of the current renewables' generation portfolio.

It soon became apparent that this methodology failed, in that a very large initial portfolio of renewables-only generation was required, resulting in the situation that, without reducing the multiplier over time, the amount in storage just kept increasing monotonically.

I thought to look at other possibilities, first doing a search of the hydrology literature on such as: “sizing resevoir storage to match demand”. I found the following, potentially useful, link: “https://engineeringnotes.com/water-engineering-2/storage-resevoir/how-to-determine-capacity-of-a-storage-resevoir”
Two methods were described, the second being what is called the “Mass Curve method”. What became clear here was that, in order to determine the required storage, in any run, the initial storage in the resevoir must be such that, on commencing the march through the timesteps during, for example, one calendar year of 5-minute timesteps,

A first step to a “Real” Battery Scenario

As it is of absolute importance to obtain the best estimate of the storage requirement, I thought to give due consideration to the very real losses in using battery storage. As a first step to including these very real losses in any practical battery storage configuration, I thought, from the outset, to consider the case of the “non-ideal” battery. In a recent email citing a paper at: https://www.windtaskforce.org/profiles/blogs/battery-system-capital-costs-losses-and-aging , Willem Post cites the following recommendation from Tesla, the manufacturer of the Hornsdale “Big Battery” in South Australia, that to maximise battery life:
“The 40% throughput is close to Tesla’s recommendation of 60% maximum throughput, i.e., not charging above 80% full and not discharging below 20% full, to achieve a 15-y[ear] life, with normal aging”. See also Post (7) for a comprehensive discussion of grid-scale battery losses.

In determining the accumulating storage then, I needed, at the very least, to ensure that at all times that:

- the resulting value for the Required Storage was set at 1.25 times the maximum accumulating storage, (thus ensuring that the accumulating storage never exceeded the battery manufacturer’s requirement that 80 percent of the actual storage is never exceeded),
- at any time point, the amount of the storage component available to calculating the deficit/surplus was never such that the residual in the battery storage was permitted to fall below the stipulated 20 percent of the current Required Storage capacity.

What became clear from the use of the hydrologist’s methods is that any iterative attempt at predicting the required storage must presume that the chosen storage is at full capacity at the commencement of the iteritive procedure.
Also, it seemed sensible to chose an initial value for the multiplier/s such that the average value of the total available renewables-supplied generation, (that is, wind plus solar far plus Rooftop PV plus hydro), is equal to, or just slightly greater than, the average demand for the period under consideration, here the calendar year 2023.

Results

In summary, after trialling many iterations using different multiplier values, I found that the multiplier 3.31 is required, with a storage requirement equivalent to 24 days of average demand. This requirement, remembering that the total storage required is 1.25 times the actual storage required to balance the demand, (given that the storage may be filled to no more than 80 percent of capacity), is 12,077,136 MWh. This then is the storage required to be able to balance demand at all times throughout calendar year 2023.

Giving some sort of context to what this bare number means -
it corresponds to 26,842 Geelong Big Batteries, or, 93,633 Hornsdale Big Batteries.

It is useful to compare the latter with an estimate by Paul McArdle, which I understand is some 70,000 -80,000 Hornsdale Big Batteries. But I further understand that Mr McArdle presumed, as a reasonable first approximation to obtaining a ball-park figure, that the batteries are “ideal”: he did not attempt to address such practicalities as, available storage vs the required storage, transmission losses, two-way trip losses, redundancy required based on battery failure frequency, etc.

The inclusion of any of these many other very real sources of energy losses in the round-trip from generation of surplus through to battery storage to subsequent supply to meet the demand at those times when there is a deficit in the renewables’ output merely increases the required battery storage.

There are several, extremely serious, implications resulting from these findings.

1. Impact on CO2 emissions reductions calculations

With a requirement of some 30,000 “Big Batteries”, there is a clear requirement on the authorities that they determine an accurate estimate of the CO2 emissions resulting from the mining, milling, refining, manufacture of the colossal amounts of materials required for the production, transport and site preparation for this huge number of “Big Batteries” required. That the resulting CO2 emissions might occur in countries outside of Australia does not excuse the requirement for the necessary accounting: any resulting CO2 emissions are released into the same atmosphere.

2. Recycling Burden

Any realistic estimate gives a battery lifetime of some 10-15 years at most. How will it be possible to develop efficient, both in materials and energy efficiency, and effective, recycling and re-use regimes to process such horrendous quantities of waste battery materials? Uttering pious words that “a circular economy will be developed” with no thought as to the detail, as NSW Planning, for example, is doing at the present time, is merely a strategy of leaving the resolution of these horrendous problems to future generations. For a realistic estimate as to the extent of the waste disposal issue, see Mills (4).

3. Environmental Impacts

Given that the Geelong “Big Battery” requires a land-take that is at least equivalent to that of one of Victoria’s Australian Rules Football Stadiums, there is an urgent need to address the likely environmental impacts of what is, by any estimation, a huge land-take requirement. Also worth emphasising is that there can be no argument as to land-use of the land-take required for a BESS. These behmouths occupy the entirety of the land on which they are constructed. There is also the land take required for the enormous amount of overburden and waste rock generated by the mining and milling operations required in the winning of the necessary materials required for the batteries. Again, see Mills (4).

4. Fire Risk

At present, various EIS reports for BESS proposals usually emphasise the risk of fire damage TO the proposed BESS facility from bushfires. There seems to be no account taken of the likely damage to the vicinity of any BESS resulting from fires that start within the facility itself. That there is a very real risk of fires starting in these facilities during, say, a fast-charging scenario, seems at present to be almost totally ignored in these proposals. That there is such a very real risk is indicated by the high rate of fires occurring in domestic premises resulting from the presence of active, in-use batteries of the same Lithium-Ion technology. To think that such a level of risk can be ignored when of the order of 30,000 Geelong Big Batteries is the requirement, is simply fanciful.

5. National Security Concerns

As each of these “Big Battery” installations takes up a huge area, poses a significant fire risk due to the Lithium-ion technology used, and that there will be potentially so many of them, these big batteries constitute a very real National Security risk. It is not inconceivable that a determined aggressor, using something as simple as a concerted drone attack, could set out to destroy these installations, resulting in Eastern Australia a firestorm that would make, for example, the fire-bombing of Dresden during WWII, look like a village bonfire in comparison. That a grid-wide blackout resulting in the total paralysis nationally for some weeks would be the inevitable result of such an attack seems to be an almost incidental consequence. There is also the very real risk that a cyber attack on any potential “back-door”, built in by foreign suppliers, could be used to shut down the batteries instantly, at any time, producing widespread blackouts. Why have governments seemingly given no thought to the likelihood of such a scenario? See, for example, Prins *et al* (5) for a UK perspective of the likely devastating impacts on National Security that so-called “Net Zero” policies are already causing and increasingly will have in Britain. For the Australian context and perspective, the excellent paper by Wilson (6) is recommended unreservedly. This paper not only discusses the, entirely negative, impacts of the present policies supporting renewables in Australia, it also provides a foundational basis for the meaning of Energy Security.

Conclusions

This initial analysis indicates that something of the order of the equivalent of some 30,000 Geelong “Big Batteries” will be required to even begin to address the storage requirements of a 100-percent Renewables scenario for the Eastern Australian grid at present electricity Demand requirements. This figure of 30,000 does NOT address the round-trip losses necessarily resulting from the generation, storage, and later release of electrical energy from that storage. Accounting for these very real losses would merely <u>increase</u> the required battery storage figure.

This number of “Big Batteries” resulting from this very preliminary stage of my investigation indicates the requirement for some very serious investigative work, as a matter of extreme urgency, by those in authority who are presently forging ahead with the “100-percent Renewables plus Battery Storage” policies.

It is instructive, I think, to quote from the paper of Fekete *et al* (2), where they summarise the outcome of their extensive literature search on the topic of the need for the requirement for backup and/or storage to support intermittent renewable generation:

“*Perhaps the most disturbing statement was “Many studies suggest that large (>50%) CO2 emission reductions will not be possible without carbon capture and sequestration (CCS)” (Loftus et al., 2015; Craig et al., 2017) citing the “Deep Decarbonization Project” (https://ddpinitiative.org). If this is a prevailing sentiment among researchers studying the viability of transitioning the energy sector to renewables, one would wish that they were louder and clearer several decades and trillions of dollar investments ago and informed the public that renewables are not sustainable since they will always require the assistance of fossil fuels.*”

Similarly, as far as I am able to determine, no relevant Australian government authority has performed and made publicly available any analysis that provides any indication whatsoever, in a readily understandable way, such as how many "Big Batteries" will be required in Eastern Australia, how they will be sourced and paid for, what are the energy requirements for their production, the waste disposal and CO2 emissions resulting therefrom, where these batteries will be sited, and, given their relatively short service life, how they will be recycled and re-used.

It beggars belief that none of this absolutely necessary preliminary, investigative work seems to have been addressed by the relevant Australian Planning Authorities.

Pursuing this grand dream of "Renewable Energy Superpower" for Australia is, to use a term of Mark Mills, "an exercise in magical thinking". Put simply, it is time that this nonsense ceased.

Paul Miskelly
4 March 2024
e: paul.miskelly@aapt.net.au

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5 July 2024
The Hon. Paul Scully MP MLA
Member for Wollongong
Minister for Planning and Public Spaces
Parliament of NSW
E: wollongong@parliament.nsw.gov.au
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Dear Mr Scully,

Validity of claims by Renewable Energy Proponents re No. of Households Served by proposed Generators

Executive Summary

From an analysis of real generation data for an example solar farm, coupled with a reliable set of household consumption data, it is shown that the claims made as to households served and the scale of battery storage required for a particular proposed solar farm in NSW are, quite simply, considerably overstated. These findings beg the question as to how many other such proposals, perhaps already approved by Planning NSW and the Independent Planning Commission (IPCN), have made similar, untested, claims.

There are several important consequences of these overstatements by proponents.
1. To service a given expected level of Demand, always an essential metric for which to have a reliable estimate, if it is found in subsequent operation that proponents have wildly overstated the demand that their proposed generators might service, then either far more generators will have to be built, posing significantly increased environmental and social impacts, destruction of valuable farmland, etc., or, where not addressed, massive Statewide power shortages will be the inevitable consequence.
2. Addressing any serious shortfall in battery storage would require a massive increase in the number of BESS installations, resulting in similarly vastly increased social and environmental impacts, and a massively increased fire hazard to surrounding regions, the latter resulting from the inherent safety issues endemic in the Li-ion battery technology itself.
3. Massively increased waste disposal issues resulting from the hugely increased resource requirements. It is to be kept in mind that solar panels do not last 25 years as claimed by proponents, and batteries, from the Hornsdale experience, have a service life of less that 10 years.

To give some idea of how far wrong the proponent is in its calculations, even with a battery storage equivalent to 450 Geelong Big Batteries, a number which would be impossible to fit into the selected site, the proponent's solar farm can never supply 262,000 homes.

This poor performance needs to be considered in conjunction with such as the spectacularly poor performance of wind generation across the Eastern Australian grid during the present calendar year. Wind's poor performance occurs frequently, if chaotically. In this background, to consider the further closure of coal-fired generation in the hope that wind plus solar generation plus battery storage will replace it is best described as an extremely dangerous policy.

Introduction

So often we see the claims in proposals for Wind and Solar Farms, or other such renewable energy facilities, that for any given proposal, the proponent claims that, it will "power so-and-so-many thousand homes". How valid are these claims and how readily might they be checked?

I thought to examine one such claim and to provide my findings to you as the Minister responsible for the Planning Approvals process here in New South Wales.

The starting point for any such analysis is the obtaining of reliable data as to the average household consumption of electricity in NSW.

In searching for official data on household electricity and gas consumption, I found the publication by the Australian Energy Regulator (AER) entitled:
"*Residential Energy Consumption Benchmarks*", published on 9 Deccember 2020,
and available at:
https://www.aer.gov.au/system/files/Residential%20energy%20consumption%20benchmarks%20-%209%20December%202020_0.pdf

I have chosen data from that very comprehensive document for what the authors refer to as Climate Zone 5. See Table 16 on page 37. According to the preamble in section 4.2.4.Climate Zone 5:

"*The sample includes 1,908 households in Climate Zone 5. This includes 1,339 in New South Wales and 505 in South Australia. Climate Zone 5 covers several metropolitan areas including greater Sydney and Adelaide. The remaining 64 are in Queensland, in a small pocket to the immediat west of Brisbane.*"

I have chosen the Climate Zone 5 data as being representative of the household consumption patterns in the region of Eastern Australia in which the particular proposed project is to be sited. From that same Table 16, I have chosen the data as representative of households in NSW, that is, covering the wider region within which the proposed project is to be situated, and which therefore it is most likely to supply. Climate Zone 5 Table 16 data for NSW is reproduced below:

"*Table 16: Climate Zone 5: Electricity consumption benchmarks by household size (kWh)*"

State/Territory	Household size	Summer	Autumn	Winter	Spring
NSW	1	732	745	927	705
NSW	2	1,278	1,232	1,565	1,162
NSW	3	1,530	1,503	1,903	1,425
NSW	4	1,819	1,717	2,148	1,627
NSW	5+	2,158	2,082	2,761	2,007

For my analysis, I have chosen the line in the above table for a household of 4 persons. What I did was to use the seasonal average consumption of a representative household of 4 persons in conjunction with 5-minute AEMO SCADA data for a representative generator, scaled to match the specifications of a solar farm proposed here in New South Wales for a similar location.

Preliminaries

For this analysis, I chose the claims made by the proponent for the Birrawa Solar Farm, a proposal that is, I understand, presently before NSW Planning for consideration.
At the proponent's website: https://acenrenewables.com.au/project/birriwa-solar/
under the opening heading "The project", the following relevant claims are made:

1. "*It will generate enough energy to power approximately 262,000 average Australian homes.*"

2. “*The solar component of the project will have a capacity of around 600 megawatts (MW) and include a centralised Battery Energy Storage System (BESS) of up to 600 MW for 2 hours. The BESS will enable energy from solar to be stored and then released during times of demand.*”

The Issued Scoping Report at:
https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-29508870%2120211012T060833.452%20GMT
provides the further relevant information that, *“Birriwa Solar Farm which includes:*

- *the construction and operation of a solar photovoltaic (PV) energy generation facility with an estimated capacity of up to 600 MW; and*
- *associated infrastructure, including grid connection and battery storage of up to approximately 1,000 MW (with an energy storage duration of up to four hours).”*

From these statements I have presumed that: the Solar Farm is to have a capacity of 600 MW, and the Battery Energy Storage System (BESS) will have a capacity of 4000 MWh (1000 MW output times 4 hours).

Analysis - Ability of the Solar Farm plus BESS to supply the claimed number of households

It is an oft-overlooked fact, where renewables proponents discuss the performance of wind and solar generation in terms of average outputs, that solar panels produce no electricity whatsoever at night, all night, every night, 365 days per year, (includes leap year nights too!).

Any associated battery storage must therefore make up the supply shortfall, this being the full requirement of any power generated by the solar facility, for an average of 12 of those hours, at the very least, of every 24-hour day of the year, (the 12 hour period being an average value for the period commonly known as “night-time”, or “darkness”).

The proponent states that the proposed BESS has a storage capacity of 1000 MW times 4 hours, providing a potential maximum battery storage capacity of some 4000 MWh.
Presuming that the BESS battery is fully charged at any given sunset, and not allowing for losses, (which are indeed significant, and will be required to be fully accounted for in any detailed analysis), the question is: how many homes can the battery supply during the 12 hours of the night?

In any proper analysis, proponents must show, to satisfy the latter part of the second claim above, that the BESS battery will be able to supply the full Demand, required by 262,000 homes, during the full night time period, including long winter nights. That’s the implied meaning of: “*The BESS will enable energy from solar to be stored and then released during times of demand.”*

Any detailed analysis must allow that the hours of darkness for each day vary throughout the year, being a minimum at the Summer Solstice and a maximum at the Winter Solstice (which incidentally, for 2024, has occurred just prior to the writing of this document). In considering the worst-case scenario, on winter nights, the night-time period is significantly longer than 12 hours, even in New South Wales at the latitude of the proposed location for the Birrawa facility.

For this analysis, I have presumed that the period to be considered commences on 1 January 2023, and ends at 10 June 2024, so that the initial nights, the period of darkness is close to the minimum for the Summer, so, for the purposes of the analysis, is favourable to the facility’s initial start state.

For generator data, I am using the real-time 5-minute generation data, publicly available from the AEMO, the operator of the Eastern Australian Grid, for the solar farm at Darlington Point New South Wales, which is listed by the AEMO as having an installed capacity of 245 MW. I have multiplied the output at each 5-minute data point by a factor of 2.182, (the multiplier being derived from the fact that as the stated capacity of the Birrawa solar generator is to be an installed capacity of 600 MW, then its output at any time, given that it is to be sited at a location not far distant from the Darlington Point facility in a similar climatic region, can be considered, to a first approximation, to be 600/285 times the output of the Darlington Point facility), and replaced it in the generator table.

The next step is, at each 5-minute timestep, to determine the Demand during that 5-minutes, resulting from 262,000 average Australian homes, in Zone 5 of the above table, each home comprising a 4-person household, these values varying as to the Season of the calendar year.

These Demand values are added to the generator table constructed above.

It is then a relatively simple matter to proceed to step through the table,

- determining the difference between the generator Supply and the Demand;
- adding (if a generation surplus) or subtracting (demand during the 5-minute period being greater than generator supply) the result from the current state of the BESS battery charge, terminating the process should the BESS battery charge state drop below 20-percent of rated capacity, or if not;
- repeating the preceding steps at the next 5-minute time step to re-run the calculation, until;
- the last 5-minute time step is processed, indicating that for the given time span, the solar generator plus BESS is able to satisfy the Demand imposed by 262,000 average Australian homes.

Limits: where the battery continues to discharge, the battery charge may not fall below 20-percent of the rated capacity (here 4000 MWh times 0.2 = 800 MWh), as such a state of discharge has a detrimental effect on battery lifetime. Where the battery charges, it may not charge to above 80-percent of full capacity, that is 3200 MWh. These then are the lower and upper limits of the battery's state of charge, (for the choice of these limits, see, for example, (Post, 2019).

Results

Commencing the run at 12:05 AM, that is, just after midnight on 1 January 2023, with an initial charge as the 80-percent limit, that is, 3200 MWh, the run terminated with the battery being discharged to its 20-percent limit at 2:05 AM on 2 January 2023.

This is a definitive result. A BESS of 4000 MWh capacity is incapable of supplying the Demand requirements of 262,000 homes for even 2 nights of the year 2023, at the height of the Summer months, when nights are shortest.

Conclusion 1 The above analysis shows that the claim by the proponent that the solar "farm", presuming that it has an installed capacity of 600 MW, that it will supply 262,000 average homes, can best be described as wildly optimistic.

This massive failure requires a clear explanation from the proponent showing, in detail, how the calculations were performed and what assumptions were used, to arrive at a number of 262,000 average Australian homes served.

It is tempting to re-run the calculation, decreasing the number of households each time until, if possible, a value for the number of households might be reached where the process is able to step through the entire time period under consideration, that is: 1 January 2023 – 10 June 2024.

I did repeat the process and found that the 600 MW Solar Farm plus 4000MWh capacity BESS battery is able to support some 22,500 average Australian households, that is, some 11.64 times less than that claimed by the proponent, so of the order of 10-percent of the proponent's claim..

I also chose a Battery Storage value of 200,000 MWh, which is a very large battery, being in fact the equivalent of some 450 Geelong Big Batteries, but even with this amount of storage, the combined system, addressing the Demand of 262,000 average Australian homes, fell over at 2023/04/18 02:35:00, that is, after some 3 and a half months operation. Clearly, where even using a battery storage that is so large, so gargantuan, that it is completely unachievable, also fails, then the claim that the proposed solar farm will serve 262,000 homes is in the realms of fairyland.

It is clear from this last run that the required demand simply runs down the initial battery storage, that is, in attempting to supply 262,000 homes, the solar farm is unable to recharge the battery sufficiently to any extent at all.

Conclusion 2 If the claim made by the proponent for the Birrawa Solar Project as to number of homes served is typical of the process being used generally by proponents of renewable energy projects that come before Planning NSW, then this analysis suggests that serious questions need to be asked about the assessment methods presently used, by both Planning NSW, and the Independent Planning Commission.

Yours faithfully,

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