A submission on the AGL Big Battery proposal.

If NSW Ministers Kean and Stokes are to continue to follow their wind and solar energy strategy to the exclusion of cheap and reliable coal and gas, followed by the spending of additional billions on "firming solutions", then grid scale batteries are part of that solution.

AGL with this big battery proposal (600 MW) continues its strategy of covering all money making options. This proposal is closely followed by the 700 MW Eraring proposal from Origin and other huge batteries that make the "SA Big Battery" pale into insignificance.

With our last major pumped storage project being progressed, if that's the correct word, it remains for batteries to offer a partial solution, given that nuclear is not an allowed option (although it is mentioned in the Liddell EIS – maybe AGL is thinking 20 years ahead and planting the seeds.)

Grid scale batteries, in addition to their expense suffer other design features including spontaneous combustion.
We know that EV batteries suffer from this design flaw as do household storage batteries.
Earlier this year, Hyundai recalled 82,000 EVs globally, including over 1000 in Australia to replace the battery packs in response to instances of fire overseas.
In March, the ACCC confirmed a recall notice for some domestic Battery Energy Storage Systems from LG Energy Solution due to potential defects which can cause overheating and fire.

It is not clear that the Preliminary Hazard Analysis adequately addresses the hazards and risks of grid-scale batteries.

Another major issue is waste, especially the battery cores.

NGH Environmental, in the approved Oxley Solar Farm EIS, in a courageous section on battery waste, both during operations and when decommissioning, wrote:

> "Batteries may require replacement up to a maximum of two times during the life of the solar farm"

Recent papers estimate the life of grid scale Lithium Ion Storage Batteries to be up to 3000 cycles.
Jacobs advise that the Liddell battery will be cycled for a minimum of 250 cycles per year. This aligns perfectly with the NGH prediction for a conservative project life of 25 years. To this you must add the waste from the decommissioning process.

The Liddell SEARs, in recognition that waste is significant, state:

> "Waste – the EIS must:
> identify, quantify and classify the likely waste streams to be generated during construction and operation, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste."

This clause has been included in the SEARs for all recent renewables projects. It is time for the Department to insist that the Liddell proponent adequately addresses the issue.

If Jacobs had quantified the issue they would come to the conclusion that many hundreds (thousands?) of tonnes of battery cores are part of the operational waste stream.

In Appendix G, Preliminary Hazard Analysis, battery waste is not mentioned.
In the main body of the Liddell EIS, we get these snippets:

From Page xxiv

"Battery technology is in its early stage of deployment and maturity and the rapid increase in deployment makes end of life planning for batteries an important consideration. At this stage, AGLM have not appointed a technology supplier and do not have an agreement that the batteries will be returned to the supplier at the end of their useful life. Where possible, all components of the asset would be recycled or reused as to align with the preferences of the waste hierarchy and it is anticipated, based on review of current recycling schemes and opportunities, that most components would be recycled at end of life."

Flick the problem on, but don't solve it.

From Page 16, a repeat of the SEARs

"Waste – including identification, quantification and classification of the likely waste streams likely to be generated during construction and operation, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste including waste to be used for reclamation or other project activities;

An assessment of waste generated by the Project is included in **Section 6.11."**

Which leads us to Page 165

"6.11.3.1 Identification of new waste streams

Existing waste generation and management process would remain unchanged with the following exceptions:

▪ Formalisation of the Bayswater Waste Storage Area aimed at reducing contamination risks

▪ Brine Concentrator Decant Basin return water pipe aimed at facilitating processing of brine to salt cake subject to WOAOW project approval.

Key additional waste generation activities are identified as follows:

▪ Management of Battery components including enclosures, battery cores, inverters and transformers at end of life

Battery components

Battery technology is in its early stage of deployment and maturity and the rapid increase in deployment makes end of life planning for batteries an important consideration. At this stage, AGLM have not appointed a technology supplier and do not have an agreement that the batteries will be returned to the supplier at the end of their useful life.

Where possible, all components of the asset would be recycled or reused as to align with the preferences of the waste hierarchy. **Table 6-33** below, describes the recycling opportunities and relevant schemes or legislation for major components of the Battery. The scrap metal market in Australia has been weakened by the COVID-19 pandemic but is projected to grow over the next five years, aligning with the projected growth of domestic and global construction activities.

Table 6-33: Recycling opportunities and relevant schemes for major asset components

Battery component recycling opportunity

Lithium-Ion Batteries

Federal Government listed batteries as a priority product, first appearing on the product priority list in 2014-15, moving to a top priority in the product priority list 20-21. For this reason, the Battery Stewardship Council is progressing toward a voluntary industry scheme commencing in 2020.

The Australian Battery Recycling Initiative (**ABRI**) lists 19 battery recyclers servicing NSW. It is anticipated that with the expansion of both Electric Vehicles and Energy Storage Systems at both residential and utility scale, opportunities to recycle batteries will be available and viable at end of life.

Battery component Recycling opportunity
AGL is a member of ABRI to ensure that end-of-life solutions for energy storage systems are built in at the design stage.

6.11.3.2 Operational waste
Over the life of the Project, various components of the Battery may require or benefit from upgrade or replacement. This would most likely involve the replacement of battery cores within the containers but may also involve the repair or replacement of other infrastructure. End of life or defective lithium-ion batteries are expected to be returned to the supplier for re-purposing or appropriate disposal, while steel components would be recycled.
The operation of the BAW would not generate additional waste streams or alter waste management processes beyond improvements to how waste liquids from Bayswater are stored prior to disposal."

Let me summarize all that:
The main mention of battery waste is in the last section:

> "Over the life of the Project, various components of the Battery may require or benefit from upgrade or replacement. This would most likely involve the replacement of battery cores within the containers but may also involve the repair or replacement of other infrastructure. End of life or defective lithium-ion batteries are expected to be returned to the supplier for re-purposing or appropriate disposal, while steel components would be recycled."

Batteries **will** require replacement, not **may**. It **will** involve the wholesale replacement of battery cores.
The only solution offered is the **expectation** of returning the batteries to the supplier, with no guarantee that they can arrange that contract or enforce it, especially at decommissioning. Until this can be proven, then the waste issue remains with AGL and the EIS should reflect their solution.
There is no evidence that grid scale batteries can be, or are being **re-purposed.**

There is currently **no** recycling solution for battery cores. Ask Nobel prize winner Akira Yoshino.

In the EIS Jacobs puts forward the hope and pray solution:

> "The Australian Battery Recycling Initiative (**ABRI**) lists 19 battery recyclers servicing NSW. It is anticipated that with the expansion of both Electric Vehicles and Energy Storage Systems at both residential and utility scale, opportunities to recycle batteries will be available and viable at end of life."

How many of the 19 recycle EV or grid scale batteries, not just lead-acid car batteries? What actual recycling do they do for the lithium battery cores?

There is time to solve this problem, but the Department needs to act.

My suggestion is that the Liddell battery and the Eraring one to follow have conditions of consent that don't allow battery commissioning until the battery waste issue is solved.

Anthony Gardner