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February 21st, 2020

AEMO
ISP Forecasting & Planning Team
isp@aemo.com.au

RE: General comments on the Integrated system plan for the NEM, draft report

Dear AEMO ISP Forecasting and Planning Team,

Fluence is a global energy storage technology solutions and services company, and a joint venture of the U.S.-headquartered AES Corporation and Germany-headquartered Siemens AG. Our solutions are built on the foundation of industry-leading technology platforms that are optimized for different application groupings, and Fluence leads the energy storage industry with over 1,600 MW of projects deployed or awarded in 21 countries and territories.

Fluence also offers a comprehensive services suite to ensure customers are staying ahead of the market. From early-stage feasibility and cost-benefit analysis that stand up in the real world, to ensuring optimal performance of storage assets, Fluence provides expert advice and services to propel customers' projects forward.

Fluence offers the set of comments below as part of our submission on the inputs and assumptions to be used in its Forecasting and Planning publications for 2020.

Fluence Comments:

We acknowledge that a lot of thought and detail has been put into the modelling for the ISP and that using a scenario approach is a valid approach to craft a broader analysis that creates the output for the ISP. Despite this, we believe the applications and value of large-scale battery-based energy storage solutions (referred to as "Large-Scale Batteries" in the draft ISP) have significantly been under-estimated for the reasons mentioned below.

Accurate modelling of the value-add Large-Scale Batteries can provide in the NEM can potentially change the development path of transmission assets required and the location of certain generation assets, by understanding how and where Large-Scale Batteries can provide services, defer capex and add value.

As already indicated in the Fluence submission on Feb 7th 2020, we and others in the market have concerns that the pricing assumptions for Large-Scale Batteries, if adjusted to reflect pricing Integrators are offering customers today, will show net benefits in AEMO's least-cost modelling approach and result

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in larger estimates of deployments in the ISP forecast. Additionally, the price forecast for Large-Scale Batteries should be re-evaluated based on independent consultant forecasts, the majority of which are forecasting more aggressive declines. Accounting for this can also show deployments of Large-Scale Batteries becoming quickly more viable over the next few years and more attractive as a modular build up. Fluence is happy to support coordination of gathering this information from industry participants and consultants. Fluence believes the assumptions and modelling approach determining the development of the NEM in the ISP is limiting the potential of Large-Scale Batteries.

Modelling the value of Large-Scale Batteries:

- **No recognition of multiple value streams for energy storage:** Based on the assumption for modelling 2-hour to 4-hour Large-Scale Batteries for an energy-shifting application only, the model seems to be valuing pumped hydro energy storage due to the large duration offered, but is failing to account for the multiple value streams energy storage assets, especially battery-based energy storage, can provide. We believe the model is only applying one application of BESS when it is evaluated as a potential new build. It is also not clear from the draft ISP if energy storage has been evaluated for other applications that it may provide:
    - **No accounting for FCAS, FFR or synthetic inertia:** We believe the model does not account for ancillary services that Large-Scale Batteries may provide such as Frequency Response (both Contingency and Regulation bi-directionally).
        - Large-Scale Batteries can also provide Fast Frequency Response and synthetic inertia for compliance requirements and to support the grid.
    - **Impacts on MLFs unclear:** The ISP assumptions indicated Large-Scale Batteries maybe used to improve MLFs, but it isn’t clear if this was factored into the modelling and if the value adder to RE generators was accounted for in the cost-benefit analysis of the model for Large-Scale Batteries.
    - **No recognition of potential for peak power support:** Large-Scale Batteries can also be used as capacity for peak power support that will be utilized few times a year of high demand, by offering cap contracts bilaterally in lieu of a capacity market mechanism in the NEM. Such projects could be structured to stack additional services as well, as Fluence-deployed 4-hour-duration systems are currently providing in multiple states in the United States.

In conclusion, Fluence believes it is important to model in multiple revenue streams the BESS can stack to evaluate its net benefit to the system. For example, when the least-cost model determines if a BESS can be built, it should factor in multiple value benefits of energy shifting, synthetic inertia and the value of frequency and voltage regulation. Our understanding is only one application is modelled in when an asset is built. This may be a significant omission that impacts the LCOE of a battery-based energy storage solution in the least-cost modelling. As mentioned above, given Large-Scale Batteries is modular and can be expanded; as power requirements increase in the future, additional storage can be added at lower costs to existing sites.

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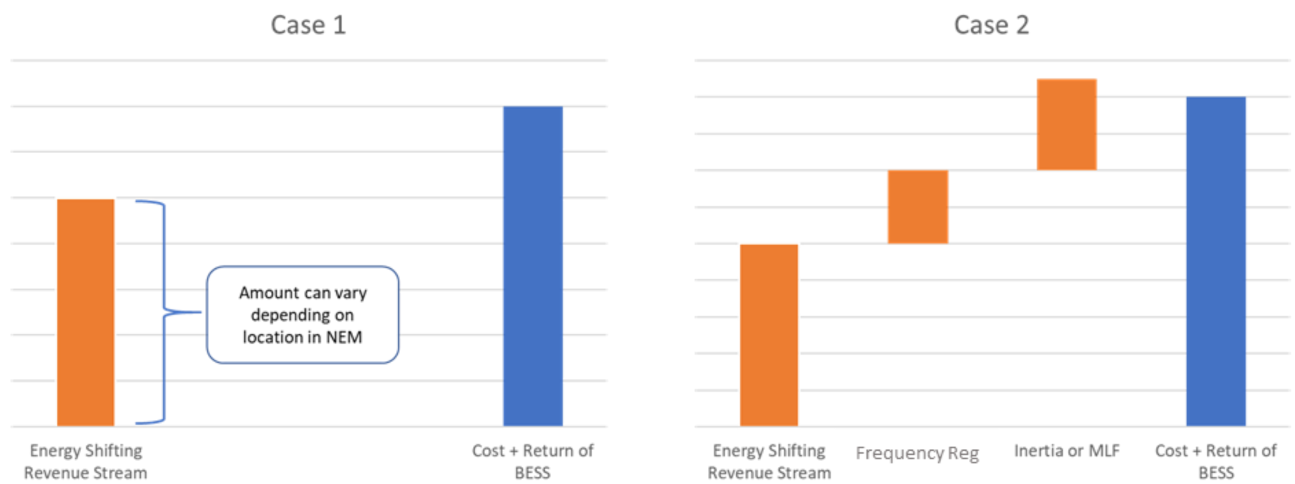
Layering in multiple applications and evaluating long-term cost reductions in Large-Scale Batteries will improve the benefits offered, providing results that would align with the true commercial proposition. Consider two cases illustrated below. Case 1 shows what we believe, is the value stream Large-scale batteries provide in the ISP model. In Case 2, the NPV of Large-Scale Batteries is far higher, indicating greater benefits to the system, and may be deployed as an option to help make VRE dispatchable, given the true value-add is now accounted for. The Case 2 Large-Scale Battery may be larger and more costly, but the benefits can justify the larger size or duration of solution required.



Storage as Transmission:

We understand that under the non-network section in the ISP appendices, it was determined that Large-Scale Batteries were not an economic alternative. We don't believe this would be a generic case across the system for all upgrade decisions. The advantage of using Large-Scale Batteries to create "virtual transmission lines" is the speed of deployment and without lack of perfect foresight that a linear optimization model may use, the ability to build up modularly to meet the required demand. Already we have seen large-scale batteries be evaluated in recent RiT-T evaluations, where certain scenarios showed Large Scale Batteries were net beneficial and overall value add of Large Scale batteries were higher. Using an example of a required transmission line that would take 5 years to build and is built because additional capacity needs to be transferred over the next several years. Looking at the table below, one can see the investment commitment and timing of funding needed for a Large Scale battery with declining prices, can be more beneficial to the system.

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Year (s)	Additional capacity to be transferred (MW)	Transmission upgrade/ New Transmission line	Large Scale Battery Used as Virtual Transmission (VTL)
X-5	0MW	Full Investment for 60MW capacity upgrade Line	
X-1	0MW		Investment for 10MW Battery VTL
X	10MW		Investment for additional 10MW Battery VTL
X+1	20MW		Investment for additional 20MW Battery VTL
X+3	40MW		Investment for additional 20MW Battery VTL
X+5	60MW		

Note: Above numbers do not factor in duration constraints of storage and these need to be evaluated on a case-by-case basis of where virtual transmission will be more beneficial vs Traditional poles and wires. Longer durations requirements will limit the net benefit of Virtual Transmission unless stacked with applicable other applications.

Comparison of cost/benefit to other Technologies in the model:

- It is not clear if Large-Scale Batteries are being modelled for and compared against other storage technologies *including* the cost and time of transmission upgrades that may be required, or simply comparing the costs of one deployed technology to another (i.e., BESS vs PHES). The reason for this to be correctly accounted for in the model is a Large-scale battery provides significant value in terms of construction time, modular design enabling deployments from 100s of kWh to GWh scale, and can be located nearer to load centers with a smaller land requirement. There wouldn't be a need for large Transmission upgrades associated with Large- Scale Batteries to move the power from a geographical favorable central site. Using the example above in Figure 1, a Large Scale Battery can be deployed with these benefits closer to the source of generation that needs to be dispatchable or closer to the load, but certainly avoiding transmission costs to move power from adequate pumped hydro locations.

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- Large Scale Batteries have the ability to displace power assets that are dispatched for less than 4 hours a day. Utility-scale energy storage has already been proven in other markets to be an effective asset in displacing inefficient peaking plants or meeting peaking requirements of existing power plants, enabling generators to optimize operations of baseload plants, which can bring down overall system costs. In many markets it has been shown that Large-Scale Batteries are able to displace new Gas Generation. We believe to make an accurate analysis on the Gas build potential in the NEM, it would be prudent to evaluate the opportunity cost (if any) of providing gas domestically for the Power system vs exporting Natural gas at potentially a higher price to other markets.

To include the benefits of Large-Scale Batteries the integrated model would need to factor in the least cost benefits of each technology in conjuncture with other dynamic inputs, and correctly compared to the total cost to the system of other alternatives. Accounting for all the modelling suggestions above, layering in optimization for generation, transmission, Ancillary services and multiple applications of Large -Scale Batteries, may result in a different outlook to support the NEM.

Fluence understands that re-establishing assumptions will require additional analysis, time and further research, but that doing so ensures that additional opportunities to optimize the NEM's operations and markets go unnoticed or unexamined. Fluence is willing to work closely with AEMO to provide input on the assumptions that reflect pricing in line with offerings provided by the Industry. Additionally, Fluence would be happy to support the AEMO team in better evaluating the diverse applications that energy storage can provide in the NEM and how these can be evaluated in an integrated planning model (i.e., similar to how Fluence has worked alongside network planning teams in the United States, Germany, the United Kingdom, India and other markets).

The suggested changes above maybe significant and if this maybe postponed till a new ISP, Fluence requests that the fundamentals of the ISP are reflected as the model produces, but the exact solution to deliver these results should be technology agnostic or open for further evaluation. This will allow for the right technology and commercial decision to solve the required applications. For example:

> Dispatchable power: The need for storage and flexible resources be identified, but the technology be open to commercial decisions and potentially further evaluation. As we have shown above, Large Scale Batteries could be the technology of choice, and we believe this should be highlighted in the ISP as a potential solution along with other technologies to be further modelled, evaluated and commercially determined.
>
> Transmission upgrades: There is clearly an identified set of power flows required today in the ISP and potentially needed as the market transforms. It should be identified that further analysis would be needed to determine if non-network alternatives would be better suited, which could be Batteries as well. Commercial decision makers do not have perfect foresight and may prefer the flexibility that modular deployment of Large-Scale Batteries offers.

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Thank you for the opportunity to provide feedback on this important topic. If you have any questions, please do not hesitate to contact us.

Sincerely,

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