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Draft Investment Infrastructure Objectives Report — 16 May 2023

EnergyAustralia is one of Australia's largest energy companies with around 2.4 million electricity and gas accounts across eastern Australia. We also own, operate and contract a diversified energy generation portfolio across Australia, including coal, gas, battery storage, demand response, wind and solar assets, with control of over 5,000MW of generation capacity.

We appreciate the opportunity to provide feedback on AEMO Services Limited's (ASL) draft Infrastructure Investment Objectives (IIO) Report. As noted by ASL, the NSW Government's Electricity Infrastructure Roadmap seeks to deliver "a new wave of assets at unprecedented scale".[1] We support the Government's objectives in terms of delivering a lower carbon-intensive electricity supply, with customer safeguards around reliability and affordability.

The draft IIO report mentions risks involved in delivering the Roadmap objectives, primarily in terms of transmission project delay and also the prospect of earlier than expected coal exits. We encourage ASL to explore other deliverability challenges that would result in reliability and cost impacts for consumers where Roadmap investment objectives are not met. Such analysis would add significant value by highlighting specific policy enablers to mitigate deliverability risks. ASL should also provide additional information on modelling of costs, benefits and customer impacts. Government agencies at present appear to be reluctant to have an honest conversation about the expected cost of the transition and more concerned with presentation of benefits. As the independent Customer Trustee, ASL has an important role in appropriately managing expectations which should ultimately help garner support for government policy.

The final IIO report should explore execution risks and consequences of delay

A key execution risk for the delivery of major renewable energy projects remains challenges in navigating planning approval process. At a time when new generation is required by the market, EnergyAustralia faces uncertainty and risk to our existing operations and the development of new projects due to inconsistent and complex planning regulations in NSW. This applies to all infrastructure required to facilitate new renewable generation, be it transmission infrastructure or long-term storage.

[1] ASL, *Draft Infrastructure Investment Objectives Report*, May 2023, p. 10.

Standardisation or the creation of industry-specific Secretary's Environmental Approval Requirements (SEARs) for renewable energy projects other than large-scale solar energy development should be considered, especially for projects required to deliver the Roadmap's investment objectives. The final 2023 IIO Report should consider this risk, the uncertainty in terms of timeliness of approval, and the cost for proponent, and the consequences of continued delays.

ASL's draft tender schedule for renewable generation is 6,000GWh for all years to 2030, equal to the maximum build limit assumed in its modelling. ASL has sought feedback on its build limits and supply chain challenges, which in our view are critical in delivering optimal development pathways. ASL's preferred development pathway shows the addition of 7,351 GWh of renewable generation equivalent in 2025. This exceeds its assumed build limit. An average annual amount of 5,500GWh is added from 2027 to 2029. Noting there is some variance in earlier years, in our view the tender schedule and development pathway amounts leave little flexibility in what can be feasibly delivered given planning, supply and social licence constraints.

ASL comments that the generation aspect of its development pathway is neutral to technology and location, however table 7 of the report mentions technology and regional specific build limits. Project commissioning should be coordinated with network build and specifically the commissioning of particular renewable energy zones in order to maximise customer benefits. It would be beneficial to see such locational specific data in the final IIO report, and to understand how any generation and transmission coordination will take place.

We appreciate ASL has obligations to set out development pathways and tender schedules in line with meeting minimum Roadmap objectives. As part of its scenario analyses dealing with risks of transmission delay, it should model an illustrative sensitivity with lower build limits and the consequences of not meeting legislative objectives to highlight the importance of resolving supply constraints and inform proportionate policy action to resolve these. Different impacts on emissions and customer pricing should be shown that might inform any trade-offs that need to be made. This analysis may be useful alongside the current check-up[2] of the NSW Government's energy policies and the separate scheduled review of the Roadmap's objectives by 2025 under section 78 of the Electricity Infrastructure Investment (EII) Act.

Sensitivity analysis could also examine generation lead times, noting that the EII Act's infrastructure investment objectives refer to the "construction" of generation capacity. This may not mean the commissioning or dispatch capability of assets, which depend on enabling transmission capacity and connections processes. In any case ASL should provide more clarity on how it has interpreted this reference to "construction" in terms of project milestones and its modelling of lead times.

Similar comments apply to the execution of long-duration storage projects and ASL acknowledges the delivery risk in constructing 2GW of capacity in the late 2020s.[3] Notably, the least cost development pathway has 1.6GW of long duration storage constructed in 2029-30. As for generation, the associated tendering schedule for storage appears to reflect a 'just in time' approach to meeting Roadmap investment targets. ASL is yet to process the implications from the most recent delay in Snowy 2.0's

[2] NSW Government to undertake electricity sector check up to deliver clean energy future | NSW Government
[3] ASL, p. 30.

commissioning and we could expect further delays. Estimated lead times for other pumped hydro projects might also be affected.

Data presented with the draft IIO report does not distinguish between batteries and pumped hydro where long duration storage data are presented. Assumptions for these technologies are highly uncertain and technology readiness will be tested in forthcoming tenders.[4] Information submitted in the most recent tender round is obviously commercially sensitive but would have given ASL valuable data on which to assess plausible ranges in technology input parameters, which could be used in sensitivity analyses. That no pumped hydro projects were successful in the first long duration storage tender round, whether intended by ASL or not, provides an important signal to the market regarding the progress of pumped hydro developments. This includes with additional government support in the form of recoverable grants.[5] We encourage ASL to disclose the potential scale of pumped hydro storage as part of a least cost development pathway, and the critical enablers for this, as developers facing long lead times require confidence that there is broad and ongoing support for their projects. In doing so, ASL's report should be clear on the different modelling treatment of pumped hydro relative to long duration batteries, including with respect to their different asset lives and other capabilities that might be important for reliability, resilience to lulls and provision of essential system services.

The draft IIO report and associated Network Infrastructure Strategy (NIS) do not mention social licence, although this is implied in the exploration of transmission project delays. AEMO is consulting on how to accommodate social licence issues in its Integrated System Plan analysis and we expect parameters to be introduced or amended in its final Inputs Assumptions and Scenario Report (IASR). This could see revised construction lead times and associated costs, including as modelling sensitivities. On specific timing assumptions, ASL's central case assumes VNI West would be commissioned in 2031-32 and it would be worth clarifying how this relates to the 2028 completion mentioned in the agreement between the Commonwealth and Victorian governments under Rewiring the Nation.[6]

Assessment of reliability outcomes

ASL has not undertaken an Energy Security Target (EST) calculation or detailed assessment of the development pathway's reliability outcomes, but its modelling uses minimum reserve levels as a proxy for these.[7] It also states that the pathway reflects reliability needs through to 2040, with implications for firming tenders. Specifically, ASL currently sees no need for additional firming until 2039, when 1.59GW of new capacity needs to come online. ASL's outlook to 2030 in particular is an important signal for all developers of firming infrastructure, not just those bidding for firming Long Term Energy Services Agreements (LTESA). We look forward to seeing ASL's detailed calculations against the EST and Reliability Standard in its final report. We expect this will substantiate the role of the additional 550MW of firming capacity recently announced under the Commonwealth's Capacity Investment Scheme.

For the final IIO report we also expect to see analysis around Snowy 2.0 timing, including the prospect of additional delays, and potential cost increases. It may also be

[4] ASL, p. 9.
[5] Pumped Hydro Recoverable Grants | EnergyCo (nsw.gov.au)
[6] Rewiring The Nation To Supercharge Victorian Renewables | Prime Minister of Australia (pm.gov.au)
[7] ASL, p. 47, footnote 87.

worth assessing sensitivities around the Eraring power station given ongoing speculation around its 2025 closure date.

We provided comments to ASL late last year regarding its 2022 'firming' IIO report, requesting additional modelling detail that might assist potential developers where key assumptions change. This included duration requirements, location efficacy and other characteristics of candidate technologies. We appreciate ASL's response to us and further information subsequently provided in tender information this year. Reliability assessments in IIO reports should still be accompanied by details that enable participants to replicate results since input data (especially key project timings) quickly become outdated, and ASL is limited in its ability to publish a comprehensive range of sensitivities. Calculations underlying development pathways should also be transparent to enable stakeholders to validate least cost assessments. Future editions of the IIO report and associated NIS should widen their scope to identify how development and transmission investment pathways interact with system strength and other essential services where markets are evolving.

Assessing resilience to renewables lulls

The EST must be measured in terms of maximum demand and parameters reflecting peak summer periods, hence there is value in also assessing pathways against the probabilistic Reliability Standard. ASL is aware of potential changes to the form of the Reliability Standard. The requirement for it to assess renewable energy lulls puts ASL somewhat ahead of this debate as it is already examining different risks that may arise in future energy systems.

Our understanding from the recent deep dive session on renewables lulls[8] is that ASL is considering whether and how to endogenise renewables lulls in determining development pathways. ASL considers that where a development pathway is assessed as being not resilient to lulls, it is obliged to correct this. We are concerned this might introduce a much stricter reliability constraint and with higher costs for NSW customers that are beyond their willingness to pay. We appreciate that ASL is aware of this and that its approach needs to be calibrated to reflect events that are sufficiently probable, with relationships to the Reliability Standard.

The IIO report must contain an assessment of the resilience of the NSW electricity system to lulls under the proposed development pathway.[9] Our understanding is that neither the Act nor the EII Regulation require development pathways to be resilient to lulls. ASL has broad discretion regarding how lulls are defined. This contrasts to the EST and Reliability Standard which reflect strict definitions and processes, and must be met as part of the Act's "overall" infrastructure investment objectives.[10] The requirement to meet the Reliability Standard is in addition to a further general requirement on ASL to analyse resilience of scenarios in relation to reliability of supply.[11] In viewing these requirements together, we consider that policy makers did not intend for ASL to effectively step into the role of the Reliability Panel with regard to lull assessments. That is, the requirements on ASL to conduct lull assessments are merely informative, whereas the Act's objectives are explicit. If there is a deficiency in data or methods underlying the

[8] https://youtu.be/M6ePwUP9vw8
[9] EII Regulation 2021, clauses 24(2)(e) ad 25(1)(g).
[10] EII Act 2020, sections 44(2)(b) and (c).
[11] EII Regulation 2021, clause 25(3)(b)(i).

Reliability Standard with respect to renewables lulls or similar credible risks, our view is that this is more appropriately dealt with by the Reliability Panel's review process.

To this end, we strongly encourage ASL to continue to develop its own analysis to inform the wider debate on these issues. We support the following as part of its proposed assessment for the final 2023 report and beyond:

- sensitivity testing of its thresholds for defining renewables lulls
- use of short-term time series modelling to capture dynamic effects and USE impacts, rather than rely solely on a headroom assessment of resource adequacy
- assess lulls on a NSW-wide rather than renewable energy zone basis to properly capture resource diversity, including via network and interconnector flows
- ongoing collaboration with AEMO, academia and others on method and data improvements, particularly synthetic traces and climate trends
- adoption of revised AEMO modelling approaches to address shortcomings associated with perfect foresight assumptions, which will be critical in assessing how dispatchable resources behave during these types of events
- use of capacity expansion modelling but only in an informative sense or as a sensitivity i.e. to quantify the additional system cost associated with resilience to particular lull events that may or may not be credible risks.

Assessments of costs, benefits and customer impacts

The draft 2023 IIO report states that the present value of the wholesale costs arising from the chosen development pathway is $78 billion over 20 years.[12] This is more than double the $36 billion cost stated in the 2021 IIO report[13] and warrants detailed explanation. The value in the 2022 firming IIO report was calculated over a 10 year horizon so not directly comparable, but at $42.5 billion appears to be of a similarly high magnitude as the draft 2023 report.

The draft report omits to express this in $/MWh as was done in 2021 and for the sake of wider communications we encourage ASL to further translate this into mass market customer bills. Having this information for the draft report may have averted unhelpful media reporting of transmission capital costs, which while still significant, abstract from end use customer impacts. This would also correspond to the Office of Energy and Climate Change's (OECC) counterfactual calculation of Roadmap benefits. The OECC's report on modelling benefits does not update its 2020 estimate of the expected bill savings of $130 and $430 a year for residential and small business customers respectively, in spite of devoting several pages on the need to do so[14], and being able to provide ASL a draft aggregated net present value of $10.6 billion.

The largest component of ASL's modelled cost of supply reflects electricity purchase costs which are a product of load-weighted NSW spot prices and operational demand. We appreciate that actual wholesale energy costs have increased significantly since 2021 however this might not explain ASL's elevated cost projections over a 20 year horizon,

[12] ASL, p. 15.
[13] ASL, *2021 Infrastructure Investment Objectives Report*, December 2021, p. 37.
[14] Office of Energy and Climate Change, *NSW Electricity Infrastructure Roadmap benefits modelling report*, June 2023, pp. 9-14.

where the reasons behind recent increases should have passed. The final IIO report should identify any assumptions of persistently high coal and gas prices and the extent to which fossil fuel generators are price setters[15], even as more renewable generation and storage units enter the market. Given stakeholder concerns about cost 'blow outs', ASL should carefully identify the extent to which transmission cost increases are another contributing factor.

As per our comments above regarding risks of project delays, it may be worth exploring a modelling sensitivity of cost increases. We appreciate this may not materially alter development and tendering timings given the EII Act investment targets but it would be useful to inform projections of bill impacts and manage stakeholder expectations, noting the apparent doubling of costs since 2021. Understanding key cost drivers and how these can change provides more confidence in ASL's and OECC's modelling of Roadmap financial impacts.

Beyond 2030, ASL is now projecting higher investment in renewables capacity compared to previous reports[16] which would tend to supress load-weighted prices. Roughly speaking we do see wholesale costs for the latter years now remain somewhat flatter compared to the increases shown in the 2021 IIO report. ASL should verify whether this effect is indeed due to higher renewables investment as this would be a key selling point for the Roadmap.

A further observation in comparing 2021 and 2023 draft reports is that LTESA costs appear to have significantly reduced beyond 2030, from roughly $1 billion a year on average[17] to less than $0.5 billion. Again it would be useful for ASL to explain what has driven this change.

Noting we should expect annual cost fluctuations and figure 18 in the draft IIO report is an illustrative example of LTESA cashflows, we question whether there is a negative correlation between wholesale revenues (or costs from the customer perspective) and LTESA payouts on an annual basis. Specifically, payouts to developers or their repayments above threshold amounts operate on a lagged basis once actual revenues and any shortfalls or surpluses are reported and validated. Because of this lag, we might expect to see the coincidence of large LTESA payouts and high spot prices in any given year, and vice versa, which might amplify price impacts for consumers. Countering this is that contribution determinations from the AER are partially calculated using forecast cashflows. Our understanding of ASL's 'missing money' approach to LTESA cost estimation is that it does not consider these administrative aspects and timings. A further complication, which may not be material in aggregate, is that options under LTESAs need to be exercised before any revenue adjustment mechanisms are engaged.

Other feedback on ASL's modelling and assumptions

ASL is running tendering processes with financial merit criteria, so we expect projects to become increasingly less commercially attractive over time as better renewable resources and other factors are exploited by developers early on. This means that the need to rely on LTESAs and contract parameters like repayment thresholds could result in higher costs and payment burdens for NSW consumers. Social licence factors may have a similar deteriorating effect on costs and project lead times if more remote or

[15] OECC, p. 13.
[16] ASL, May 2023, p. 29.
[17] ASL, December 2021, p. 38.

'easier' site locations are developed earlier, and latter projects incur higher costs from more extensive community engagement and sub-optimal siting. These effects do not appear to be reflected in AEMO's IASR workbooks and technology assumptions. Levels of project curtailment and associated risk for developer revenues would also tend to weigh on project economics as transmission capacity becomes increasingly utilised over time, although this depends on access rights allocations and timing of network investment.

Levels of price volatility affect arbitrage opportunities and we understand this is reflected in ASL's modelling of storage project revenues. It would be worth understanding whether volatility increases over the development pathway horizon. It might be the case that spot price outcomes increasingly reflect extended periods of very low prices driven by high renewables output, with less frequent but much higher pricing in periods with energy scarcity and reliance on firming and storage. If so, this will have important implications for contract markets and the Scheme Financial Vehicle's financial exposures, which would tend to increase scheme administration costs via contract premia and prudential requirements. Retailers would be similarly affected and it would be worth exploring this in the broader context of NSW consumer financial interests.

As we have noted above in the context of different storage technologies, it would be worth clarifying differences in the economic lives of batteries relative to pumped hydro storage in the context of a 20 year modelling horizon. That is, whether there are any cost impacts associated with battery reinvestment and the need to re-tender for projects within this horizon. ASL's presentation of modelling outputs should also distinguish between batteries and pumped hydro forms of long duration storage.

ASL and AEMO are liaising on methodological approaches and we encourage ongoing consideration on how to address any biases arising from the application of perfect foresight to storage technologies. Our expectations align with AEMO in that this is more likely to affect shorter duration technologies.

We understand that the IIO report's development pathways are co-optimised for network infrastructure with input from and feedback to EnergyCo's NIS. ASL and EnergyCo have outlined the relationships between their respective documents however it would be worth clarifying how any major revisions for the final IIO report will affect the NIS, which we understand will not be revised until 2025. This relates primarily to the effect of Snowy 2.0's latest delay (i.e. commissioning as late as December 2029) which was also not reflected in the NIS.

Finally, we observe the following with respect to ASL's scenarios which may warrant additional explanation or revisions to scenario parameters:

- Figure 27 shows that the No Coal by 2030 with Strong Electrification scenario has the lowest cost of those modelled and we note ASL's caveats on the likelihood of key scenario parameters. An accelerated coal exit combined with higher electricity demand would likely cause significant price volatility associated with tighter supply demand balances. It is intuitive there are higher scheme costs but even these are significantly understated given the implausibly low cost of utility solar PV that is assumed.

- Figure 28 shows that the emissions profiles for the Central and Transmission Delay scenarios are basically the same which seems unlikely. Our expectation is

that commissioning delays would not be anticipated by developers, resulting in a need to rely on existing and more carbon intensive generators, as noted by ASL.[18]

- the general alignment of development pathways across the Central and Early Coal Exit scenarios (and to a lesser extent Transmission Delay) shown in Figures 24 to 26 largely reflects the impact of meeting the same EII Objectives to 2030 and modelling constraints thereafter, to the point that their informative value is diminished. As noted above there would be more value in presenting a scenario or sensitivity where there is a broader delay in investment in order to highlight the potential higher costs, including reliability and emissions outcomes, of not meeting EII Objectives.

If you would like to discuss this submission, please contact me on 03 9060 0612 or Lawrence.irlam@energyaustralia.com.au.

Regards

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[18] ASL, May 2023, p. 52.