16 February 2023

Mr Andrew Turley
Group Manager Forecasting
Australian Energy Market Operator (AEMO)
GPO Box 2008
Melbourne VIC 3001

Lodged electronically: forecasting.planning@aemo.com.au

EnergyAustralia Pty Ltd
ABN 99 086 014 968

Level 19
Two Melbourne Quarter
697 Collins Street
Docklands Victoria 3008

Phone +61 3 8628 1000
Facsimile +61 3 8628 1050

enq@energyaustralia.com.au
energyaustralia.com.au

2023 Inputs, Assumptions and Scenarios Report — Draft Report for Consultation — 31 December 2022

EnergyAustralia is one of Australia's largest energy companies with around 2.4 million electricity and gas accounts in NSW, Victoria, Queensland, South Australia, and the Australian Capital Territory. EnergyAustralia owns, contracts, and operates a diversified energy generation portfolio that includes coal, gas, battery storage, demand response, solar, and wind assets. Combined, these assets comprise more than 5,000MW of generation capacity.

AEMO's draft Inputs Assumptions and Scenarios (IASR) consultation represents the first formal opportunity for stakeholders to comment on the development of the 2024 Integrated System Plan (ISP) and AEMO's core reliability assessments in its gas and electricity statements of opportunities. These publications and AEMO's general forecasting work program are significant and continually evolving, both in terms of their scale and complexity, and in their impact on market and policy settings. We support AEMO in its willingness to continue to engage with many varied stakeholders, the transparency in its methods and datasets, and the general direction of its forecasting approaches.

Our key responses with respect to the draft IASR are:

- the **capital cost estimates** presented by Aurecon and CSIRO already reflect recent cost increases however in many cases these are still below what we expect developers are likely to be facing in the current market.

- combined with these cost increases, we support AEMO exploring the challenges posed by growing **risks in project execution and commissioning delays**. The proposed introduction of a social licence dimension to its scenario designs could reflect a combination of increasing costs (e.g. to accommodate undergrounding, landowner compensation and suboptimal locations) as well as commissioning delays.

The parameters used to measure workforce requirements could be converted to deliverability constraints and thus modelled as a downside sensitivity of AEMO's proposed "smoothed infrastructure" delivery, as mentioned in sections 2.5 and 3.13 of the draft IASR.

- A running theme in energy market planning and operational assessments in the wake of winter 2022 is the **integration between the gas and electricity** sectors. AEMO has already established a cross-sectoral analytical framework and we encourage refinements here in the form of technical or operational limits. In particular, the 2022 ISP highlighted a long-term reliance on gas-fired generation. The plausibility of this reliance needs to be tested given the general gas supply outlook, high rates of electrification and intermittency of other generation sources. Gas constraints operating at shorter timescales could also be explored i.e. seasonality as well as daily capacities of storage and pipeline infrastructure.

- As we have raised previously, we encourage AEMO's ongoing investigation around modelling of storage behaviours and the **role of perfect foresight**. These may be more relevant to AEMO's modelling methodology and an extension of the insights gained from its time sequential modelling for the 2022 ISP.[1] The IASR could potentially explore this through plant availability assumptions. In addition to being affected by imperfect foresight, it seems unlikely that storage capacity would be fully available for energy arbitrage given alternative ancillary and new essential system services markets.

- AEMO's scenarios involve significant degrees of electrification. The resulting increases in the level and variability of electricity demand underlines the ongoing public discussion around resource adequacy issues and changes in reliability risk. We consider that AEMO's **starting point assumptions for electrification overestimate what is achievable**. Near-term rates of electrification should be validated against likely policy lags. Presumably values for 2022-23 should also be the same across scenarios and aligned with actual observed levels of electrification. This potentially raises methodology and transparency issues in being able to reconcile electric vehicle uptake and appliance switching over time, including as starting points and forecasts are revised in subsequent editions of the ISP, ESOO and GSOO.

Further detailed responses to the draft IASR are attached.

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

Lawrence Irlam
Regulatory Affairs Lead

[1] https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/a4-system-operability.pdf?la=en – see section A4.2.4, pages 16-20.

Scenario design and sensitivities

We note AEMO's overall scenario design reflects informal stakeholder feedback to date, however we question the value and plausibility of adopting relatively high rates of hydrogen and biomethane blending in the Green Energy Exports and Diverse Step Change scenarios. Some exploratory work around AEMO's footnote to table 4 (namely the pipeline and appliance effects of high blending rates) would be of value before adopting these assumptions into planning scenarios. Conversely there is a risk that AEMO will invest material effort in developing and modelling scenarios which are ultimately assigned negligible weighting. The implied biomethane volumes of a 7.5 to 10 per cent blending target in the Diverse Step Change scenario should also be validated against plausible production sources. Until these feasibilities can be validated, it may be prudent to explore 'renewable' gas blending as a sensitivity only.

This issue highlights the wider value in AEMO exploring distribution network impacts (gas and electricity) of decarbonisation pathways involving different degrees of electrification. This would inform deliberations of policy-makers and the AER on the long-term end user costs of maintaining gas networks. This includes accelerated depreciation profiles and the risk of asset stranding, as well as the need to appropriately subsidise and integrate CER technologies as part of gas appliance switching.

We generally support the sensitivities suggested by AEMO, with a particular interest in examining the role of social licence. As noted above this could take the form of higher costs or project delays. This would need to correspond with other assumptions or sensitivity designs, for example the Victorian Government's decision to explore offshore wind might reflect higher social licence barriers in continued onshore development. Similarly there are likely to be social licence issues associated with workforce transition and community impacts that relate to employment demand, affecting the calibration of any "smoothed infrastructure" sensitivity.

Other sensitivities could include:

- the degree of uncertainty in Queensland Energy and Jobs Plan. This relates to project execution risk in two large PHES projects but also transition plans for existing coal-fired generators

- technology choices and incentives from governments. This includes short versus long duration in Victoria's energy storage targets, as well as the exclusion of new gas generation from the recently announced 'Capacity Investment Scheme'. If this policy direction is taken to the extreme it may warrant a 'no new gas generation' sensitivity. Such a sensitivity could also be useful in simulating any lasting negative effects of government price interventions on new upstream gas production, or general gas supply adequacy over the longer term (also discussed below).

- AEMO's modelling of coal exits presumes (at least in part) commercially-driven decisions on the basis of revenue and cost foresight. However, exits are likely to be less orderly and some closure dates could therefore be assumed or exogenous to the modelling. Governments may enter into bespoke arrangements to prolong the life of particular coal-fired generators on reliability grounds, noting this is a potential

feature of the Queensland Energy and Jobs plan, and an "orderly exit management framework" still appears to be on the policy agenda.[2]

- general supply chain barriers could be a variable worth exploring. AEMO has proposed these be fixed in relation to scenario design but arguably the more aggressive high growth pathways like the Green Energy Exports scenario will put pressure on global supply chains, and this is worth stress-testing.

Gas and electricity sector integration

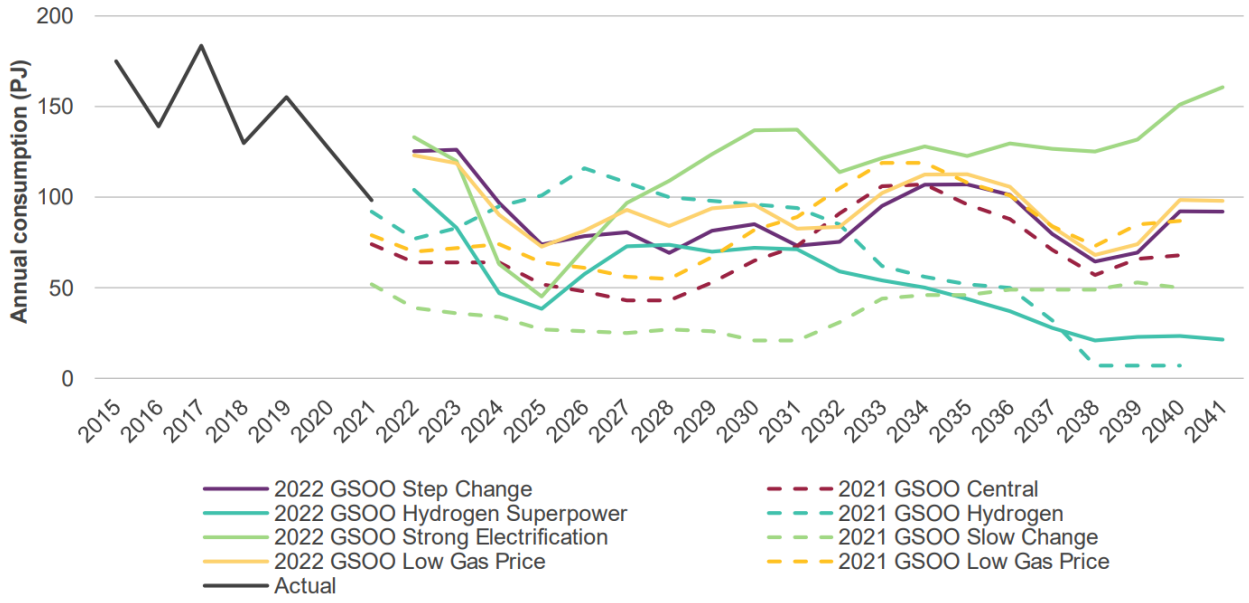
The adequacy of east coast gas supply has been an issue of ongoing concern for the ACCC and other agencies for many years. The responses of governments in giving AEMO emergency intervention powers ahead of winter 2023, and the impacts of gas price regulation on new production sources, mean that AEMO should give particular focus on gas supply risks as they affect NEM planning and reliability assessments.

As this relates to the draft IASR, there may be justification to reflect gas supply constraints as a sensitivity, whether this be on the basis of energy limits or on entry of new gas generation from a policy perspective. Gas production volumes also affect price forecasts as noted below.

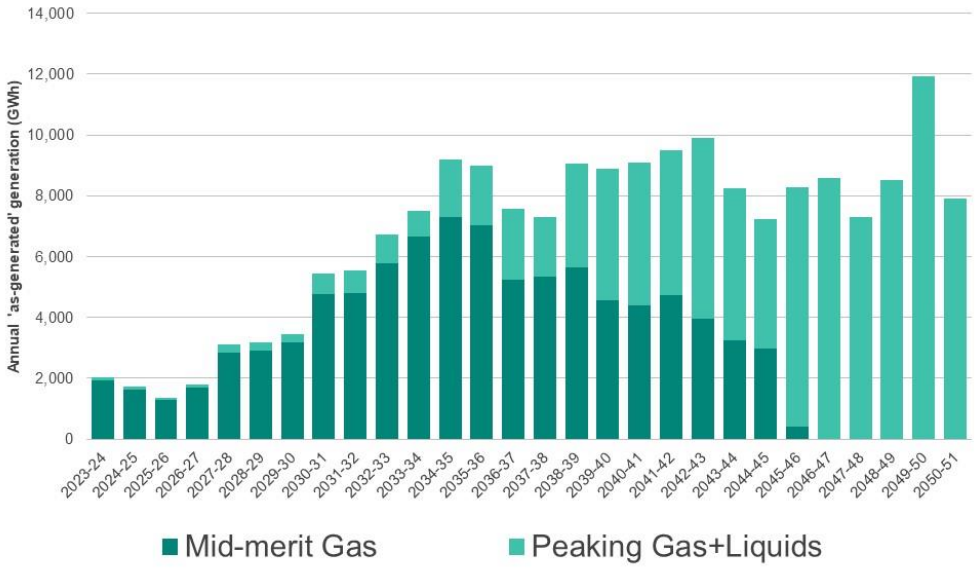
There also seems to be some scope to better align GSOO and ISP modelling inputs and approaches. The energy output from gas-fired generators in some of the 2022 ISP scenarios reflects a significant trend increase out to 2050 which appears to be inconsistent with AEMO's most recent GSOO supply outlooks. Specifically, gas generation in the 2022 ISP Step Change shows a quadrupling of output levels by the 2030s, which is not evident in any of the GSOO scenario projections. This suggests a misalignment of assumptions or constraints used between the GSOO and the ISP, and inconsistencies might also be apparent in daily and seasonal gas generation profiles.

[2] https://www.energy.gov.au/sites/default/files/2022-12/Energy%20Ministers%20Meeting%20Communique%20-%208%20December%202022.docx

Figure 18 Actual and forecast NEM gas generation consumption, all scenarios and compared to 2021 GSOO, 2015-41 (PJ)



Source: AEMO Gas Statement of Opportunities March 2022, p. 32.



Source: "2022 Final ISP results workbook – Step Change – updated inputs.xls", NEM generation by year

Carbon budgets and government policies

We note AEMO's proposed approach to modelling a 2030 carbon budget as well as out to 2050. In our view this would appear to be robust in the face of potential amendments to the NEO which would require AEMO to have regard to the emission reduction targets in the Climate Change Act.[3]

AEMO should be clear in how it will emulate the Queensland Government's proposed approach around coal closure timing, namely that closures 'by 2035' will be dependent on assessments of reliability and system security. We expect AEMO to carefully consider the timing and costs for the two very large pumped hydro projects in this Plan as they will have a significant impact on modelled outcomes for the region.

We would expect AEMO has already been consulted in the setting of the Victorian Government's storage targets and hope that public information in this is forthcoming that will illuminate different duration or locational characteristics.

New entrant generation and storage assumptions

As noted above we consider the capital costs for new entrant generation and storage to be too low. This reflects known factors of term supply chain disruption and very high lithium prices. The EPC market is also changing significantly, with contractors exiting and difficulties in securing construction contracts. This may affect technologies in different ways, for example less so for modular battery installations and moreso for transmission and similar construction projects with higher risks and longer build times. Market conditions may revert to longer term trends however the current situation is highly uncertain.

This is also not a failing of AEMO or its consultants, more a reflection of changing market dynamics and the time lag between gathering and processing market data for the purposes of the IASR. Ultimately this reflects starting point assumptions which need to be updated and will flow through to long term cost trajectories.

Coal and gas fuel assumptions — prices and volumes

As AEMO has noted, starting point fuel assumptions for coal and gas fuel inputs will need to be re-examined in light of government-imposed price caps. We would expect these to potentially extend into 2024, furthermore in the case of gas where a mandatory code of conduct will apply for the foreseeable future. Clarity on how these price caps may affect fuel supply volumes (i.e. existing contracts versus incremental supply) as well as generator bidding behaviour should become available in the coming months as governments and market participants work through implementation issues. To the extent Lewis Gray's price forecasts reflect assumptions about new supply sources e.g. Port Kembla import terminal, this should also be revisited. It may be more plausible that supply shortfalls for the nearer

[3] https://www.energy.gov.au/government-priorities/energy-ministers/priorities/national-energy-transformation-partnership/incorporating-emissions-reduction-objective-national-energy-objectives

term are met through additional negotiated volumes under the Heads of Agreement or other government triggers rather than private investment.

Lewis Gray's longer term gas price trends are, in our view, on the low side. We would also expect to see larger differences in prices across the more aggressive decarbonisation and higher economic growth scenarios. Longer-term decarbonisation pathways involving varying degrees of electrification and potential renewable gas penetration will have significant (albeit highly uncertain) impacts on the commercial operation, utilisation and pricing of fossil fuel infrastructure. For example, Lewis Gray assumes that scenarios with declining demand would result in pipeline owners increasing tariffs in order to maintain a steady revenue.[4] It is not clear whether any subsequent price elasticity effects are accounted for in its modelling, including how the same (and much larger) consumption effects would arise through increasing gas distribution tariffs. Declining utilisation and higher rates of intermittent usage would also tend to increase unit pricing of other infrastructure and potentially upstream gas production. AEMO notes that fuel costs for each gas generator reflect the influence of contracts and transmission costs[5], and it should further explain whether this includes factors like seasonality. If so, it would be useful for stakeholders to see an example of how this is applied.

Our expectation is that AEMO will eventually require more granular modelling of coal and gas volumes which would correspond to more sophisticated price inputs, including shape and seasonality factors, and even some approximation of scarcity or fuel preservation behaviours. Improvements in the modelling of energy limits is already being explored in AEMO's separate reliability guidelines consultation. More granular fuel price and volume assumptions may also be necessary to validate the capacity model outputs in AEMO's ISP using shorter term time sequential modelling.

AEMO should also explore and confirm that the scenarios and associated gas demand forecasts underpinning its 2022 GSOO, used by Lewis Gray, are consistent with the scenarios now proposed for the IASR. We also note that these demand forecasts do not extend to 2050. While it may not be material for AEMO's modelling, representation of different 'end points' for the gas sector, in accordance with 2050 net zero emissions reductions targets, would assist in validating whether scenarios are internally consistent.

Network modelling

We request AEMO provide more clarity on the individual affects that minor network projects and the Waratah BESS SIPS will have on notional transfer capability between SNSW, CNSW and SNW. It is not clear what effect the SIPS scheme has on the aggregate transfer capacity between CNSW and SNW noting the earmarked Bannaby to Sydney West line upgrade project. Furthermore, this anticipated increase is significantly higher following entry of the Central-West Orana REZ Transmission Link.

[4] Lewis Gray Advisory, p. 23.
[5] AEMO, draft IASR, p. 107.

Power system security and inertia

Noting these will be the subject of further specific consultation, AEMO should confirm the coherence of its system strength remediation needs and cost assumptions, some of which arise across different publications. For example, the draft IASR lists a value of $106/kW as included in each REZ augmentation or as a cost per connection. It would be worth clarifying how these costs relate to cost recovery by TNSPs in the presence of government subsidies for transmission development, and how therefore how this flows through to system cost/benefit assessments. In terms of system strength needs, AEMO's December 2022 System Strength report[6] indicates a potential for up to 40 synchronous condensers at 125 MVA across the NEM. EnergyCo's recent Draft NSW Network Infrastructure Strategy[7] states that the Central West Orana zone alone may require 15 synchronous condensers at 100 MVA.

[6] https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/operability/2022/2022-system-strength-report.pdf?la=en. See Table 42.

[7] https://www.energyco.nsw.gov.au/sites/default/files/2022-09/appendices-draft-network-infrastructure-strategy.pdf. See Table 14.