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Mr Daniel Westerman
Chief Executive Officer
Australian Energy Market Operator
Lodged by email: ISP@aemo.com.au

Dear Mr Westerman

Submission to Draft ISP Methodology

The Centre for Independent Studies (CIS) appreciates the opportunity to provide a submission to the Australian Energy Market Operator on its Draft ISP Methodology.

The CIS is a leading independent public policy think tank in Australia. It has been a strong advocate for free markets and limited government for more than 40 years. The CIS is independent and non-partisan in both its funding and research, does no commissioned research nor takes any government money to support its public policy work.

The Draft ISP Methodology contains several areas that need to be amended.

- The problem of perfect foresight for battery operators and gas capacity buildouts has not been adequately addressed and the use of a rolling sequence of repeated weather years is problematic.
- Consumer Energy Resources (CER) have not been co-optimised with large-scale generation and storage.
- Distribution network upgrades needed to support CER have also not been fully factored into the costs of the model.
- Delayed coal retirements have not been considered, despite being more likely than earlier retirements.

Yours sincerely

Aidan Morrison
Director
Centre for Independent Studies Energy Program

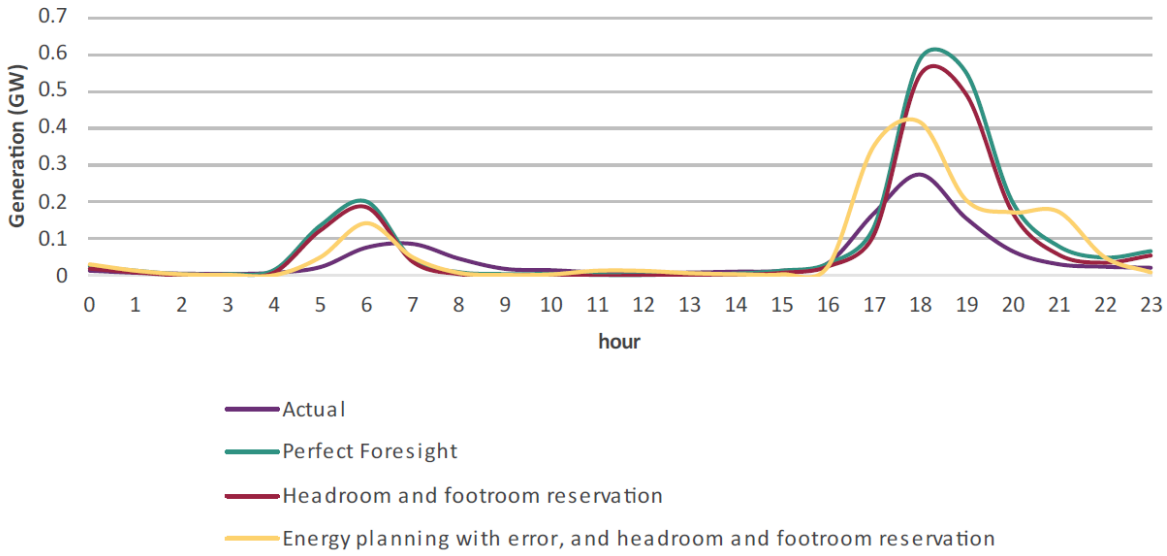
The problem of perfect foresight for storage, gas and transmission

The Centre for Independent Studies commends AEMO for providing further analysis of the impact of perfect foresight on the ISP model. However, the proposed solution to the problem of imperfect foresight does almost nothing to address the core issue.

AEMO has proposed to rely on 'headroom and footroom reservation' as the default method with only a vague commitment to validate the output with the 'deliberate energy planning error' method.[1] AEMO states, "This approach does not attempt to reflect revenue maximisation behaviours that may be promoted by energy arbitrage opportunities, however the effect of these opportunities may lead to greater frequency of imperfect operation by storage operators, of which this approach is a reasonable proxy"[2].

The proposed approach is not a reasonable proxy of how storage operators behave, and will create a modelled battery output that bears very little resemblance to how operators actually operate their storage assets. AEMO's own graph below[3] shows that the modelled peak battery dispatch using 'headroom and footroom reservation' is twice as high as the observed peaks, which do not occur at the same time. This methodology is barely more accurate at approximating real battery discharge profiles than using the 'perfect foresight' method. It assumes the system will be able to access the designated headroom and footroom "only during conditions that would otherwise result in unserved energy"[4]. But these are precisely the conditions that determine the storage capacity needed by the grid and there is no guarantee storage operators will make this headroom or footroom available to the grid at the time needed to avoid unserved energy.

Figure 6 **Actual and forecast average daily energy generation from utility-scale battery storage systems in 2023-24, from time-sequential modelling with perfect foresight, headroom and footroom reservation, and deliberate energy planning error**



Adding in the 'energy planning with error' methodology makes the profile closer to actual output, but still overestimates the response of batteries to high price events. If AEMO relies on only these two methods (especially 'headroom and footroom reservation'), the ISP model will provide an inaccurate picture of battery dispatch that overestimates the amount of battery

output likely to be available during low-supply events. The proposed solution therefore does not address the model's underlying issue of overly-optimistic battery discharge profiles, which causes the ISP to underestimate the total cost of storage needed to meet reliability standards.

Additionally, AEMO has incorrectly labelled battery dispatch as 'generation' on the graph and throughout the document. Batteries do not generate electricity — they merely store it, and consume electricity in the process — so care should be taken not to confuse them with generators.

To properly address the problem of imperfect foresight, AEMO needs to more accurately model the dispatch profiles of battery operators based on historical data to ensure reliability standards are met. If a more accurate model is too computationally difficult, simple assumptions can be made to bring the modelled battery dispatch more in line with reality. For example, the modelled peak dispatch should be halved, as shown in AEMO's real battery dispatch data above. This will ensure the model builds sufficient storage to support the grid during peak demand periods given the actual operation of batteries, and not idealised dispatch profiles.

Likewise, the problem of perfect foresight of gas capacity buildouts needs to be adequately addressed. AEMO has stated it "may check what is needed if the worst sequence were to occur (as was conducted in the 2024 ISP), to ensure resilience in the development of the ODP"[5]. Checking to see whether the proposed GPG plant build-out is resilient against the worst-case scenario for weather sequences is mandatory if consumers are to be confident that the ISP meets reliability requirements.

This issue also affects the transmission buildout. AEMO has proposed to continue modelling a rolling, repeated sequence of weather years throughout the modelling horizon, and "may test the resilience of the ODP in the capacity outlook model via sensitivity analysis, for example by the use of 'worst weather' sequence which reflects the most adverse weather conditions across the horizon"[6]. Again, testing the modelling output against the worst possible weather sequence is crucial to ensure the reliability standard is met. All grid infrastructure must be appropriately sized to deal with worst-case scenarios to avoid unserved energy exceeding the regulated limit. Fitting an ODP to a 'typical' weather sequence does not help achieve this goal. AEMO should make worst-case scenarios central to its modelling, rather than an afterthought dealt with in sensitivity analyses.

The method of using a rolling, repeated sequence of weather years also creates a risk that AEMO's 'filtering approach' will result in suboptimal technology choices. AEMO uses "snapshot years across the horizon to determine whether a technology is a part of the most economically efficient solution at any time across the planning horizon".[7] Basing key decisons on only three or so years out of the entire modelling horizon means those three particular weather sequences will be arbitrarily elevated in their influence on modelling outcomes. This is especially concerning, as it is unlikely the chosen weather sequences will represent the worst-case scenario the grid must withstand.

Consumer Energy Resources

As its reasoning for treating CER uptake as an exogenous input, AEMO states, "Many households and businesses are investing in CER, and AEMO considers that those individual investment decisions are being driven by both financial and non-financial factors"[8]. This statement is highly misleading. As demonstrated in Section 3 of the CIS Energy Team's paper

Rooftop Solar: Paradise Lost (see attachment), consumers' primary motivation in investing is CER is to get a return on that investment through a reduction in their energy bills. Without a sufficiently large return on investment provided by direct government subsidies and the indirect cross-subsidies inherent in the network tariff system (see Sections 4-6 of the attached), CER uptake would drop dramatically. The cost taxpayers and other consumers must bear to incentivise the forecast CER uptake should not be ignored in the modelling.

As the Energy and Climate Change Ministerial Council noted in its review of the ISP, treating CER as an exogenous input "can cause internal inconsistency between assumptions coming into the model and outputs coming out of the model"[9]. As explained in the CIS submission to the ISP Methodology Consultation Paper, this problematic treatment of CER should be remedied by co-optimising CER and distribution with large-scale generation, storage and transmission, if the ISP is to find the truly lowest-cost system.

Distribution networks

It is unclear why passive CER storage is assumed to be "unaffected by distribution network limitation".[10] Given AEMO is planning to undertake more modelling at the distribution network level for future ISPs, these limitations should be factored into the operation of passive CER storage.

It is also unclear whether AEMO will test the effects of low levels of CER uptake when modelling the distribution network. It is vital that the costs of distribution network upgrades needed to support CER are included in the model, along with the CER costs themselves as described above.

Coal retirements

AEMO has not included the effect of coal generator retirement delays in the ISP methodology. It is vital that potential delays to coal retirements are given appropriate weight in the model, given NSW and Queensland have both recently announced extensions of their coal plants.[11] Omitting detailed consideration of coal extensions will prevent the ISP model from representing a sufficiently broad range of plausible future scenarios, thus failing to guard consumers against the risk of over-investment in the likely event that further coal extensions are announced.

Gas Development Projections

The methodology described by AEMO for modelling gas development projections contains too many instances in which AEMO has stated it "may" use a particular method. It provides too much flexibility for AEMO to make subjective judgements about which gas development is reasonable for the counterfactual versus other development paths. AEMO states, "AEMO may identify that an alternate gas development projection for the counterfactual development path of each scenario may be beneficial if the counterfactual development path identifies reasonably different GPG requirements without investment in transmission augmentations (other than committed and anticipated projects)." This makes it difficult to know what actual methodology will be used in the ISP. The gas development projection methodology needs to be further clarified to improve transparency and accountability.

Delphi Process

The method AEMO uses to allocate scenario weights is inconsistent and has resulted in unrealistic scenario weightings in previous ISPs. AEMO states, "Scenario weights are developed through an appropriate form of stakeholder engagement that enables AEMO to demonstrate that the weightings reflect appropriate collaborative decision-making from across the stakeholder cohort (for example, the use of a Delphi technique)."[12] AEMO further describes the Delphi technique as drawing on "an anonymous panel of subject matter experts".[13]

The current ISP methodology conflates stakeholders with independent experts. Stakeholders may include those with relevant expertise who can provide genuine insights into future residential and industrial demand, however they will also include those with vested interests that bias their input towards scenarios which encourage investments in expanded transmission infrastructure from which they directly or indirectly benefit. Allowing such inherit conflicts of interest in the Delphi process risks compromising the objectivity and accuracy of scenario weightings.

The credibility and effectiveness of the Delphi process critically depend on selecting panel members with relevant expertise and appropriate incentives for accurate forecasting. Ideal panel members should demonstrate expertise in one or more of the following: residential, commercial, and industrial electricity demand, consumer behaviour, market dynamics, and technology adoption trends. Crucially, their professional interests should align with accurate, objective forecasting rather than advocacy biased toward specific technologies, policies, or investments associated with certain scenarios.

As such, CIS submits that stakeholders with a direct interest in specific energy development scenarios — including network companies, generators, industry lobby groups, government representatives, and policymakers — should be excluded from the Delphi panel. These groups either stand to benefit materially from the selection of scenarios that justify expanded infrastructure investments, such as transmission networks, or, in the case of policymakers, are naturally inclined to favour scenarios compatible with their existing policy positions. Including these stakeholders risks introducing biases that undermine the objectivity and credibility of the scenarios emerging out of the Delphi process.

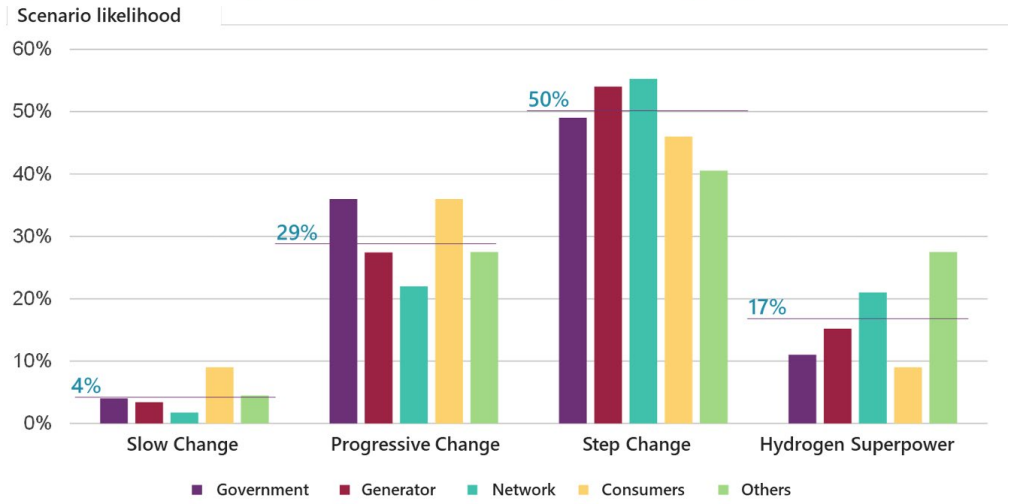
While it is unrealistic to completely eliminate all vested interests, the selection of Delphi panel members should aim to minimise such interests by prioritising participants whose professional incentives align primarily with accurate forecasting rather than advocacy for particular technology or investments. Ideal panel members would therefore include:

- **Academics and independent researchers** with relevant expertise in energy economics, market dynamics, consumer behaviour, and technology adoption, whose professional standing hinges on the rigour and accuracy of their forecasts.
- **Consumer representatives** or experts with a deep understanding of consumer preferences, affordability concerns, and real-world consumer behaviour trends.
- **Institutional investors and money managers**, whose fiduciary responsibilities strongly incentivise accurate market predictions and prudent capital allocation. Although they may hold pre-existing or prospective investments in energy infrastructure projects, which could bias their scenario preferences, they remain highly responsive to market realities and are professionally incentivised to realign investments toward scenarios

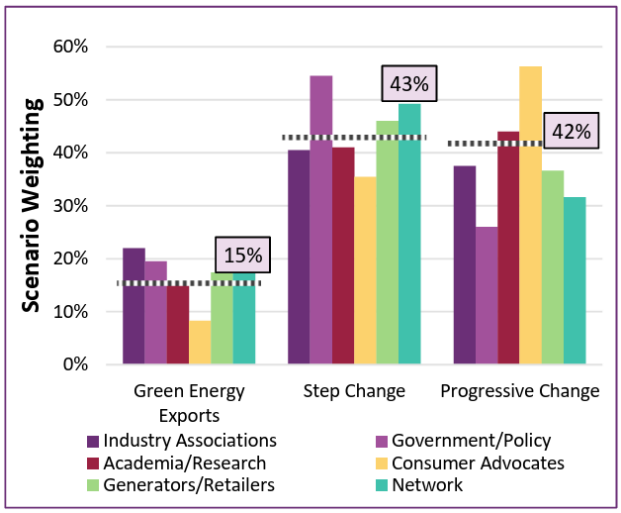
actually unfolding, rather than advocating stubbornly for scenarios they may have initially favoured.

The results from the Delphi panels in previous ISPs illustrate the fundamental issues with AEMO's selection of panel members. In the 2022 ISP's second Delphi panel, consumer groups gave a much higher weighting to Slow Change than any other stakeholder group with a vested interest (i.e., government, generators and networks) and a much lower weighting to Hydrogen Superpower (see figure below).[14] Hydrogen Superpower ended up receiving a weighting (17%) over 4 times as high as Slow Change (4%), despite consumers giving them the same weighting of around 9%.

Figure 9 Scenario weightings, second Delphi panel (by stakeholder group)



In the 2024 Delphi panel, the difference between consumer representatives' weightings and the weightings of lobby groups, government, generators and retailers was even more pronounced (see figure below). Consumers clearly favoured Progressive Change, the least optimistic scenario, over Step Change and gave Green Energy Exports half the weighting given by stakeholders with vested interests.[15]



Particularly given the failure of a green hydrogen industry to materialise in Australia as expected, consumers have thus far been much more accurate at predicting likely futures than stakeholders with vested interests in particular policies, generators or networks. Thus, AEMO

must ensure that, if it is to use the Delphi process, all experts selected for the panel have expertise in the fundamental drivers of residential and industrial demand, without vested interests in particular policies, generators or networks. This will ensure the process provides more reasonable scenario weightings based in reality, rather than weightings that reflect the preferred outcomes of industry and government.

AEMO has stated, "Considering the insights provided by the Delphi process, AEMO may subsequently apply the weightings informed by the panel's responses, or adapt them, with justification, as appropriate."[16] AEMO should either run a Delphi panel consisting of experts as described above without influencing scenario weightings or, if that is not possible, dispense with having an independent, expert-led process altogether and take responsibility for choosing scenario weightings and providing appropriate justification.

An alternative approach for determining scenario parameters as inputs into the ISP process is to implement a market-based forecasting mechanism, analogous to prediction or information markets. Such mechanisms aggregate dispersed knowledge from diverse participants whose financial incentives directly reward accurate forecasts, thereby substantially mitigating individual biases and vested interests. By incentivising accurate predictions and penalising bias, these markets effectively synthesise both private and publicly available information, often outperforming traditional forecasting methods.

Detailed implementation considerations are beyond the scope of this submission. However, at a high level, instead of assigning probabilities to broad scenarios, a prediction market could be established in which contracts directly tied to specific, measurable parameters relevant to ISP modelling are bought and sold. Examples of such parameters include annual electricity demand, peak system load, CER penetration, or electric vehicle adoption rates. The prices generated by these markets would reflect collective market expectations, thereby providing transparent, real-time, and continuously updated forecasts.

For example, a prediction market could establish contracts tied to Australia's annual electricity consumption in 2035. Participants would trade contracts around a benchmark figure — say, 350 TWh — buying if they anticipate higher consumption and selling if lower. The resulting equilibrium price would reflect the market's collective forecast, similar to how financial markets price in expectations of interest rate changes or commodity prices.

TOOT analysis

The TOOT analysis is not fit for purpose in its current form. AEMO has acknowledged "the relative market benefits that the TOOT analysis provides are for each project and do not consider overlapping benefits with other projects nor the synergies that could exist for multiple projects. Therefore the arithmetic sum of the relative market benefits do not necessarily add up to the net market benefits of the ODP."[17] This is a flaw of the methodology, which overvalues the benefits of each project, since projects that are part of an interdependent subsystem have their benefits assessed separately and double-counted.

Instead of taking one project out at a time, AEMO should be taking out one interconnected set of projects at a time to assess its benefit to the system. A key example would be Snowy Hydro 2.0 and the transmission needed to connect it to major load centres, namely HumeLink, VNI West, Sydney Ring and Western Renewables Link. This will ensure the benefits of individual projects are not inflated in the cost-benefit analysis.

AEMO's current approach is at odds with the responsibilities of AEMO Services, the NSW Consumer Trustee. AEMO Services has stated in relation to Central West Orana:

> ...the Regulator will consider a maximum capital cost amount provided to it by the Consumer Trustee in accordance with section 31(2) of the EII Act. This maximum capital cost amount sets an upper limit on the development and construction capital costs of the authorised project. Under the EII Act, the maximum capital cost amount must be kept confidential between the Consumer Trustee and the Regulator and they must not disclose the amount to any other person.[18]

Under the current TOOT analysis methodology, AEMO is essentially publishing the maximum capital cost amount a project can recover, above which it would fail to provide sufficient benefits in the cost-benefit analysis. This is in contravention to the precedent set in NSW for AEMO's subsidiary AEMO Services. This is why it is vital the current TOOT methodology is amended to prevent disclosure of maximum capital cost amounts that would allow network companies to maximise regulated revenue from ISP projects at the expense of consumers.

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[1] AEMO. 2025. 'Draft ISP Methodology: Attachment to Consultation Paper – Addressing perfect foresight for storage devices in the time-sequential model'. p 10.
[2] Tracked changes. p 92.
[3] AEMO. 2025. 'Draft ISP Methodology: Attachment to Consultation Paper – Addressing perfect foresight for storage devices in the time-sequential model', p 9.
[4] Tracked changes. p 92.
[5] Consultation Paper. p 44.
[6] Tracked changes. p 39.
[7] Tracked changes. p 61.
[8] Tracked changes. p 70-71.
[9] Energy and Climate Change Ministerial Council. 2024. 'Review of the Integrated System Plan: Final Report'. p 37.
[10] Tracked changes p 47.
[11] NSW Government. 2024. 'NSW Government secures 2-year extension to Eraring Power Station to manage reliability and price risks'. https://www.environment.nsw.gov.au/news/nsw-government-secures-2-year-extension-to-eraring-power-station; Hall, James. 2025. 'Queensland tears up transition targets and will keep coal for longer'. https://www.afr.com/policy/energy-and-climate/queensland-tears-up-transition-targets-and-will-keep-coal-for-longer-20250407-p5lpn7.
[12] Tracked changes p 133.
[13] Tracked changes p 133.
[14] AEMO. 2022. '2022 Integrated System plan'. p 34. https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/2022-integrated-system-plan-isp.pdf.
[15] AEMO. '2024 ISP Delphi Panel'. p 2. https://aemo.com.au/-/media/files/major-publications/isp/2023/2024-isp-delphi-panel---overview.pdf.
[16] Tracked changes. p 134.
[17] Tracked changes. p 142.
[18] AEMO Services. 2024. 'Statement of Reasons: Authorisation of Main Central-West Orana Renewable Energy Zone Network Infrastructure Project'. p 8. https://aemoservices.com.au/-/media/services/files/publications/authorisation-function/statement-of-reasons-cwo-main.pdf.