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11 February 2025

Mr Daniel Westerman

Chief Executive Officer

Australian Energy Market Operator

Lodged by email: forecasting.planning@aemo.com.au

RE: Submission to Draft 2025 IASR Stage 1

Dear Mr Westerman

The Centre for Independent Studies (CIS) appreciates the opportunity to provide a submission to the Australian Energy Market Operator (AEMO) on its Draft 2025 IASR Stage 1.

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.

We are concerned that the Draft 2025 Inputs, Assumptions and Scenarios Report (IASR) reflects a blind faith that government policy will be fully achieved. This is inappropriate for a planning document from an organisation that is meant to be independent and act in the long-term interests of consumers. By embedding government targets as fixed constraints across all scenarios, AEMO has severely limited the usefulness of the scenario collection, undermining its ability to assess investment risks and the feasibility of alternative pathways.

Beyond this concern, the Draft 2025 IASR also contains numerous optimistic and questionable assumptions that risk distorting planning outcomes. These include unrealistic projections of industrial demand, inadequate consideration of system security costs, an overstatement of Consumer Energy Resources (CER) adoption, and the exclusion of viable generation technologies. AEMO's current approach effectively biases the ISP towards high-cost pathways that may not reflect the most efficient or achievable energy transition for consumers.

We urge AEMO to revise its approach to scenario development by ensuring policy assumptions are treated as variables to be tested rather than fixed outcomes. Additionally, greater transparency and rigour are needed in key modelling assumptions to ensure the ISP delivers a genuinely least-cost, least-regret pathway for the National Electricity Market.

Yours sincerely

Aidan Morrison

Director

Centre for Independent Studies Energy Program

Scenarios and government policy

Are the scenarios, and the scenario collection, suitable for use in AEMO's planning publications including the 2026 ISP? Does the scenario collection support the exploration of a diverse range of possible futures that could occur over the planning horizon?

No, the scenario collection is not fit for purpose, particularly for the 2026 ISP. The scenarios do not support a diverse range of possible futures that could occur over the planning horizon. Also, given the assumption that the 82% renewable energy is achieved, none of them are likely, and arguably aren't even plausible.

AEMO Ignores Policy Uncertainty Despite Its Own Stated Goals

AEMO has overlooked the significant uncertainty posed by evolving policies, which heavily influence the future of our electricity system. This is despite AEMO describing the use of scenario planning as a way to "purposefully capture the key uncertainties and material drivers of these possible futures" on page 5 of the Draft 2025 IASR Stage 1. AEMO further states on page 5 that "the value of the scenario collection is in describing uncertainties from which further analysis identifies benefits or regrets of various alternative investments" and "the scenarios continue to provide a broad range of environments on which to... test the risks of under- and over-investment". However, AEMO does not test the benefits or regrets of investments under alternative government policies; thus undermining the breadth of the scenarios and their ability to test for over-investment and, therefore, any value the scenario collection could have offered.

By following government policy without question, AEMO is not providing policymakers and the public with independent, expert advice on the feasibility of the current plan for the energy system. Should certain government targets become near-impossible to achieve, AEMO's current approach means the transmission investments approved under the ISP will not be optimal in the real future; forcing consumers to pay more than necessary.

AEMO's Justification for Hardwiring Policy Targets is Illogical

The explanation provided by AEMO as to why policies must be imposed as a binding constraint in all scenarios is illogical. On page 25, AEMO states:

> *While the optimal development path must demonstrate positive benefits in the most likely scenario, all scenarios are still intrinsically part of the cost benefit analysis, necessitating consistent consideration of policies across each scenario. AEMO considers that an approach in which only some policies are selectively considered in the scenarios would result in inconsistent consideration of the policies across the scenario collection, once the weighted net economic benefits of each scenario are combined to select the optimal development path... This approach recognises that inefficient outcomes are likely to emerge where power system planning does not adequately consider committed government policy (i.e. the included policies). While it is possible that an included*

policy's objectives or the actual pace of achievement of those objectives may change after the publication of the ISP, AEMO considers it appropriate for each of the ISP scenarios to model for the stated objectives of these policies.

AEMO has not explained why all scenarios must include "consistent consideration of policies" simply because they are part of the same cost-benefit analysis. Scenarios are required to be internally consistent, not consistent as a whole. Scenarios being consistent with one another breaches the requirement that the scenario collection be broad, distinctive and useful enough to account for the risks of over- and under-investment.

If the concern is that including some jurisdictional policies and not others will bias the results against consumers in some states, the solution is simple: AEMO can include a baseline scenario with no government policy. Another key scenario would be one in which only legislated emissions targets are included, allowing the model to build the lowest cost system that meets emissions reduction targets instead of one which is forced to meet inefficient renewable energy targets that may be almost impossible to meet in the real world.

AEMO Selectively Identifies Investment Risks While Ignoring the Danger of Overbuild

AEMO has recognised "inefficient outcomes" arising from government policies not being included in system planning while ignoring the ineffective outcomes that will eventuate for consumers if highly unlikely or inefficient government targets are pursued; or indeed if such targets are moderated or removed, as frequently occurs when governments change.

AEMO further states on page 25 that "it has not identified a need to develop a different approach based on how a policy is assessed to be an included policy under NER 5.22.3(b)." This is despite repeated submissions from the Centre for Independent Studies (CIS) pointing out the vital need for a different approach.[1] As CIS has previously argued in our submission to the 2025 IASR Consultation Paper, the NER 5.22.3(b) requirement that AEMO "must consider" government policies does not mean AEMO must slavishly adhere to government targets and consider no alternative. In fact, AEMO's current approach to scenario design is in direct contravention to NER 5.22.10:

(a) In preparing an Integrated System Plan, AEMO must...

(5) consider the following matters...

(ii) the risks to consumers arising from uncertainty, including over investment, under-investment, premature or overdue investment ...

AEMO has not fulfilled its responsibility to consider the risks to consumers arising from policy uncertainty, and in doing so has greatly increased the risk that consumers will end up paying for premature and over-investment in transmission infrastructure. AEMO must ensure it complies with both 5.22.3(b) and 5.22.10 in the NER if it is to fulfil its obligations to consumers.

AEMO’s Policy Lock-In Fuels a Jurisdictional Policy Arms Race

On page 10 of the 2025 IASR Scenarios Consultation Summary Report, AEMO states:

> *AEMO does not agree that it would be appropriate, given the ISP rules, to develop an alternative base case that examines future investment needs without regard to the breadth of policy drivers influencing the power system needs; evaluating the overall benefits of individual or collective policies is best conducted by each government which has greater opportunity to consider broader costs and benefits inside and outside the energy system.*

Binding all scenarios to all policies and leaving the evaluation of policies to governments has resulted in a state government policy competition, as jurisdictions know that if they announce a policy — even one detrimental to the system as a whole but beneficial for consumers in their state — it will be included in every scenario by AEMO. CIS has previously explained the risks AEMO’s actions have created for consumers.[2]

AEMO’s Exclusion of Nuclear Energy from ISP Modelling is Unjustified

Furthermore, AEMO has not provided sufficient reasoning as to why it refuses to model a scenario including nuclear plants, given the current ban could plausibly be lifted before the 2026 ISP is published and the inclusion of the technology in the grid could be made official government policy. On page 39, AEMO states:

> *Currently, Section 140A of the Environment Protection and Biodiversity Conservation Act (1999) (C’th) prohibits the Federal Government from approving the construction or operation of a nuclear installation that is for the purpose of generating electricity. This is current legislation that prohibits a particular electricity generation technology, and as such AEMO cannot consider the technology option in any of its scenarios.*

However, the *Environment Protection and Biodiversity Conservation Act (1999) (C’th)* does not prohibit AEMO from considering the impacts of a nuclear policy on transmission planning in the near term. Such a policy would have a significant impact on the Optimal Development Path (ODP) and is a key uncertainty that should be modelled to ensure the ISP scenarios are resilient to policy change. It is important that AEMO operates using a balanced approach to government policy, rather than a short-sighted approach that assumes all policy targets will both never change and will be met regardless of their feasibility.

The Politicisation of AEMO Undermines the Credibility of the ISP

Currently, the ISP unquestioningly presents a renewables-dominated energy plan as both optimal and achievable. As the ISP is mainly driven by the federal government’s 82% renewables target, the plan in its current form is a vehicle of Labor policy. If AEMO’s strict adherence to government policy continues and the Coalition wins the next federal election, the ISP would then become a vehicle of Coalition policy. To be consistent, AEMO would have to unquestioningly present a government-determined nuclear plant rollout as both optimal and achievable.

The permanent loss of AEMO's independence from the government of the day would be disastrous for market participants and consumers. AEMO must consider realistic scenarios in which current government targets are missed, moderated or removed.

Strict adherence to government policies, particularly renewables targets, means the lowest cost system for consumers (or even the lowest cost system that meets emissions reductions targets) is not being modelled. This risks emissions reduction targets for the whole economy failing to be met, as sustained increases in consumer bills would likely destroy the social licence for reducing emissions in other sectors that are harder to abate. As AEMO states on page 42, "These NEM-wide carbon budgets recognise that the electricity sector has a key role to play as an early mover by enabling the decarbonisation of other sectors via electrification and increased energy efficiency." Such electrification will be unlikely to eventuate if electricity prices rise too high, and energy efficiency alone will be unable to achieve current emissions reduction targets.

Which of the two described scenario variants for the Green Energy scenario is the more appropriate variant for application as the scenario in AEMO's 2025 IASR scenario collection (depending on the planning analysis, AEMO may apply the alternate variant in sensitivity analysis)?

Both scenarios are highly unlikely to be achieved, given the lack of economic viability of currently-planned hydrogen electrolyser projects — as evidenced by major industry players pulling out of hydrogen projects in recent months.[3]

The ***Green Energy scenario* should be removed in its entirety**, as the scenario already represents an implausibly-high renewables penetration trajectory that is constrained to meet the 82% by 2030 target. As Figure 1 shows, the *Step Change* scenario already fulfils the role of being an upper bookend scenario.

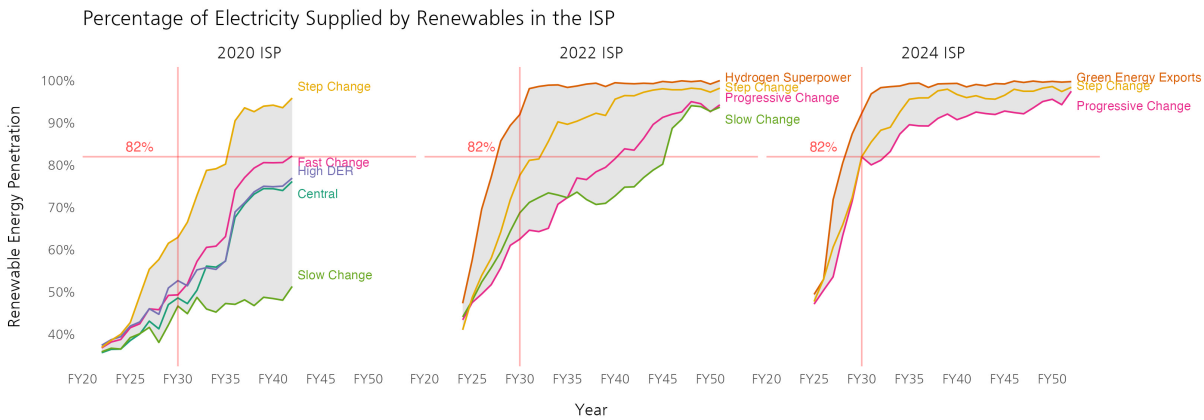

Figure 1. Percentage of electricity supplied by renewables shows greater convergence *Step Change* and *Green Energy* scenarios has increasingly converged across successive iterations of the ISP.

Are the scenario parameters, and parameter values, clear and suitably aligned with their respective narratives?

No, the scenario parameters and values in AEMO's Draft 2025 IASR are neither clear nor suitably aligned with their respective narratives. AEMO continues to manipulate industrial demand assumptions in the *Progressive Change* scenario, diverging from its original scenario design and independent economic modelling while failing to justify key changes. Such manipulation lowers the projected cost of a renewables-dominant grid and undermines the ISP's reliability as a planning document.

Industrial Demand Manipulation in *Progressive Change*

AEMO's treatment of industrial demand in the *Progressive Change* scenario remains one of the major discrepancies in the 2025 IASR. Originally, *Progressive Change* was designed as a scenario where slower global decarbonisation would sustain industrial activity, particularly in energy-intensive sectors such as mining and manufacturing. This was reflected in Oxford Economics Australia's modelling, which projected that *Progressive Change* should see stronger industrial activity due to weaker global decarbonisation efforts and continued demand for Australian resources.[4]

However, in the 2023 IASR, AEMO introduced large-scale industrial closures into *Progressive Change;* a feature previously exclusive to the now-discarded *Slow Change* scenario. The Draft 2025 IASR maintains this assumption, stating in pages 69 and 70:

> *The Progressive Change scenario for the NEM shows drops in consumption in the short to medium term, accounting for challenging economic conditions resulting in closure risks for major electricity consumers. That scenario explicitly includes closures of major industrial facilities across the NEM to enable investigation of over-investment risks in the ISP.*

Such a shift is not supported by Oxford Economics Australia's modelling, which projected continued industrial demand under *Progressive Change*.

AEMO may claim that these industrial closures are simply a structural feature of *Progressive Change* as designed, but this is a post-hoc revision rather than a continuation of original modelling assumptions. The fact that this assumption was introduced only in the 2023 IASR, after *Slow Change* was removed, raises questions about why AEMO made this adjustment and whether it was done to suppress industrial demand in *Progressive Change* to make the cost of a renewables-dominant grid appear lower.

By artificially lowering industrial demand in *Progressive Change*, AEMO reduces the forecasted need for firming capacity such as peaking gas, grid-scale batteries, and other dispatchable resources. This manipulation distorts cost comparisons between different energy pathways, making a renewables-heavy grid appear more cost-effective than it realistically would be. If industrial demand were properly modelled to reflect higher activity levels as projected by Oxford Economics, the ISP would require more firming investments, revealing a higher total system cost for variable renewables. Instead, by assuming industrial decline, AEMO reduces the scale of required investments in firming capacity, falsely deflating the projected system cost of renewables.

Lack of Transparency in Key Assumptions

AEMO has failed to provide adequate justification for why *Progressive Change* now assumes major industrial closures, raising serious transparency concerns. The Senate Inquiry into Energy Planning and Regulation has already highlighted AEMO's opaque modelling practices,[5] and the 2025 IASR does little to improve confidence in AEMO's transparency and accountability.

AEMO does not explain why industrial demand is projected to collapse in *Progressive Change*, yet remain stable or even increase in *Step Change*, which assumes a much stronger economy. The IASR attributes declines in industrial consumption in *Progressive Change* to 'challenging economic conditions' and assumes major industrial facility closures across the NEM. However, it provides no justification as to why these economic risks materialise only in *Progressive Change* and not in other scenarios.

This lack of transparency makes it impossible for external stakeholders to scrutinise AEMO's modelling effectively. It also raises broader concerns about whether scenario design is being tailored to produce predetermined outcomes rather than objectively testing diverse future pathways. Given that the ISP underpins major infrastructure investments, it is essential that scenario assumptions are clearly documented, justified, and open to review. AEMO's refusal to disclose the full reasoning behind its industrial demand assumptions undermines confidence in the ISP's integrity.

Consumer Energy Resources (CER)

Are the CER forecasts suitable for their respective scenarios? What strategic factors do you consider may influence CER projections?

The Draft 2025 IASR marks a notable shift toward moderation in its treatment of CER. By placing greater emphasis on averages and weighted averages, AEMO has reduced reliance on Green Energy Markets (GEM)'s aggressive forecasts and given more weight to CSIRO's somewhat more conservative projections for rooftop solar, consumer battery, and Virtual Power Plant (VPP) adoption.

This shift is evident in AEMO's latest approach, which weights battery and VPP forecasts at 2/3 of CSIRO and 1/3 of GEM in the *Step Change* and *Green Energy Exports* scenarios, and applies average rooftop solar forecasts rather than defaulting to GEM's more aggressive assumptions. These adjustments reflect a more restrained growth trajectory for CER, acknowledging economic constraints and practical limitations that shape CER uptake.

Nevertheless, despite AEMO's move towards moderation, the CER forecasts in the Draft 2025 IASR remain unsuitable for the 2026 ISP for three key reasons:

1. Failure to integrate and co-optimise CER investments with utility-scale investments in the ISP, in order to better consider trade-offs with alternatives.
2. Failure to ensure consultant forecasts adequately incorporate distribution network constraints and investments, which are critical to accurately modelling CER projections.
3. Reliance on unrealistic assumptions, including speculative policy incentives and an inadequate representation of grid limitations, leading to inflated CER adoption projections.

As a result, AEMO's CER projections do not resolve the shortcomings identified in the ECMC's Response to the ISP Review, fail to capture real-world network constraints, and remain fundamentally incompatible with the ISP's system planning objectives.

CER Should Be Endogenised and Co-Optimised in the ISP

AEMO Must Integrate CER into Least-Cost System Planning

The current approach fails to contemplate the possibility that the optimal level of CER uptake could be the same as, less than, or little more than the current levels. This ties the model into the untested assumption that vastly-increased uptake of CER is optimal for the system and the long-term interest of consumers, which is likely to not be the case.

While AEMO acknowledges the significance of distribution network upgrades and has committed to providing greater costing detail in future ISPs, it has failed to commit to fully integrating these costs within the least-cost Development Paths and the Optimal Development Path (ODP). Instead, AEMO continues the longstanding practice of treating CER uptake as an exogenous input from consultant forecasts, rather than an endogenous variable to be co-optimised alongside generation and network investments. By locking CER uptake into fixed consultant projections, AEMO forces utility-scale investments to optimise around predetermined CER levels, instead of allowing the ISP model to dynamically evaluate trade-offs between CER, large-scale generation, storage, and network investments.

This approach directly contradicts the ECMC's directive in response to the latest ISP Review, which stated that "a truly whole-of-system plan must consider the relative merits of additional investment on both sides of the market", and thus AEMO is asked to enable "investment optimisation that spans the demand- and supply-sides of the market".[6]

Additionally, the ISP Review itself called for:

> *... a more integrated analysis of the risks and trade-offs between electricity transmission, generation, storage, CER and distributed resources... [which enables] the ISP to promote the least cost delivery of electricity, in the long-term interests of consumers.*[7]

The need for reform to co-optimise demand-side planning (CER) with supply-side planning in the ISP has been widely endorsed by stakeholders, including climate change and environmental advocacy groups, academic and research organisations, and consumer advocates.[8]

Despite these clear directives with strong support from stakeholders, AEMO fails to commit to co-optimising CER and distribution network investments with utility-scale generation and transmission planning. Instead, CER investments remain fixed inputs, preventing the ISP from being a truly optimised whole-of-system plan.

AEMO's Proposed Approach Fails to Deliver Whole-of-System Optimisation

In response to the ECMC directives and the ISP Review, AEMO proposes in the *Integrated System Plan (ISP) Methodology Issues Paper* to engage more extensively with Distribution Network Service Providers (DNSPs) to assess existing and future distribution network capabilities and their impact on CER operation, particularly for rooftop solar and batteries. As part of this, AEMO plans to incorporate cost curves for distribution network augmentation into the *Network Expansion Options Report* and represent distribution constraints at a sub-regional level in ISP modelling. By doing so, AEMO aims to identify opportunities where distribution network augmentations could facilitate greater CER uptake and compare these with utility-scale generation, storage, and transmission investments.

While this proposal introduces greater visibility of distribution costs, it ultimately fails to meet ECMC's requirements for a whole-of-system plan for several reasons.

First, AEMO still treats CER uptake as an exogenous input, relying on fixed consultant forecasts rather than dynamically testing CER levels within the ISP model. This means that while AEMO may now assess optimal DNSP investments based on assumed CER uptake, it does not assess whether CER adoption itself is cost-optimal given the associated distribution network costs. As a result, the ISP remains structurally biased towards high CER uptake, regardless of whether alternative investment pathways could deliver lower system costs.

Second, AEMO continues to exclude CER capital costs from system cost calculations, despite ECMC's directive to integrate CER with broader system investments. While distribution augmentation costs will now be considered, CER capital costs are still omitted. The CIS estimates CER capital costs under 2024 *Step Change* to be $348 billion, compared to $83 billion for large-scale solar and batteries.[9] In net present-value terms, CER costs amount to $121 billion, annualised to 2050 at a 7% discount rate, nearly doubling AEMO's headline capital cost figure in the 2024 ISP.

CIS therefore urges AEMO to commit to fully incorporating and co-optimising CER capital costs and related distribution investments into its final system cost estimates. AEMO's continued refusal to do so, despite repeated calls from stakeholders, undermines the ISP's credibility as a genuine whole-of-system plan.

Moreover, AEMO's claim that the ISP reflects "whole of system costs"[10] is not just misleading but false, as it systematically omits billions of dollars of consumer spending from the reported total system cost. By continuing to exclude CER capital costs, AEMO distorts cost comparisons, conceals the true financial burden on consumers, and ultimately misleads policymakers and market participants about the least-cost pathway for the energy transition.

CER Must Be Dynamically Modelled, Not Treated as a Fixed Input in the ISP

By outsourcing CER projections to external consultants and treating them as an exogenous input to the ISP model, AEMO effectively prevents the ISP from optimising CER alongside utility-scale generation, storage, and network investments. Under the current approach, utility-scale investments must be optimised around predetermined CER uptake, rather than allowing the ISP to assess trade-offs between CER, network augmentation costs, and large-scale energy solutions. This locks in CER adoption regardless of cost-effectiveness, distorting least-cost system planning.

To achieve a genuinely co-optimised system, AEMO must treat CER as an endogenous variable, determining the most cost-effective level of CER — including associated distribution network costs — compared to utility-scale alternatives. Anything less than this amounts to an abdication of AEMO's responsibility to deliver a truly efficient, least-cost system plan.

Merely introducing additional sensitivity testing is insufficient, as it explores only limited variations in CER uptake while continuing to treat CER as the default preferred investment. This fails to address the fundamental problem that utility-scale investments are still forced to optimise around fixed CER assumptions.

At a minimum, AEMO should adopt sequential modelling, where it first establishes a baseline least-cost solution using utility-scale assets and then substitutes CER only when it delivers clear system-wide net benefits. For example, utility-scale batteries near load centres could be evaluated against distributed residential batteries, while rooftop solar uptake could be compared with large-scale solar farms. This approach ensures that consumer investment is relied upon only when it provides a genuine comparative advantage and system-wide efficiencies, rather than burdening households by default with the expectation of financing the energy transition through purchasing their own energy infrastructure.

CER Forecasts Don't Adhere to ECMC Directives to Incorporate Distribution Network Factors for 2026 ISP

In response to the ISP Review, the ECMC directed AEMO to improve how the 2026 ISP accounts for CER, specifically by integrating distribution network constraints and DNSP investment considerations. The ECMC explicitly required AEMO to:

- "[undertake] targeted stakeholder engagement to enhance assumptions underpinning consumer energy resources (CER) and distributed resources projections in the ISP. The assumptions should reflect a comprehensive view of initiatives affecting CER and distributed resources uptake and evaluate the implications for operational demand."
- "... [analyse] how DNSP investments, programs and annual plans, may impact CER and distributed resources development, and thereby the ODP for transmission, and include these findings in the ISP in order to send clearer signals to inform DNSP planning."

Despite these directives issued in April 2024, the December 2024 CER forecasts from CSIRO and GEM still fail to properly incorporate grid capacity and DNSP investment as key factors influencing

CER uptake. Instead, both consultants continue to treat DNSP investment as an externality, assuming that network upgrades will occur as needed without rigorously assessing their cost, feasibility, or impact on CER adoption rates.

As outlined below, CSIRO and GEM take incomplete approaches to modelling grid constraints. CSIRO applies a proxy for grid constraints by imposing system size limits on rooftop PV uptake, while GEM accounts for solar curtailment due to export constraints. Neither consultant fully integrates distribution network hosting capacity as a hard constraint on CER uptake, nor do they attempt to quantify the capital costs of required network augmentation. As a result, the ISP's CER projections remain detached from real-world grid limitations, failing to align with the ECMC directive to integrate DNSP planning.

Without a clear evaluation of the distribution network's capacity to host CER, AEMO risks using CER forecast inputs that overestimate CER adoption and thereby misrepresent the system-wide costs of accommodating high consumer energy resource penetration.

Consultant CER Forecasts Are Unrealistic and Overstates Adoption

The CSIRO and GEM forecasts CER projections by underpinning the ISP are built on assumptions that fail to reflect real-world constraints, making them overly optimistic and incompatible with a least-cost system plan. These projections inflate CER uptake by ignoring distribution network limitations, incorporating speculative subsidies absent from the IASR/ISP, and deviating from AEMO's stated principle of economically rational consumer behaviour. As a result, the forecasts should be revised downwards to reflect lower coordination, slower system size growth, and more cautious battery and VPP uptake projections.

CER Forecasts Ignore Distribution Network Constraints and Rely on Speculative Policy Assumptions

The consultant forecasts fail to integrate physical grid limitations and embed aggressive policy assumptions that do not align with ISP scenario narratives:

Grid constraints are not properly modelled

Neither CSIRO nor GEM properly accounts for distribution network hosting capacity as a constraint on CER uptake.

CSIRO proxies network constraints through system size limits, assuming that rooftop PV will be restricted in size rather than explicitly modelling grid congestion or curtailment risks.

GEM explicitly models potential curtailment of solar exports due to network export limits, which reduces export revenue for solar households. However, since most financial benefits from rooftop PV now stem from self-consumption rather than feed-in tariffs, GEM's approach provides only a partial representation of grid constraints.

Neither consultant fully accounts for the physical limitations of the distribution network, or the costs of network upgrades required to accommodate high CER penetration.

CER forecasts rely on speculative policy assumptions

GEM builds CER uptake around aggressive policy-driven incentives that are not assumed in the ISP, calling into question whether its forecasts are even compatible with AEMO's scenario framework. GEM previously assumed a national battery rebate covering 50% of capital costs under *Step Change* and *Green Energy Exports* in the 2023 IASR, later revising this to one-third of capex in *Green Energy Exports* and 25% in *Step Change* for the 2025 draft IASR. GEM acknowledges that this assumption has a "significant impact in accelerating uptake of battery systems from 2027 onwards."[11] Additionally, GEM assumes that the Australian Carbon Credit Unit (ACCU) scheme will be expanded to subsidise distributed PV.

CSIRO, by contrast, previously modelled CER uptake under existing policy settings and did not assume new subsidies. However, in the Draft 2025 IASR, CSIRO has partially converged with GEM's approach by incorporating the assumption that battery subsidies will emerge to reduce upfront costs, despite such subsidies not being present in the ISP.

By allowing consultants to disregard distribution network hosting capacity and embed speculative policy assumptions, AEMO inflates CER uptake projections and misrepresents the financial and technical feasibility of high CER penetration. Without explicit modelling of grid limitations and the costs of required network reinforcements, these forecasts assume CER expansion can occur unhindered, leading to unrealistic projections that could misguide infrastructure investment and policy decisions.

To maintain the integrity of long-term system planning, AEMO must ensure that consultant forecasts strictly adhere to the policy settings outlined in the IASR, rather than incorporating speculative assumptions that distort CER projections. Additionally, grid constraints must be properly modelled, ensuring that CER uptake is evaluated in light of actual network hosting capacity and the costs of required distribution upgrades. Without these critical adjustments, AEMO's ISP will continue to overstate CER adoption potential, creating a distorted view of system costs and undermining least-cost planning objectives.

CER Forecasts Deviate from AEMO's "Economically Rational" Perspective for CER Uptake

AEMO asserts that CER forecasts are based on an "economically rational consumer-focused behaviour perspective."[12] Yet, both CSIRO and GEM deviate from this principle by embedding non-financial motivations into their adoption models.

CSIRO adopts a consumer technology adoption curve, treating smaller rooftop PV installations as being influenced by both financial and non-financial motivations, while larger systems are assumed to be purely financial decisions based on a rate-of-return model. This bifurcation is inconsistent with AEMO's claim that all uptake models reflect economic rationality, as CSIRO's approach includes non-economic factors that drive smaller system adoption.

GEM's payback-based model initially appears to align more closely with AEMO's framework, as it explicitly ties solar and battery uptake to financial viability. However, non-financial motivations remain embedded in the forecasts, arguably contradicting GEM's own methodology. GEM acknowledges that home batteries have yet to reach financial attractiveness,[13] yet projects strong growth in battery and VPP adoption regardless. GEM justifies this in two ways: first, by assuming new subsidies will emerge, even though they are not included in the ISP/IASR; and second, by citing behavioural motivations such as a "desire to do their bit in addressing global warming," a "misapprehension that the battery will leave them financially better off," and the "bragging rights" associated with owning cutting-edge technology.[14]

CER Forecasts Should Be Further Moderated to Align with Market Realities

For these reasons, CER projections remain significantly inflated, despite AEMO's shift to a more conservative trajectory in the 2025 IASR. Battery uptake and VPP forecasts, in particular, remain unrealistic, with assumptions that do not reflect market trends or observed consumer behaviour.

Battery uptake projections remain overly aggressive, given that home battery prices have not decreased in the past six years. According to the Solar Choice Battery Price Index, battery prices have remained relatively flat from 2018 to 2024, as shown in Figure 2. [15] There is no economic justification for the assumption that battery adoption will accelerate despite stagnant prices lacks economic justification.

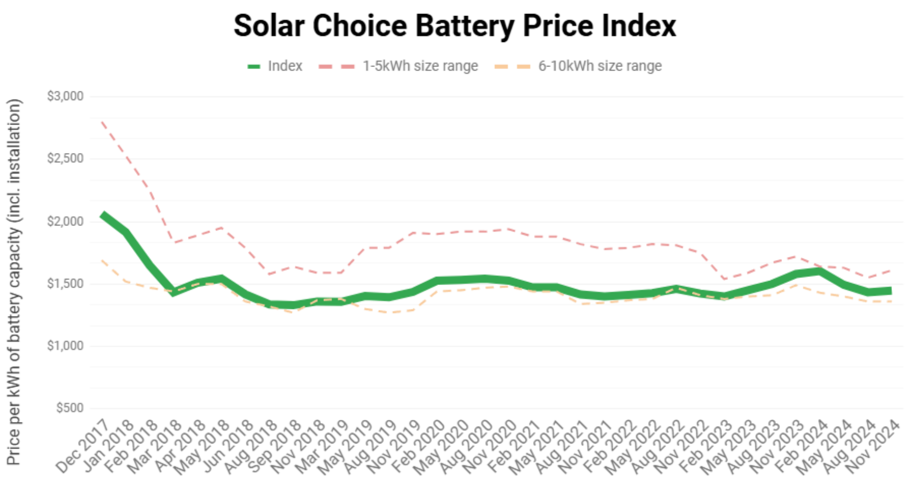

Figure 2. Solar Choice Battery Price Index showing home battery prices remained relatively flat from 2018 to 2024.

Further, VPP forecasts continue to overestimate adoption, even as AEMO itself concedes that: "Despite the long-term potential, the uptake of VPP products to date has been modest."[16]

While CIS supports AEMO's shift toward more realistic CER forecasts in the Draft 2025 IASR, further downward revisions are necessary to account for grid constraints and market realities, to ensure CER adoption is not overstated.

Sensitivities

What uncertainties are valuable to explore with sensitivity analysis?

As outlined above, and in previous CIS submissions, the scenario collection should include a baseline scenario without government policy constraints; or failing that, a scenario that includes only legislated emissions-reduction targets and not other policies such as renewables targets. This is vital for consumers to understand the impact of these policies on total system costs, which are reflected in their bills. However, if no such scenario is introduced, AEMO should at least explore a sensitivity analysis in which government targets are not met — particularly governments' renewable energy targets — in order to assess the impact of these policies on the optimal development path and therefore on customers.

Retail Prices

AEMO's admission that retail electricity prices will increase under the ISP's planned development path is a welcome recognition of reality. However, the extent of the price increase is significantly underestimated, particularly given recent trends in retail electricity prices and the cost pressures arising from the transition.

Unfounded Expectation of Declining Prices in the Early 2030s

The IASR states in page 79 that:

> *Prices are expected to trend downwards until the early 2030s as significantly more low-cost renewable energy generation is expected to come online.*

This assumption contradicts recent trends where retail prices have increased as more renewable generation enters the system. The expectation of lower prices appears to presuppose that:

1. Increased renewable penetration does not drive up network costs. In reality, new transmission infrastructure is required to connect renewable generation, and these costs are passed directly to consumers through higher network charges.

2. The market will absorb large volumes of VRE without self-cannibalisation of wholesale prices. But as more variable renewables enter the system, they undercut their own revenues during high-output periods, reducing financial returns and necessitating additional subsidies or market interventions — costs that ultimately flow through to consumers.

3. Firming costs, particularly for gas peakers and batteries, will remain lower than historical trends suggest. The actual costs of dispatchable generation have been rising, driven by gas shortages, pipeline constraints, and high capital costs for battery storage. As firming is critical to system reliability, these escalating costs will contribute to rising retail prices.

Contrary to AEMO's assumption, evidence suggests that higher VRE penetration has not correlated with lower consumer prices. Instead, it has exacerbated volatility in the wholesale market, increasing the need for expensive firming solutions.

Underestimation of Gas-Firming Costs in the 2040s

The IASR projects on page 76 that:

> *Modest increases in wholesale prices in the 2040s are projected due to the increased penetration of flexible gas power generation.*

However, Simshauser and Gilmore's study on policy sequencing suggests that gas firming costs will be much higher than AEMO anticipates.[17] The study highlights gas shortages during peak demand days in winter, leading to severe price spikes and potential supply shortfalls. Additionally pipeline transmission constraints, particularly for NSW and Victoria, which will limit the ability to supply gas at projected prices. However, this understates the cost impact of gas firming on retail prices. The actual cost burden on consumers will be far higher due to:

1. **Gas price volatility and supply constraints** — The reliance on gas peakers assumes sufficient, affordable gas supply, yet studies such as Simshauser and Gilmore (2024) indicate peak winter demand will exceed pipeline capacity, leading to gas shortages and extreme price spikes. These spikes translate directly into higher wholesale electricity prices, which flow through to retail bills.

2. **Higher-than-expected gas transmission costs** — The IASR's gas price assumptions rely on outdated pipeline cost estimates. Simshauser and Gilmore (2024) highlight that pipeline transmission costs are underestimated, particularly in Victoria and NSW, where winter gas demand for firming will surge. Any shortfall in gas delivery increases reliance on expensive LNG imports or alternative firming options, further pushing up retail electricity prices.

3. **Increased reliance on expensive firming technologie**s — If gas firming proves less reliable or cost-effective than assumed, consumers will bear even higher costs as the system turns to batteries and pumped hydro; both of which require major capital investment and have uncertain long-term cost trajectories.

Clarification on Transmission Costs

Table 11 of the IASR outlines transmission cost assumptions, but fails to account for several factors that will likely increase costs in the short term (before 2030).

The IASR states that in the short term, transmission charges are based on the latest available pricing proposals and determinations from the AER. However, several large-scale transmission projects that will be delivered pre-2030 do not yet have official AER pricing determinations. This includes projects like NSW Renewable Energy Zones (REZs), which will add substantial costs to consumers before 2030, but appear to be excluded from the pricing calculations in the absent of corresponding Contingent Project Application for the projects.

CIS therefore suggests that AEMO should clarify on what basis short-term transmission pricing proposals and determinations are made if there is no CPA?

Additionally, Table 11 refers to transmission augmentation per scenario, but it is unclear whether this refers to the three candidate development paths (CDPs) outlined in the ISP. CIS asks AEMO to clarify whether the transmission augmentation per scenario correspond to CDP 1, CDP 2, or CDP 3 in the 2024 ISP.

Coal

On page 95 AEMO states that:

"New brown coal generation (with or without carbon capture and storage [CCS]) and advanced ultra-supercritical pulverised black coal (with and without CCS) – given federal and state existing policies regarding net zero emissions, including this technology would present an internal inconsistency with those policy requirements. Considering also that there are **lower cost dispatchable alternatives offering greater system flexibility**, investment risks for new coal developments are therefore assumed to be too high to be commercially viable."

There is no good reason why this exclusion should be made. As discussed above, the treatment of government policy as infallible, and effectively accomplished, is a critical failure of the ISP.

This is especially true given how ISP has been used in public, such as by Matt Kean in his capacity as Chair of the Climate Change Authority on 4 November before Senate Estimates, during which he stated that "the ISP is a look at the counterfactuals as to other sources of generation to provide the cheapest replacement cost of an existing system."[18] Given that prominent energy figures such as Matt Kean still assume that the ISP does make comparisons with other alternative technologies in order to determine the 'least cost' way to deliver electricity, AEMO should quickly and publicly clarify that the current approach does not do this, and rectify the approach by incorporating meaningful comparisons with alternative technologies such as coal and nuclear so that the ISP's actual method begins to conform with public expectations and understandings of what it does.

Candidate technology build costs

Do you support the implementation of first-of-a-kind premiums for technologies that have not been deployed in Australia and with the underlying assumptions appropriate?

First-of-a-kind (FOAK) premiums are appropriate for offshore wind, but greater clarification is needed with respect to the values on page 98. AEMO needs to clarify whether the FOAK premium for offshore wind involves adding 125% to costs (which is more reasonable) or multiplying costs by 125%, given the factor will be "reduced to 0" presumably after the first year in which capacity is built. If AEMO intends to multiply costs by 125%, this factor should be increased as a 25% increase to costs is too low to account for the significant challenges of building offshore wind in Australia.

Do you have any comments regarding the draft build cost projections?

AEMO states on page 98 that the "GenCost 2024-25 Consultation Draft incorporates hydrogen fuel readiness for gas generation, which results in an increase in costs relative to previous estimates". As explained above, green hydrogen electrolysers are unlikely to be economic in the near future and thus hydrogen readiness should not be included in gas infrastructure costs.

Batteries

On page 107, AEMO states:

Exact storage locations are identified considering the storage needs of REZ and regional developments through time-sequential dispatch and power flow modelling, using AEMO internal expertise to determine suitable locations where transmission costs may be offset by locating storage.

AEMO needs to provide more transparency on these "suitable locations" that have been selected using "internal expertise" so that stakeholders can be assured of the reasonableness of these selections.

Weighted average cost of capital (WACC) and discount rate

Is the proposed application of technology-specific WACC's for different technology types appropriate and reasonable for the ISP?

The current pre-tax real WACC values presented on p 118 favour transmission projects, as the regulated transmission WACCs are 3-4.5%, which are much lower than the generation and storage WACCs ranging from 5-13.5%. This is problematic because transmission projects themselves are not less risky than other projects — in fact, most recent regulated transmission projects have faced massive cost blowouts of 100-500% in the space of a few years.[19] The risks faced by investors are only reduced for these regulated transmission projects because consumers are forced to bear the risk. By giving regulated transmission projects a much lower WACC range than other technologies, AEMO is biasing the model towards building projects that are less risky for investors and more risky for consumers. This is likely to result in a suboptimal set of projects that does not fulfil the purpose of the ISP, which should be providing a lowest cost system for consumers, particularly with respect to transmission. If different WACCs must be used, it would be fairer to consumers to use the unregulated transmission values for regulated projects.

As it stands, the Green Energy scenario in particular will have its value inflated compared to the counterfactual because it has the largest transmission build, biasing the ISP towards making more projects actionable. RIT-Ts will also be skewed towards approving projects that previously would not have been approved if the proposed WACCs are used.

Furthermore, it is not appropriate to give gas turbines a higher WACC than other technologies due to their higher emissions, as this constitutes double-counting a carbon price. The model is already forced to meet carbon budgets, so increasing the WACC for gas projects is unnecessary and makes them seem costlier than they are; skewing the optimal combination of projects that would deliver the lowest cost system for consumers.

The Oxford Economics report used to determine the WACC for solar and wind is flawed. The report indicates a 153 bps debt risk premium for solar projects and 154 bps for wind projects,[20] but this is in the ballpark of projects with long-term Power Purchasing Agreements (PPAs), not merchant solar and wind farms. As indicated by a Griffith University study, projects with 100% PPA coverage have credit spreads of around 180 bps, while a fully merchant renewable project with no PPA coverage will have elevated credit spreads around 200bps.[21] The report's unrealistic survey results may arise from Oxford Economics only receiving responses from only 21 of the 108 organisations asked to complete the survey.[22] Oxford Economics made note of interview participants highlighting "that there is a merchant risk premium for solar assets as the implications of negative pricing due to the 'Duck Curve' makes post-PPA revenue flows uncertain".[23] This merchant risk is substantial for both solar and wind, given the falling capture prices observed in recent years (Figure 3)[24] and should be reflected in lower gearing and higher debt risk premiums as outlined in the Griffith University study.

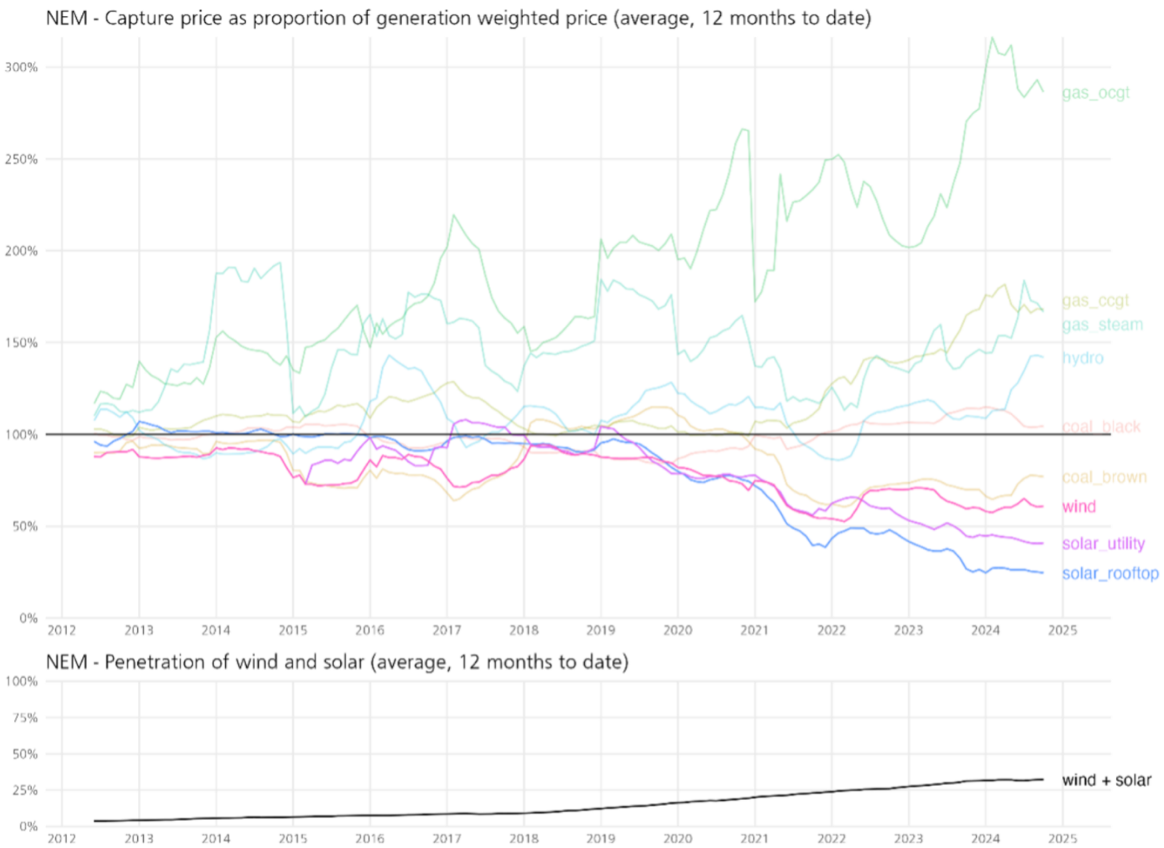

Figure 3. Capture prices for wind and solar as a proportion of generation weighted price have decreased with increasing wind and solar penetration.

For transparency, it would be better to use the same WACC across all technologies.

Is the discount rate, including its upper and lower bounds, reasonable?

Yes, as outlined above, it is important that the discount rate remains the same across all technologies.

System Security

On page 162 AEMO writes:

> *For the 2026 ISP, AEMO proposes to continue to use a declining unit commitment constraint, and to also include an additional cost component to retiring thermal generation to represent the cost of replacing their fault current contributions towards the minimum fault level requirements. This has the effect of providing the optimisation engine with a more reflective system security cost impact when withdrawing existing thermal units from service...The cost of these synchronous condensers is allocated to the retirement cost of existing coal-fired generating units in proportion to its rated fault current contribution, as a percentage of the total regional requirement.*

AEMO should clarify the assumptions surrounding how the coal fleet provides system security services such as fault current contribution, or other services provided by spinning reserves, in the lead-up to their retirement. It should be noted that in the current ISP's Step Change Scenario, the capacity factor of coal plants declines significantly, from current usages, well below 50% and even as low as 32% for brown coal in 2030-31.

It isn't clear that under such low utilisation the coal fleet will be able to provide the same system security that it does today. As such, the need to invest in synchronous condensers may arise considerably sooner. This would make modelling the cost of synchronous condensers as a retirement cost for coal power stations inappropriate.

Demand-side participation (DSP)

Are the long-term DSP settings, grown to meet a target level by scenario informed by international review, suitable for use in AEMO's planning publications?

On Page 79 AEMO writes:

> *The Green Energy scenario assumes high growth in DSP, representing a future with highly engaged consumers who, in addition to embracing CER technologies, value the savings from orchestrated DSP programs over the convenience of fixed tariffs and uncontrolled demand.*

It should also be noted that in this proposal *Step Change* grows to 4.25% DSP of peak demand, 10% in NSW.

This is an extraordinarily high level of DSP, and represents a transformational shift in people's attitudes towards electricity use and availability. By and large the assumption that people will be able to use electricity when they need it, particularly at times when it is hot or cold and they need cooling or heating for their own comfort, should remain. It seems unrealistic to assume that consumers could be readily induced to forego the convenience that always-available electricity provides for any sensible degree of compensation without inducing a strong political backlash.

Retirement Costs

Are the retirement cost assumptions detailed in the accompanying Draft 2025 Inputs and Assumptions Workbook appropriate?

The retirement cost assumptions in the Draft 2025 IASR remain incomplete and underestimate the true costs of decommissioning, disposal, and site rehabilitation across various generation technologies. While the retirement costs of fossil fuel plants such as coal, gas, and pumped hydro are explicitly accounted for, the exclusion of critical end-of-life costs for renewables and storage technologies skews cost comparisons and misrepresents the long-term financial obligations of the energy transition.

The Draft 2025 IASR continues the flawed approach of the 2024 ISP by excluding disposal and recycling costs for solar panels, wind turbines, and large-scale batteries. The previous reliance on a 2018 GHD report — which did not consider recycling or disposal obligations — remains a concern. This omission implicitly assumes that all waste from renewables will either be abandoned on-site or sent to landfill at no cost, despite increasing regulatory requirements for mandatory recycling.

Australia's legislative environment is increasingly making recycling the only option. In Victoria and South Australia, solar panels and batteries have been banned from entering landfill and must be recycled or stored until they can be recycled.[25] Western Australia has announced similar restrictions and the federal government is also developing a mandatory product stewardship scheme, which could make solar panel manufacturers and importers liable for recycling costs.[26] Queensland has recently announced a solar panel recycling pilot scheme, which will inform the national scheme.[27] The Draft 2025 Workbook does not account for these foreseeable costs, creating a misleading cost comparison between renewables and conventional generation.

AEMO has again excluded retirement costs for offshore wind, arguing that decommissioning costs will be incurred beyond the ISP modelling horizon. However, this rationale is flawed. Investors and developers require a clear understanding of the full lifecycle costs before committing to a project. Excluding these costs distorts investment signals and fails to ensure the economic viability of offshore wind developments. The assumption that benefits beyond the modelling horizon will offset these costs is speculative and unsupported by real-world cost assessments.

Battery storage is a critical component of the transition to renewables, yet AEMO still does not include disposal costs for large-scale batteries, citing insufficient data. This is a critical omission, given that lithium-ion batteries have finite lifespans and pose environmental and financial liabilities at end-of-life. The absence of cost estimates undermines transparency in assessing the true system-wide cost of integrating large-scale storage.

Hydrogen

Do you have any alternative views on the electrolyser cost curve?

The cost curve is unrealistic. As noted on page 108 of the Aurecon report that underpins the initial capital cost estimates: “BloombergNEF notes that factories around the world could produce up to 31.7GW of electrolysers per year at the end of 2023, nearly 17 times what was delivered that year and more than seven times the capacity expected to be delivered in 2024 leading to severe overcapacity of manufacturing.”

At least some of the economies of scale that come from ‘gigafactories’ are likely already baked into the present market price, that is also further depressed by the massive overcapacity, and hence excessive competition in the electrolyser market. Prices are likely to increase as this slack is taken up by new demand, or some of the overcapacity is removed due to closures and bankruptcies.

There is no credible prospect of immediate, significant and sustained decreases in such prices in a economic environment that is characterised by a glut of manufacturing capacity.

Furthermore, the price of electrolysers is not the only determinant of the viability of hydrogen.

On page 168 AEMO writes: “Electrolysers can be operated flexibly, providing capacity to ramp up and down rapidly, potentially even providing fast frequency response in a similar way to electrochemical batteries.”

Even if this type of operation is technically possible, there is no indication it is economically viable, even if the capital costs do significantly reduce, which, as discussed, it is likely they won’t. The underlying challenges of using hydrogen, including the significant energy losses necessary from its manufacture and utilisation, as well as the difficulty in getting low-cost renewable energy, as well as challenges in its storage and transportation are leading to almost all commercial investments in hydrogen to be shelved or cancelled recently.

None of the core scenarios with any weighting should assume there is any hydrogen industry that warrants the load being modelled separately to the underlying industrial demand, which assumes relatively flat and inflexible loads.

A ‘hydrogen-optimistic’ sensitivity could be conducted to explore the impact of these underlying challenges being suddenly overcome, which reverses the clear and inevitable trend that much-hyped hydrogen projects get delayed and cancelled rather than being delivered.

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[1] See CIS submissions to the 2025 IASR Consultation Paper and Draft 2024 ISP submissions.

[2] See CIS Submission to Select Committee on Energy Planning and Regulation in Australia regarding Government Policy in the Integrated System Plan, https://www.aph.gov.au/DocumentStore.ashx?id=c8f07fe4-89d8-4496-8c5d-a93d1a4363b2&subId=767777.

[3] Akimoto, Daisuke. 2024. “The End of Japan’s Hydrogen Rush in Australia?” *The Diplomat*. https://thediplomat.com/2024/12/the-end-of-japans-hydrogen-rush-in-australia; Mercer, Daniel. 2024. “Energy giant Origin retreats from flagship green hydrogen project as hopes for fuel fade”. *ABC*. https://www.abc.net.au/news/2024-10-03/energy-giant-origin-walks-away-from-green-hydrogen/104429206.

[4] BIS Oxford Economics. 2022. AEMO Macroeconomic Outlook FY2023.

[5] Commonwealth of Australia. 2024. Select Committee on Energy Planning and Regulation in Australia. 2024. Final Report. p. 122.

[6] ECMC. 2024. Response to the Review of the Integrated System Plan, p. 8.

[7] DCCEEW 2024. Review of the Integrated System Plan: Final Report, p. 26.

[8] Ibid. p. 80.

[9] The $348 billion total capital cost for CER is calculated by multiplying the new capacity of rooftop solar and consumer batteries installed under the 2024 *Step Change* scenario by the projected capital costs based on available data in 2023-24 GenCost. GenCost provides annual capital cost schedule for rooftop solar but not for consumer batteries, reporting the current installation cost at $1,455/kWh. As a result, we assumed this installation cost remains constant throughout the projection period for calculating the total capital cost of consumer batteries. If the learning rate of 1-hour utility-scale battery is applied to small-scale battery, this would reduce the total capital cost for CER to $211 billion. The analysis assumes a 30-year lifespan for rooftop solar and a 15-year lifespan for consumer batteries, incorporating replacement costs when systems reach the end of their useful life before 2050. Further, as the ISP does not provide a detailed breakdown of generator and storage capital costs, we estimated the $83 billion by calculating the annual increase in utility solar (GW), deep storage (GWh), medium storage (GWh), and shallow storage (GWh) in the Step Change scenario. These annual capacity increases were then multiplied by the corresponding capital costs from the 2023-24 GenCost report to derive the total capital cost for large-scale solar and batteries up to 2050.

[10] https://aemo.com.au/newsroom/media-release/integrated-system-plan-reflects-whole-of-system-costs

[11] GEM. 2024. Projections for distributed energy resources – solar PV and stationary energy battery systems. p. 44.

[12] AEMO. Draft 2025 Inputs, Assumptions and Scenarios Report. p. 57.

[13] GEM. 2024. Projections for distributed energy resources – solar PV and stationary energy battery systems. p. 33.

[14] GEM. 2024. Projections for distributed energy resources – solar PV and stationary energy battery systems. p. 70.

[15] Sykes, Jeff. 2024. "Solar Battery Costs: Solar Battery Price Index". Solar Choice. https://www.solarchoice.net.au/solar-batteries/price/.

[16] AEMO. Draft 2025 Inputs, Assumptions and Scenarios Report. p. 62.

[17] Paul Simshauser & Joel Gilmore. 2024. "Policy sequencing: on the electrification of gas loads in Australia's National Electricity Market". Centre for Applied Energy Economics & Policy Research, Griffith University. Working Paper Series 2024-10.

[18] Hansard. 4 November 2024. Environment and Communications Legislation Committee. p. 51.

[19] Frontier Economics. 2024. *Report 1 – Developing a base case to assess the relative costs of nuclear power in the NEM*. p. 42. https://www.frontier-economics.com.au/wp-content/uploads/2024/11/Report-1-Base-case-report-Nov-14-2024_v2.pdf.

[20] Oxford Economics Australia. 2024. "Discount Rates for Energy Infrastructure: Prepared for AEMO for the 2026 Integrated System Plan". https://aemo.com.au/-/media/files/major-publications/isp/2025/oxford-economics-australia-2024-discount-rate-report.pdf. pp. 29, 31.

[21] Gohdes, Nicholas, Paul Simshauser & Clevo Wilson. 2023. "Renewable investments in hybridised energy markets: optimising the CfD-merchant revenue mix". pp. 9-10. https://www.griffith.edu.au/__data/assets/pdf_file/0029/1784162/No_2023-03-Renewable_investments_in_hybridised_energy_markets_Semi-Merchant_Wind-76.pdf.

[22] Oxford Economics Australia. 2024. *Discount Ratesfor Energy Infrastructure*. p. 14.

[23] Ibid. p. 30.

[24] Analysis performed using the 12-month rolling average of capture prices for each technology and the generation-weighted price for the whole market, and dividing the technology capture price by the market price to show the change as VRE penetration increases. Data was taken from https://explore.openelectricity.org.au/energy/nem/.

[25] Parliament of Australia. 2023. Question on notice no. 102. Portfolio question number: 92. 2020-21 Budget estimates. Environment and Communications Committee, Climate Change, Energy, the Environment and Water Portfolio.

[26] Department of Climate Change, Energy, the Environment and Water. 2023. "Wired for change: Regulation for small electrical products and solar photovoltaic system waste." https://storage.googleapis.com/files-au-climate/climate-au/p/prj2748908c878a1b4b81a54/public_assets/Wired%20for%20change%20Regulation%20for%20waste%20small%20electrical%20products%20and%20solar%20photovoltaic%20systems.pdf

[27] de Brenni, Mick and Leanne Linard. 2024. "Miles Labor Government delivering Australia's leading solar panel recycling scheme." Queensland Government. https://statements.qld.gov.au/statements/101195.